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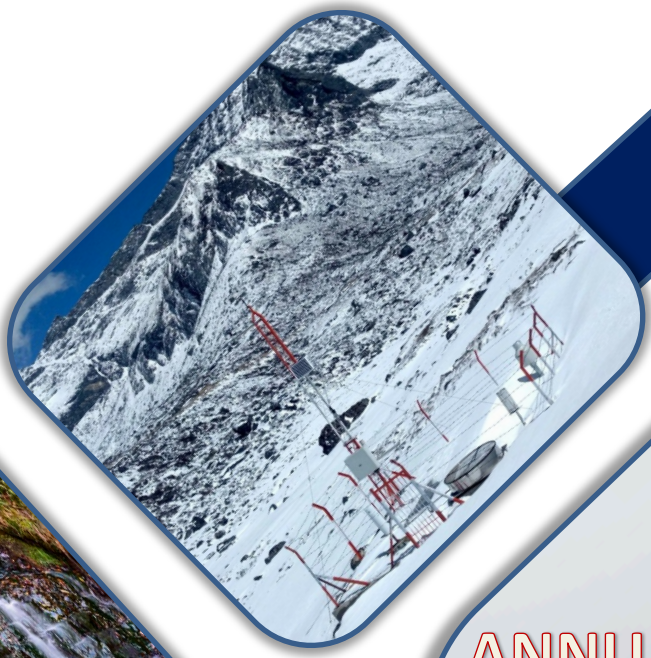
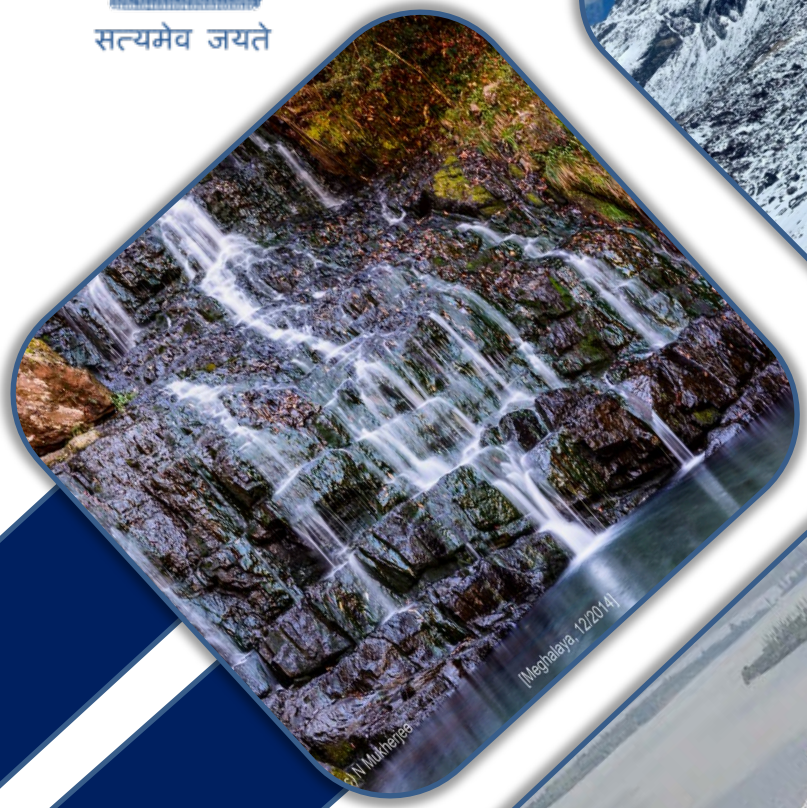




ANNUAL REPORT
2018-2019

CENTRAL WATER COMMISSION

केन्द्रीय जल आयोग

आपो ज्योति रसोऽमृतम्

CENTRAL WATER COMMISSION

(SERVING THE NATION SINCE 1945)

Government of India

Ministry of Water Resources, River Development & Ganga Rejuvenation

INDIA - LAND AND WATER RESOURCES: FACTS

•	Geographical Area & Location	328.7 M ha Latitude; 8^0 4'N to 37^0 6' N Longitude: 68^0 7'E to 97^0 25' E
•	Population (2011)	1210.19 Million
•	Rainfall Variation	100 mm in Western most regions to 11000 mm in Eastern most region
•	Major River Basin (Catchment Area more than 20,000 Sqkm)	12 Nos. having total catchment area 253 Mha
•	Medium River Basin (Catchment Area between 2000 and 20,000 Sq km)	46 nos. having total catchments area 25 Mha
•	Total Navigable Length of Important Rivers	14464 Km

WATER RESOURCES

•	Average Annual Rainfall (1951-2000)	1190mm (4000 BCM)
•	Annual Rainfall (2018)	1074mm
•	Mean Annual Natural Run-Off	1869 BCM
•	Total Utilisable Water	1123 BCM
•	Estimated Utilisable Surface Water Potential	690 BCM
•	Total Replenishable Ground Water Resources (2013)	432BCM
•	Net Ground Water Availability (2013)	411 BCM
•	Ultimate Irrigation Potential	139.9 Mha
	From Surface Water	76 Mha
	From Ground Water	64 Mha
•	Storage Available Due to Completed Major & Medium Projects (Including Live Capacity less than 10 M.Cum)	253 BCM
•	Estimated Additional Likely Live Storage Available due to Projects Under Construction / Consideration	155 BCM

LAND RESOURCES

•	Total Cultivable Land	182.2 M ha
•	Gross Sown Area (2014-15)	198.4 M ha
•	Net Sown Area (2014-15)	140.1 M ha
•	Irrigation Potential Created (upto March 2012)	113.5 M ha
•	Gross Irrigated Area (2014-15)	96.5 M ha
•	Net Irrigated Area (2014-15)	68.4 M ha

HYDRO-POWER

•	Ultimate Hydropower Potential	148701 MW
•	Potential Developed by 31.3.2018 (Installed Capacity of plants above 25 MW)	45293 MW

FROM CHAIRMAN'S DESK

I feel highly delighted to bring out the Annual Report of the Central Water Commission (CWC) for the year 2018-19. The Report gives an overview of the functions and activities of CWC in the field of water resources in India as well as in the neighbouring countries.

Since its formation in 1945, CWC has been playing vital role in the development of the water resources sector in the country. It has also provided necessary support to the Department of Water Resources, River Development and Ganga Rejuvenation on all technical and policy matters in the field of water resources such as inter-state matters, sharing of waters with neighbouring countries, bilateral treaties and MoUs, etc. CWC has carried out many activities, namely appraisal of major and medium irrigation projects and other water resources development schemes; monitoring of major, medium and extension/ renovation/ modernization (ERM) projects; civil design and hydrological studies of water resources projects; implementation of World Bank aided National Hydrology Project (NHP) and Dam Rehabilitation and Improvement Project (DRIP); hydrological observations and flood forecasting services etc. during the year.

During 2018-19, CWC provided design consultancy for DPR preparation and project construction in respect of 84 water resources development projects in India, Bhutan and Nepal. During the period, 24 water resources development projects comprising of 13 major & medium irrigation projects and 11 flood control projects were appraised by CWC which were accepted by the Technical Advisory Committee. Based on monitoring of irrigation projects as well as scrutiny of release proposals by CWC, Rs. 2849.07 Crore have been released to 43 Major and Medium Irrigation Projects under PMKSY-AIBP programme.

CWC also monitored storage position of 91 important reservoirs in the country during the year which helped the States in planning judicious utilization of their water resources during non-monsoon period. We started flood forecasting service at 23 new stations during 2018-19. The timely issue of 6851 flood forecasts (with 94.80 % accuracy) during the monsoon period of 2018 has helped concerned authorities in effective flood fighting and relief. Eleven Water Quality laboratories of CWC were accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) for chemical testing during the year.

CWC has been providing quality service to the nation in the field of water resources development and management and will continue to do so in future also.

(Rajendra Kumar Jain)
Chairman
Central Water Commission

HIGHLIGHTS OF THE YEAR 2018-19

❖ DESIGNS

- CWC provided design consultancy to States / Project Authorities for 84 water resources development projects involving detailed designs and preparation of drawings of various types of hydraulic structures.

❖ RIVER MANAGEMENT

- Carried out hydrological observations, including snow and meteorological observation, at 954 sites in different basins spread over the entire country.
- 11 River Water Quality Laboratory of CWC were accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) in the discipline of chemical testing.
- Provided Flood Forecasting Service at 249 flood forecasting stations (including 75 inflow forecasting stations) spread over 19 major river basins. During the flood season 2018, 6851 flood forecasts (4969 level forecast and 1882 inflow forecasts) were issued, out of which 6495 (94.80%) forecasts were within prescribed limits of accuracy. Daily flood bulletins and weekly flood news letters were also issued during the flood season.
- Provided technical assistance to Royal Government of Bhutan for maintenance of 32 Hydro-Meteorological sites in Bhutan.

❖ WATER PLANNING

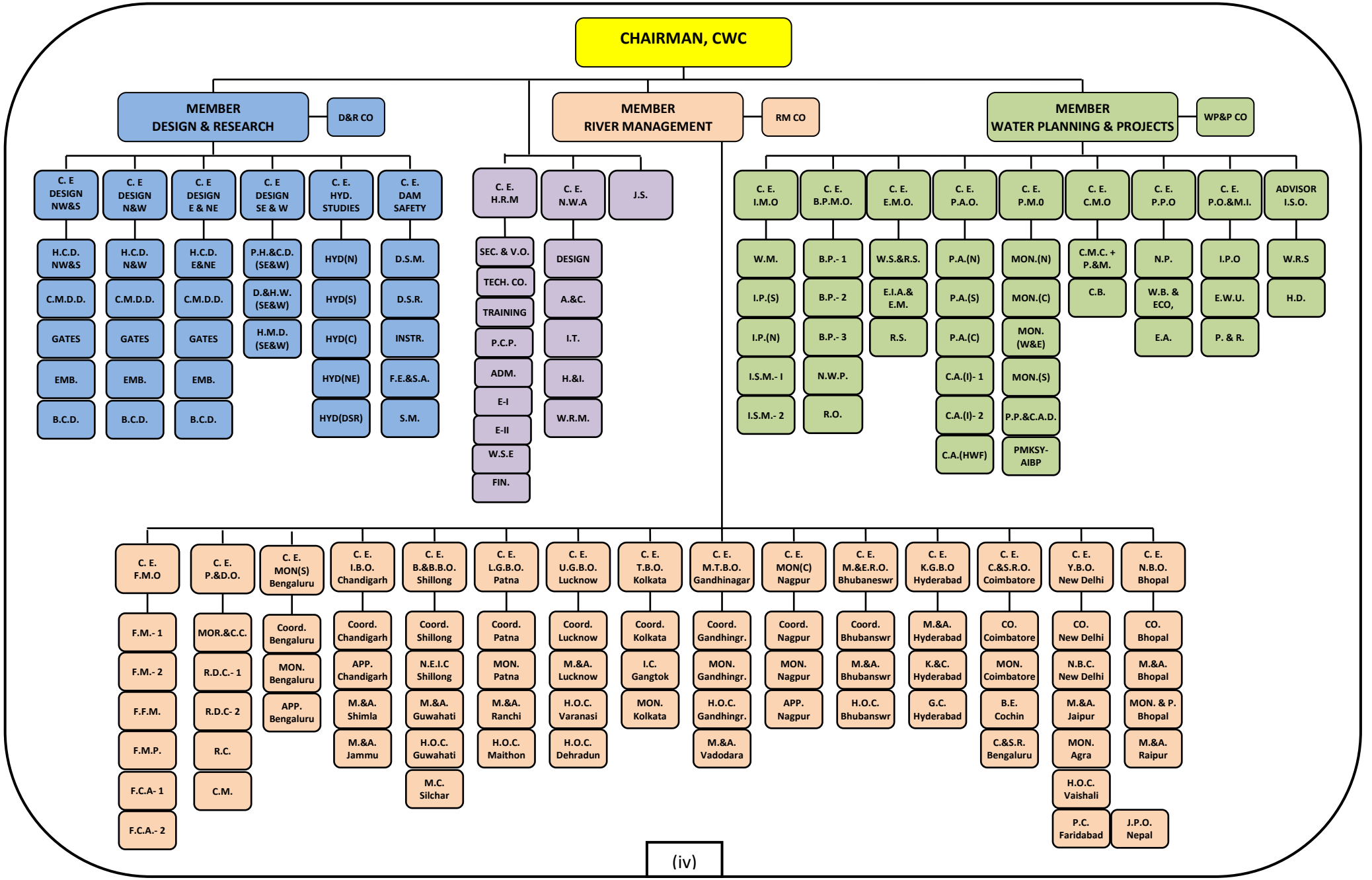
- During the year 2018-19, 39 major / medium irrigation projects were under appraisal in CWC. 24 projects comprising 13 major / medium irrigation projects and 11 flood control projects were accepted by the Technical Advisory Committee.
- CWC monitored 47 Irrigation projects under General Category and 199 Irrigation projects (including Extension/Renovation/Modernization (ERM) projects) receiving grants under PMKSY-AIBP.
- Storage positions of 91 important reservoirs, with total live storage of about 161.99 BCM, were monitored on weekly basis.
- CWC processed proposals for release of CA amounting to Rs. 2849.07 crore in respect of 43 Major and Medium Irrigation Projects under PMKSY-AIBP.

❖ HRM

- National Water Academy, CWC, Pune conducted 32 training programmes during 2018-19 including Workshop/Seminar for officers of Central / State Governments and Public sector undertakings with a total number of man weeks accomplished to the tune of 2616.2. Besides it a number of in-house trainings for officials of CWC at CWC(HQ) and field offices were conducted throughout the year as the the Annual training calendar to enhance and referesh various skills in the field of water resources sector.

CONTENTS

Organogram of Central Water Commission



CHAPTER-I

AN OVERVIEW

1.1 HISTORY OF CWC

Central Water Commission (CWC), an apex organization in the country in the field of Water Resources came into existence as "Central Waterways, Irrigation and Navigation Commission" vide Department of Labour Resolution No. DW 101(2) dated 05.04.1945. In the year 1951, it was renamed as "Central Water and Power Commission" (CW&PC) after its merger with the "Central Electricity Commission". Following the changes in the Ministry of Agriculture and Irrigation, in the year 1974, Water Wing of CW&PC was separated as "Central Water Commission", which continues till date. At present Central Water Commission functions as an "Attached Office" of the Ministry of Water Resources, River Development and Ganga Rejuvenation and is its main technical arm. It is mainly manned by the officers of Central Water Engineering Services (CWES) cadre, the only organised service of the Ministry of Water Resources, River Development and Ganga Rejuvenation.

1.2 ORGANISATION

CWC is headed by a Chairman, with the status of Ex-Officio Secretary to the Government of India. The work of the Commission is divided among 3 wings namely, Designs and Research (D&R) Wing, Water Planning and Projects (WP&P) Wing and River Management (RM) Wing. Allied functions are grouped under respective wings and each wing is placed under the charge of a full-time Member with the status of Ex-Officio Additional Secretary to the Government of India. Each wing comprising of a number of organizations is responsible for the disposal of tasks and duties falling within the scope of functions assigned to it. In the discharge of these responsibilities, officers of the rank of Chief Engineer, Director/Superintending Engineer, Deputy Director/Executive Engineer, Assistant Director/Assistant Executive Engineer; other Engineering and Non-Engineering officers and supporting staff working in various regional and headquarter organizations, assist the Members. There is a separate Human Resources Management Unit headed by a Chief Engineer, to deal with Human Resources Management / Development, Financial Management, Training and Administrative matters of the Central Water Commission. National Water Academy

located at Pune is responsible for training of Central and State in-service engineers and functions directly under the guidance of Chairman. Broad duties and responsibility of Chairman and Members are as under:

CHAIRMAN

Head of the Organization – Responsible for overseeing the various activities related to overall planning and development of water resources of the country and management of the Commission as a whole.

MEMBER (WATER PLANNING & PROJECTS)

Responsible for overall planning and development of river basins, National Perspective Plan for water resources development in accordance with the National Water Policy, techno-economic appraisal of water resources projects and assistance to the States in the formulation and implementation of projects, monitoring of selected projects for identification of bottlenecks to achieve the targeted benefits, preparation of project reports for seeking international assistance, environmental aspects, application of remote sensing technologies in water resources, etc.

MEMBER (DESIGNS & RESEARCH)

Responsible for providing guidance and support in planning, feasibility studies, standardization and designs of river valley projects in the country, safety aspects of major and medium dams, hydrological studies for the projects, coordination of research activities, etc.

MEMBER (RIVER MANAGEMENT)

Responsible for providing technical guidance in matters relating to river morphology, flood management, techno-economic evaluation of flood management schemes, collection of hydrological and hydro-meteorological data, formulation of flood forecast on all major flood prone rivers and inflow forecasts for selected important reservoirs, investigation of irrigation / hydro-electric / multipurpose projects, monitoring of major and medium projects with regard to AIBP etc.

The incumbents to the posts of Chairman and Members of Central Water Commission during the year 2018-19 were:

1.	**Chairman, CWC**	:	Sh. S. Masood Husain	(01-04-2018 to 31-03-2019)
2.	**Member (D&R)**	:	Sh. N. K. Mathur	(01.04.2018 to 31.03.2019)
3.	**Member (RM)**	:	Sh. Pradeep Kumar	(01.04.2018 to 16.04.2018)
			Sh. Y. K. Sharma	(07.05.2018 to 31.12.2018)
			Sh. R. K. Sinha	(20.02.2019 to 31.03.2019)
4.	**Member (WP&P)**	:	Sh. S. Masood Husain	(01-04-2018 to 16-09-2018)
			Sh. S. K .Haldar	(17.09.2018 to 31.03.2019)

BROAD FUNCTIONS

CWC is charged with the general responsibility of initiating, coordinating and furthering in consultation with the State Governments concerned, schemes for the control, conservation and utilization of water resources in the respective State for the purpose of flood management, irrigation, drinking water supply and water power generation. The Commission, if so required, can undertake the construction and execution of any such scheme.

In exercise of the above responsibilities following are the main functions of CWC:

- To carry out techno-economic appraisal of irrigation, flood control and multipurpose projects proposed by the State Governments;
- To collect, compile, analyse and publish the hydrological and hydro-meteorological data relating to major rivers in the country, consisting of stage, runoff, rainfall, temperature etc.;
- To collect, maintain and publish statistical data relating to water resources and its utilization including quality of water;
- To provide flood forecasting services to all major flood prone inter-state river basins of India through operation of network of flood forecasting stations;
- Monitoring of selected major and medium irrigation projects to ensure the achievement of physical and financial targets. Monitoring of projects under

Accelerated Irrigation Benefit Program (AIBP), and Command Area Development (CAD) program are also undertaken;

- To advise the Government of India and the concerned State Governments on the basin-wise development of water resources;
- To undertake necessary surveys and investigations, as and when so required, to prepare designs and schemes for the development of river valleys in respect of power generation, irrigation by gravity flow or lift, flood management and erosion control, anti-water logging measures, drainage and drinking water supply;
- To provide Design Consultancy including Hydrological Studies in respect of Water Resources Projects, when so requested, to the State Governments concerned/project authorities.
- To undertake construction work of any river valley development scheme on behalf of the Government of India or State Government concerned;
- To advise and assist, when so required, the State Governments (Commissions, Corporations or Boards that are set up) in the investigation, surveys and preparation of river valley and power development schemes for particular areas and regions;
- To advise the Government of India in respect of Water Resources Development, regarding rights and disputes between different States which affect any scheme for the conservation and utilization and any matter that may be referred to the Commission in connection with river valley development;
- To impart training to in-service engineers from Central and State Organizations in various aspects of water resource development;
- To initiate studies on socio-agro-economic and ecological aspects of irrigation projects for the sustained development of irrigation;
- To conduct and coordinate research on the various aspects of river valley development schemes such as flood management, irrigation, navigation, water power development, etc., and the connected structural and design features;
- To promote modern tools and techniques such as remote sensing technology for water resources development, flood forecasting and development of related computer software;
- To conduct studies on dam safety aspects for the existing dams and standardize related instrumentation for dam safety measures;

- To carry out morphological studies to assess river behaviour, bank erosion/coastal erosion problems and advise the Central and State Governments on all such matters;
- To promote and create mass awareness regarding the progress and achievements made by the country in the water resources development, use and conservation.

1.3 Headquarters

There are eighteen organizations, each headed by a Chief Engineer at CWC headquarters, New Delhi. Out of which, nine organizations are under WP&P wing, six organizations are under D&R wing and two organizations are under RM wing. In addition, Human Resources Management (HRM) Unit headed by Chief Engineer (HRM) is also located at headquarters. The details of the organizations are given in the organogram.

1.4 Regional Offices

In order to achieve better results in the Water Resources Sector and have better coordination with the State Government departments, CWC has established regional offices in the major river basins. It has 13 regional offices, each headed by a Chief Engineer. The offices are located at Bangalore, Bhopal, Bhubaneswar, Chandigarh, Coimbatore, Delhi, Gandhi Nagar, Hyderabad, Lucknow, Nagpur, Patna, Shillong, and Siliguri.

1.5 Important Schemes and Programmes

PMKSY - Accelerated Irrigation Benefits Programme

The PMKSY-Accelerated Irrigation Benefits Programme (AIBP) is being implemented by MoWR,RD&GR. Central Water Commission has been assigned with the responsibility to comprehensively monitor the projects receiving Central Assistance. Under AIBP, as on 2015-16, there were 149 on-going projects which were receiving grant and are being monitored by CWC.

The Government of India has launched the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) during 2015 with the motto of 'Har Khet Ko Pani' ensuring access to some means of protective irrigation to all agricultural farms in the country, to produce 'per drop more crop', thus bringing much desired rural prosperity. Accelerated Irrigation Benefits Programmes (AIBP), Repair, Renovation and Restoration (RRR) of Water bodies and Command Area Development and Water Management (CADWM) have been subsumed in Pradhan Mantri Krishi Sinchayee Yojana (PMKSY).

In order to overcome the bottlenecks faced in completion of project under PMKSY-AIBP, during 2015-16, MoWR,RD&GR has prioritized 99 projects amongst the 149 ongoing projects under AIBP for early completion. Out of these 99 priority projects, 34 projects have been reported completed and another 40 projects are scheduled for completion by June 2019.

Central Grant totalling to Rs. 2849.07 Crores has been released to 43 Projects under PMKSY-AIBP during 2018-19. Since its inception, the cumulative total Central Loan Assistance / Grant provided to States under AIBP/PMKSY-AIBP is Rs. 65351.70 Crores till 31.03.2019 to 297 projects.

Flood Management Programme

Since XI Plan, the Government of India is implementing "Flood Management Programme (FMP)", a State Sector Scheme under Central Plan, to provide central assistance to the State Governments for taking up works related to river management, flood control, anti erosion, drainage development, flood proofing, restoration of damaged flood management works, anti sea erosion and catchment treatment etc. During the XI Plan period (2007-12), 420 Nos. of schemes of various State Governments with a total estimated cost of Rs. 7857.08 Crore were included for funding under FMP and Central Assistance totalling to Rs. 3566 Crore was released. Further during the XII Plan period (2012-17), 102 Nos. of schemes of various State Governments with a total estimated cost of Rs. 5381.29 Crore were included for funding under FMP.

River Management Activities & Works related to Border Areas (RMBA) started as a Central Sector Scheme 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 Pancheswar 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. An expenditure of Rs 478.26 Cr was incurred during XII Plan against an outlay of Rs 740 Cr.

During the period, an amount of Rs. 1307.07 Crore as CA has been released under this program. A comprehensive scheme titled "Flood Management and Border Areas Programme (FMBAP)" with an outlay of Rs 3342.00 Cr (FMP-Rs 2642 Cr &RMBA-Rs 700 Cr) for period 2017-2020 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 has been approved by the Union Cabinet on 07-Mar-2019 and aims at completion of the on-going projects already approved under FMP earlier.

A total 522 schemes were approved during XI &XII Plan. Out of these schemes, 235 schemes have been physically and financially completed; 168 schemes were physically completed with outstanding financial liability; 20 schemes foreclosed and shifted and 83 schemes are ongoing,16 schemes were dropped due to physical progress less than 50%.A Central assistance of Rs 562.67 Cr was released during year 2017-18.Further a Central assistance of Rs 428.2 Cr has also been released during current year 2018-19. Thus, since start of XI Plan, total Central Assistance released is Rs 5863.94 Cr till 31-Mar-19.An outlay of Rs 2642 Cr has been kept for period 2017-20 under this component.

Central Water Commission coordinates the release of funds for scheme under FMP in the area other than Ganga and Brahmaputra basin areas. The details of fund released during 2018-19 to States for areas other than Ganga basin is given in Table 3.2.

Table 3.2

State-wise fund released under Flood Management Programme during 2018-19		
Sl No.	Name of State	Amount released (Rs. in Crore)
1	Assam	142.118
2	Bihar	16.583
3	Himachal Pradesh	162.6
4	Jammu & Kashmir	52.198

5	Nagaland	10.841
6	Uttar Pradesh	15.575
7	Uttarakhand	4.633
8	West Bengal	23.652
Total		428.20

Following activities are being taken up under RMBA component of FMBAP.

Sl. No.	Activity
1	Hydrological observations and flood forecasting on common border rivers with neighbouring countries
2	Investigation of WR projects in neighbouring countries
3	Pre-construction activities for WR projects on common border rivers
4	Grant in aid to states for bank protection /anti erosion works on common border rivers and Union Territories for flood management /anti sea erosion measurers
5	Activities of Ganga Flood Control Commission (GFCC)

An amount of Rs 256.48 Cr was released under RMBA component of FMBAP during year 2018-19.

Development of Water Resources Information System (DWRIS)

Central Water Commission is implementing the Plan Scheme "Development of Water Resources Information System (DWRIS)" with an objective to operate a standardized national water information system in the country with provision for data collection, data processing and storage and online data dissemination. The scheme has following five major components:

i. Hydrological Observations Monitoring System
ii. Irrigation Census
iii. Strengthening of Monitoring Unit in CWC
iv. Data Bank and Information System

CWC & ISRO has jointly undertaken the work of development of Water Resources Information System (DWRIS) during 11th plan. The estimated cost of the project was Rs. 78.3164 Crores. The MoU was signed between CWC and ISRO during the month of December 2008 and the project was to be completed in 4 yrs time period i.e. upto December 2012. The project comprises of 30 major GIS layers (viz. River network, basins, canal network, water bodies, hydro meteorological network, administrative layers etc.) of the country at a scale of 1: 50000. The first full version of website of INDIA WRIS has been launched on 07 Dec, 2010 in New Delhi by Hon'ble Minister Water Resources. Five versions of website of India-WRIS have been launched so far. The version 4.1 was launched in July' 2015 and is available in public domain at 1:250000 scale. The URL of the website is www.india-wris.nrsc.gov.in.

The centre for maintenance and further development of the India-WRIS portal was functioning at Central Water Commission Headquarter with support from ISRO at New Delhi since February 2015. The support from ISRO for maintenance and further development of the portal ended w.e.f. 31st December 2017. Later, the updation of portal has again been restarted by CWC since 1st February 2018 through hiring of individual consultants. During the year 2017-18, the MIS for obtaining data from States for preparation of compilation of MMI projects by Project Monitoring Organisation has been completed and hosted on CWC website. Refinement and updation layers in respect of rivers, watershed and water bodies are under progress.

In order to maintain and update such a large volume of water resources data at national level, it has been planned to establish a new setup "National Water Information Centre (NWIC)" under the Ministry. Proposal for creation of NWIC is under process in MoWR, RD & GR

National Projects

Government of India is implementing scheme of National Projects since XI Plan with a view to expedite completion of identified National Projects for the benefit of the people. So far, Central Government has declared 16 water resources projects as National Project.

Ministry of Water Resources, had issued guidelines for implementation of scheme of National Projects in February 2009. Later, Ministry of Water Resources had issued modification in the guidelines on 28.09.2012.

Initially, such projects were provided financial assistance of 90% cost of irrigation & drinking water component of the project in the form of central grant for its completion in a time bound manner. As per the approval for continuation of scheme of National Project in XIIth Plan issued on 12.09.2013, the proportion of central assistance has been revised and the same was to be provided as 75% and 90% of the cost of balance works of Irrigation and Drinking Water Component for Projects of Non-Special Category State and Special Category States, respectively. The provision of financial assistance for National Projects has been included in the recently launched PMKSY. The proportion of Central share has now been reduced to 60% except in case of projects in eight North Eastern States and three Himalayan States which will continue to receive 90% central assistance.

Out of 16 projects included in the scheme of National Projects, five projects, namely, Gosikhurd Project of Maharashtra, Shahpur Kandi Project of Punjab, Teesta Barrage Project of West Bengal, Saryu Nahar Pariyojna of Uttar Pradesh and Indirasagar Polavaram Irrigation Project of Andhra Pradesh have started receiving funds under the scheme of National Projects. Goshikhurd and Shahpur Kandi projects have been provided grant amounting to Rs. 3350.35 crore and Rs. 26.04 crore, respectively, up to March, 2019. Teesta Barrage Project started receiving funds under the scheme of National Project during 2010-11 and grant amounting to Rs. 178.20 crore has been provided for the project till March 2018. Saryu Nahar Pariyojana started receiving funding under the scheme of National Project during 2012-13 and an amount of Rs. 1526.59 Crore has been released upto March 2019. The Indirasagar Polavaram Irrigation Project started receiving funding under the scheme of National Project during 2014-15 and an amount of Rs. 6764.46 Crore has been released upto March 2019. Besides Saryu Nahar Paryojna (Uttar Pradesh) and Gosikhurd Irrigation Project (Maharashtra) have also been included under the 99 priority project under PMKSY-AIBP.

The details of other National Projects are as under:

1. Lakhwar Multipurpose Project (Uttarakhand) was accepted by Advisory Committee of MoWR, RD & GR in its 116th meeting held in December 2012. The project was accorded investment clearance for an amount of Rs. 3966.51 Cr by Investment Clearance Committee (under the Chairmanship of Secretary, MoWR, RD & GR) in its meeting held on 24.02.2016. Further, RCE of Lakhwar Multipurpose Project was again submitted to CWC for appraisal. The same was accepted by Advisory Committee of MoWR, RD & GR for Irrigation, Flood Control & Multipurpose Projects in its 141st meeting held on 11.02.2019 for Rs. 5747.17 Cr (PL July, 2018).

2. Ken Betwa link Project Phase-I (Madhya Pradesh) has been accepted by the Advisory Committee of MoWR, RD & GR during the 129th meeting held on 08.07.2016. Project was accepted for investment clearance of Rs. 18,057.08 Crore

(2015-16 PL) on 10.02.2017 by Investment Clearance Committee of MoWR, RD & GR. The DPR of Ken Betwa Link Project Phase-II is under active stage of appraisal in CWC/CEA.

3. Ujh Multi-Purpose Project (J&K) was agreed "In Principal" by the Advisory Committee of MoWR, RD & GR in its 131st meeting held on 17.11.2016 at New Delhi with a condition that a team consisting of concerned officers from CWC and other experts shall visit the project site/area and explore the alternate options with reduced submergence/displacement alongwith minimum loss of power and irrigation benefits, so that the potential of east flowing river may be fully utilised, as envisaged in Indus Water Treaty. Accordingly, the optimized proposal of the project, ensuring utilisation of full potential of east flowing river as per Indus Water Treaty, prepared as per suggestion of the above team was to be re-submitted to Advisory Committee of MoWR, RD & GR after Environment and Forest Clearance. The team has visited the project in March, 2017. The Team submitted its report in May, 2017 with suggestion for reduction in Full Reservoir Level of Dam by 6m to reduce submergence from 41 sq km to around 34.50 sq km.. The Modified DPR was then prepared and submitted to CWC for appraisal. The same was accepted by Advisory Committee of MoWR, RD & GR for Irrigation, Flood Control & Multipurpose Projects in its 139th meeting held on 07.01.2019 for Rs. 5850 Cr (PL July, 2017).

4. Renuka Dam Project (Himachal Pradesh) has been accepted by the Advisory Committee of MoWR, RD & GR in its 132nd meeting held on 06.03.2017 at New Delhi. Revised Cost Estimate of Renuka Dam Project submitted by Project Authority is under active stage of appraisal in CWC.

5. DPR of Kishau Multipurpose Project (Himachal Pradesh & Uttarakhand) was submitted to CWC in 2010 by UJVNL for appraisal. Compliances to most of the observations of CWC/CEA are awaited since 2011. Special Purpose vehicle (SPV) as Joint Venture between Uttarakhand & Himachal Pradesh was constituted for project execution and the first meeting of SPV has been held in February, 2017. Thereafter, no progress in submission of compliances was observed. The status in the matter was reviewed at MoWR, RD & GR level and UJVNL was requested to establish Executive Committee to resolve day to day issues. UJVNL agreed to incorporate the same in agenda of board meeting of Kishau Corporation Limited.

6. Noa Dihing Project was last considered in 135th meeting of Advisory Committee held on 12.03.2018. As the ownership of the project and the source of funding were not clear and overall economic viability of the project have not been established the Advisory Committee decided that the project may be deferred and again put up to Advisory Committee once the above issues are resolved.

Thereafter, Govt. of Arunachal Pradesh vide communication dated 09.01.2019 confirmed that the project ownership will be of Govt. of Arunachal Pradesh. However, the information regarding source of the funding is yet to be submitted for establishing power tariff and overall economic viability of the project.

7. DPR of Kulsi Dam Project (Assam) is under appraisal in CWC / CEA. Ownership of the project is yet to be decided. Concurrence/Agreement/MoU between Assam and Meghalaya is also required.

8. Bursar Project (J&K) is also under appraisal in CWC/CEA.

9. Two projects, viz. Upper Siang Project and Gyspa Project (Himachal Pradesh) are at DPR preparation stage. Remaining one project, viz. 2nd Ravi Beas Link Project is at conceptual stage.

1.6 Modernization and Renovation works in CWC HQ

The modernization and renovation works of CWC Head Quarter Building (Sewa Bhawan, R K Puram) was started in 2010-11. The works for 9th and 8th floor were undertaken and completed by CPWD. During 2015-16, the work for modernization and renovation of remaining office space of CWC in Sewa Bhawan (2nd – 7th floors) & West Block was awarded to National Projects Construction Corporation Ltd. (NPCC) at an estimated cost of Rs. 40.68 Crores. The work started in January, 2016 and renovation of 4th, 5th, 6th & 7th floor in Sewa Bhawan and three wings including a Modeling Centre in West Block – I & II was completed by March, 2018. During 2018 – 19, renovation of 2nd, 3rd Floor along with a Training Hall, Conference Hall & Committee Room in Sewa Bhawan and one wing in West Block-I has been completed. The remaining work will be completed in the year 2019-20.

In continuation to modernization / renovation work of office space at CWC (HQ), the work of modernization / renovation of 80 Nos. toilets located at Sewa Bhawan, West Block-I & II and Library Building, CWC (HQ), R.K. Puram, New Delhi with estimated cost of Rs. 4.84 Crores has also been assigned to NPCC Ltd. The work for same is under progress.

To meet the increased electric load demand in view of the modernization/ renovation work of office space, the work for load augmentation at an estimated cost of Rs. 3.83 Crores has also been taken up through CPWD.

1.7 Use of E-Gov in CWC

E-Gov facility is progressively being used in CWC for up-keeping and maintenance of personal records of employees working in CWC. Different modules under this system include e-Office, APAR Management System (APARMS), Sparrow and CWES Bio-data Information System etc. The details of the systems are as under:

1.7.1 Unique Employee ID for employees of CWC:

Unique IDs for all employees of CWC working at Head-Quarters as well as field offices are maintained in CWC. This ID is a unique number and serves the purpose of identification of category of service, batch/year of joining, etc. of the employees. The Employee ID is used for generation of salary bills of employees through COMP-DDO software at CWC Head Quarter as well as in various module of Personal Information System.

1.7.2 Use of e-Office in CWC

The e-office was launched in CWC in Aug 2017 with inclusion of 6 Directorates. The same has been gradually implemented in other Directorate. So far, all Directorates at HQ have been included under e-office. The process for implementing e-office in Regional Office is under progress.

1.7.3 Use of SPARROW for management of APAR for Group-A Officers

Annual Performance Appraisal Reports (APAR) of CWES Group-A Officers is being managed through Smart Performance Appraisal Report Recording Online Window (SPARROW) module of e-Office from the APAR Year 2017-18. The details of CWES cadreofficers posted in various organizations have been successfully included in the system.

1.7. 4 APAR Management System (APARMS):

Annual Performance Appraisal Management System (APARMS) is operational in CWC to facilitate proper up-keeping and maintenance of records related to APARs of employees of CWC other than CWES Group-A Officers. As per latest guidelines issued by DoPT, APAR of all Government employees are to be communicated to them.

The APARMS is an online system in which each official of CWC can view his/her APAR. Whenever any APAR of individual official is uploaded, a system generated e-mail is sent to the concerned official informing him about the same. For this purpose e-mail IDs of all the employees of CWC has been created and communicated to them. The system can be accessed through link available on the CWC website **www.cwc.gov.in**. Any employee can access their latest APAR after entering the authentication details provided to him.

1.7.5 CWES Bio-Data information System:

Bio-data Information System for Central Water Engineering Service (CWES) officers is operational to facilitate CWES officers to upload their bio-data and to mention about their achievements in the field of water resources. The CWES bio-data information system can be accessed through CWC web-site. CWC officers can log in to system with their employee ID as login code and unique passwords to view and edit their records. The information can also be viewed by common public.

1.8 Aadhaar Enabled Biometric Attendance System (AEBAS):

The Biometric Based Attendance Management System (BBAMS) was introduced in Central Water Commission Head Quarter, Sewa Bhawan, New Delhi in December, 2010. In view of the guidelines issued by the Government of India, the system has been switched over to Aadhaar Enabled Biometric Attendance System (AEBAS) in association with NIC in December, 2014. AEBAS is also being implemented in Regional Offices of Central Water Commission.

1.9 Central Water Commission Library

CWC Library is one of the most prestigious technical reference library on the subject of Water Resources Engineering and other allied subjects. It has collection of over 1.25 lakh books and 3.50 lakh journal/ bulletins/ newspapers/ reports etc., and the collection of books is growing with additions of books/journals and other publications every year.

The library is regularly subscribing journals and other publications and is also receiving nearly hundred technical and non-technical journals/ bulletins/ newsletters/ publications from various government, non-government, educational institutes and societies on complementary basis.

The Library stack is arranged in a manner to make retrieval of desired publication fast and easy. The Library is located in a dedicated building and has adequate space and improved facilities. There are two fully air-conditioned reading rooms with latest journals / magazines and newspapers. The library is being progressively modernized and automated, in order to serve the users in a better, fast and accurate way by providing latest available information from across the globe.

The Map Record Section is also a unit of L&IB. It has collection of approximate eighteen thousand toposheet, state map, rail map, political map etc.

An auditorium, which is a part of library building, is operational since January 2014. Other facilities in the premises includes conference hall for organizing training, seminar, meeting etc.

1.10 Progressive Use of Hindi in Official Work

The official language policy is being implemented in all offices under the administrative control of the Central Water Commission. To ensure proper compliance of officials Language Act, 1963 and other rules ad regulation related thereto, a Hindi Section is functioning at CWC Headquarter. Continued measures are being taken for improving progressive use of Hindi for official purpose. The Official Language Implementation Committee of the Commission meets regularly under the Chairmanship of the Chairman, Central Water Commission. Various measures required for progressive use

of Hindi are discussed and timely action is being taken on the decisions taken in the meetings. Sufficient progress has been made in the implementation of the Official Language Act and Rules in the Commission. As on March 2019, Sixty Three (63) Field Offices of CWC has been notified under Rule 10(4) of OL Rules, 1976. Further, eleven (11) Administrative Sections of CWC are identified to work only in Hindi.

Following initiatives in regard to progressive use of Hindi were undertaken during the year 2018-19:

1. Field offices of the Central Water Commission were inspected regularly with a view to review the progressive use of Hindi and also to keep a watch on the compliance of orders, instructions etc. and effective measures taken for rectifying short- comings noticed during the inspection. During the year 27 Regional Office of CWC and 12 Section/Directorates of CWC (Hq) were inspected.

2. Four meetings of Official Language Implementation Committee were held during the year. Further, four Hindi workshops were also organized at Central Water Commission (Headquarter) to generate awareness about Hindi, the provisions under Official Language Act and incentive schemes for use of Hindi etc.

3. The progress made by all Directorates, Sections and Regional Offices in the implementation of important instructions issued by the Department of Official Language regarding progressive use of Hindi for official purpose, the Official Language Act, 1963 and the Official Language Rules, 1976 is monitored regularly through the quarterly progress report. Necessary instructions were issued to rectify the shortcomings noticed therein.

4. "Hindi Pakhwara" was organized from 14 to 28 September 2018 for effective implementation of the official language policy and to create awareness about Raj-bhasha. During this period, various competitions like Hindi Noting/Drafting, Essay Writing, Technical Essay Writing, Dictation for MTS, Hindi Typing for UDC, LDC & MTS, Poem Recitation competition for Hindi and non-Hindi officials were organised and winners were awarded cash prizes and certificates. Cash Prizes and Certificates were also awarded to the officials who did their maximum official works in Hindi under the Annual Noting & Drafting Scheme. A sum of Rs. 1.50 lakh against the allocation of Rs. 2.00 lakh was spent on this occasion.

5. Raj Bhasha Shields for the year 2018-19 were awarded to the Field Offices of Central Water Commission situated in regions, A, B and C to Chambal Division,

Jaipur, National Water Academy, Pune & Monitoring & Appraisal Directorate, Guwahati respectively. Raj Bhasha Shield for Directorates and Sections at HQs were awarded to Design & Research Coordination Dte. & Establishment-13 Section respectively for doing their maximum work in Hindi during the year.

6. Hindi books were purchased for the Central Water Commission Library as per the targets fixed in the Annual Programme of the Department of Official Language.

7. First Technical Seminar in Hindi was organised by CWC in Hyderabad on 07 February, 2019 on the theme of "Water Conservation – Our Responsibility". Chairman, CWC inaugurated the Hindi Technical Seminar. Officials from Central Water Commission Headquarter and Regional Offices, Ministry of Water Resource and its other Attached Offices took part in this maiden Hindi Technical Seminar.

8. Five days Basic Training Programme to work on computer in Hindi Language was organised for officers/officials of CWC from 04.06.2018 to 08.06.2018. 20 officers/officials were trained in this Training Programme.

9. Inspections of 2 Regional Offices by the Parliamentary Committee were held during the year.

1.11 Welfare Measures and Incentives

The different welfare measures and incentives that are in existence are given under.

1.11.1 Benevolent Fund

The Central Water Commission Benevolent Fund set up in 1966 aims at providing prompt financial assistance to the deserving members to take care of damages at the time of natural calamities or to meet expenses of medical treatment for their own prolonged illness such as Cancer, TB, etc. and surviving family members of those who died while in service. The financial assistance is provided in two ways:

- Immediate Relief up to Rs. 15,000/-
- Long Term Relief up to Rs. 10,000/- payable in ten monthly instalments.

The administration of the fund vests in the Governing Body, which comprises of a Chairman, one Honorary Secretary, one Treasurer and 8 Members. The audited accounts are placed before the General Body in the Annual General Body meeting. The existing subscription rate is Rs. 10/- (ten) per month.

1.11.2 Co-Operative Thrift and Credit Society

Department of Irrigation Co-operative Thrift & Credit Society Ltd., has been functioning with its registered office at West Block–I, R.K. Puram, New Delhi since March 1959 for the welfare and benefit of the officers and staff of the Ministry of Water Resources, River Development and Ganga Rejuvenation, Central Water Commission, Central Soil & Materials Research Station, Department of Power, Principal Pay & Accounts Office of the Ministry of Water Resources and Pay &Accounts Office, Central Water Commission. It provides its member loans to the extent of Rs.1, 50,000/- and emergency loan of Rs. 15,000/-, recoverable in 60 and 10 monthly installments respectively at a rate of interest of 9% per annum. The Society pays gratuity for retiring members and writes off outstanding loans against deceased members from the members' welfare fund.

1.11.3 Sports and Cultural Activities

Employees of CWC are motivated and encouraged to regularly participate in Sports and Cultural Activities. The main achievements during the year 2018-19 are as under:

- Combined Volleyball team of CWC/CEA hold third position in the Inter – Ministry Tournament2018-19.
- The CWC Hockey reached in Semi- Final of Inter-Ministry Hockey Tournament 2018-19.
- Shri R. Suresh, MTS, CWC Library has represented the Central Secretariat Volleyball Team in the All India Civil Services Volleyball Tournament 2018-19 held at Chandigarh.
- Shri Suraj Pandey, ASO (MoWR) has reached upto Runners-up in the Men Singles event in the Inter Ministry Badminton Tournament 2018-19.

- Shri Ashwani Kumar, ASO, CWChas been selected as Badminton Convenor by central Civil Services Cultural & Sports Board, DoPT, New Delhi.
- Shri Ashok Kumar Sidhu, HeadD'man, CWC has been selected as Cricket Convenor by Central Civil Services Cultural & Sports Board, DoPT, New Delhi.

1.12 Employees Strength under various categories:

The representation of OBC, SC & ST and PWD (OH/VH/HH) officials in different grades is given in Table 1.1 and Table 1.2

Table 1.1

Representation of OBC, SC & ST Officials in Different Grades (As on 1.1.2019)

Category	No. of Filled Posts	No. of SCs	No. of STs	No. of OBCs
Group A	616	83	34	76
Group B	1109	177	65	169
Group C	473	117	20	79
Total	**2198**	**377**	**119**	**324**

Table 1.2

Representation of PWD (OH/VH/HH) Officials in Different Grades (As on 1.1.2019)

Category	Orthopedic Handicapped (OH)	Visually Handicapped (VH)	Hearing Handicapped (HH)	TOTAL
Group A	9	-	-	9
Group B	17	1	11	29
Group C	7	8	3	18
Total	**33**	**9**	**14**	**56**

1.13 Citizen's Charter for CWC

As per the guidelines issued by Department of Administrative Reforms & Public Grievances (AR&PG), a Task Force under the Chairmanship of Member (WP&P), CWC and Chief Engineer (BPMO), CWC as Member-Secretary & Nodal Officer was constituted for formulating Citizen's Charter for CWC. The Citizen's Charter was finalized with the concurrence of MoWR and has been uploaded on CWC website.

1.14 Right to Information Act

The Right to Information Act enacted by Parliament on 15th June, 2005 came into force on the 12th October, 2005 (120th day of its enactment). CWC has implemented the provisions of the Act. Information in respect of Central Water Commission in compliance of Right to Information Act ' 2005 has been put in public domain through its official website at http://www.cwc.gov.in

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Sh. Y. K. Sharma, Member (RM), CWC with participants of training programme on "Satellite Data Analysis using Google Earth Engine" at CWC,HQ, New Delhi under Google CWC collaboration on 5.12.18

Sh. S. Masood Husain, Chairman, CWC at AMU, Aligarh during International Conference on "Global Water Crisis: Food Security and Agriculture in the era of Climate Change" on 1.12.18

Sh. S. Masood Husain, Chairman, CWC chairing 2nd Meeting of CWMA at CWC, HQ, New Delhi on 3.12.18

CWC officers with DPR for Rukni Irrigation Project which was completed in December 2018

CHAPTER-II

WATER RESOURCE DEVELOPMENT

2.1 Water Resources in India

Central Water Commission (CWC) has been making periodic assessment of the country's water resources. The water resources potential of the country, which occurs as a natural runoff in the rivers is about 1869 Billion Cubic Meters (BCM). It constitutes a little over 4% of the total river flows of the world. However, due to various constraints of topography and uneven distribution over space and time, only about 1123 BCM of the total annual water potential can be put to beneficial use. This can be achieved through 690 BCM of utilizable surface water and 433 BCM through ground water.

While water for drinking purpose has been accorded top most priority in water use, irrigation is the major consumer of water. The Ultimate Irrigation Potential that can be created in the country is 139.89 Mha, out of which the potential through major and medium irrigation projects is assessed as 58.47Mha. Besides this, an additional irrigation potential of about 35 Mha can be created by taking up long distance inter basin transfer of water from surplus to deficit basins. The Irrigation Potential Created in the country, which stood at 12.9Mha in 1951, has risen to 126.73Mha by Sept 2018.

In order to appropriately address the present and future water demand and food grain requirements of the society, the following thrust/priority areas for water resources related issues have been identified by the Government.

- Improving water utilization efficiency;
- Command area development and participatory irrigation management;
- Flood management and erosion control;
- Protection fromcoastal erosion;
- Dam safety and rehabilitation;
- Revival and restoration of existing water bodies;
- Appropriate regulation and management of ground water;

- Ground water recharge;
- Inter-linking of rivers;
- Rural drinking water supply and sanitation;

Central Water Commission is directly and indirectly contributing in achieving the objectives of these thrust/priority areas.

2.2 Highlights of Water Resources Sector

As the variability of rainfall over the country is well known, the development of water resources for irrigated agriculture received high priority in the different Plan periods. Expansion of irrigation facilities, along with consolidation of the existing systems, has been the main strategy for increasing production of food grains.

Irrigation support is provided through major, medium and minor irrigation projects and command area development. Out of Ultimate Irrigation Potential of 139.89 Mha, the Irrigation Potential Created till September 2018 is 126.73Mha.The State-wise Irrigation Potential Created during X, XI and XII plan periods is given in in Table 2.1.

2.2.1 Irrigation Potential: Major & Medium Irrigation Sector

The Ultimate Irrigation Potential of the country from major and medium irrigation projects is assessed as 58.47 Mha. Irrigation Potential Created in the country from major and medium irrigation projects, which stood at 9.7 Mha in 1951, has risen to 47.97Mhaat the end of XI Plan. The cumulative figures of potential created in the successive plan periods are given inFigure 2.1

2.2.2 Major and Medium Irrigation Projects

In 1951, during launching of the First Five Year Plan, there were 74 major and 143 medium irrigation projects in the country. As per information provided to Working Group on Major Medium Irrigation & Command Area Development (MMI & CAD) for XII Plan formulation, 399 major, 1136 medium and 265 ERM schemes were taken up during the plan period i.e., from 1951 to end of XI Plan in 2012. Out of this 221 major,

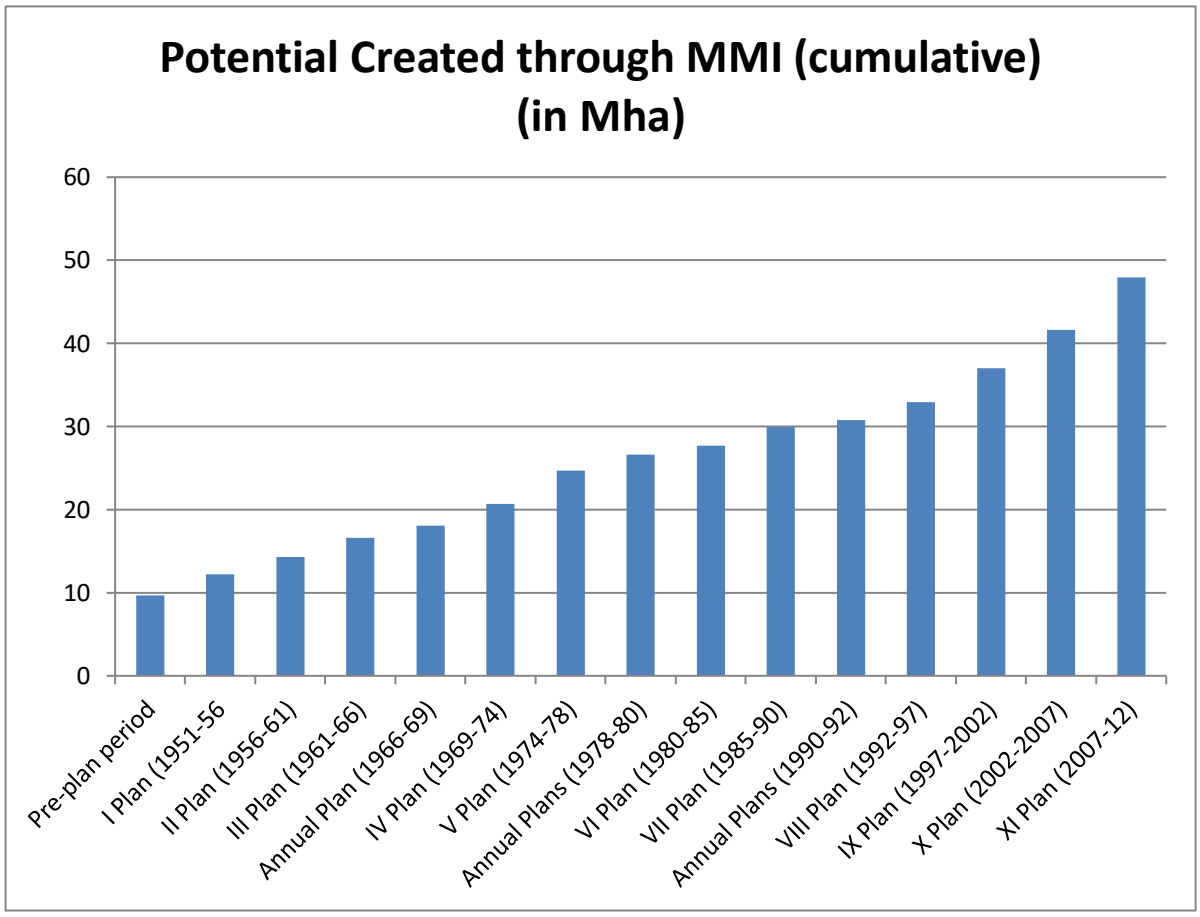
875 medium and 139 ERM projects have been reportedly completed by end of XI Plan. Number of MMI Projects taken up and completed up to XI Plan aregiven in Table 2.2.

The Plan-wise growth of irrigation potential created through major and medium irrigation sector and corresponding actual expenditure (anticipated expenditure in case of XI Plan) in various plan periods is given in Table. 2.3

Fig 2.1 Growth of Irrigation Potential Created through Major and Medium Irrigation Project during Pre-Plan and Plan Period (Cumulative)

Table 2.1

State-wise Creation of Irrigation Potential through Major & Medium Irrigation Sector



(Thousand ha.)

S. No.	Name of State/ UT	Ultimate Irrigation Potential	Potential Creation					
			Upto IX Plan	During X plan	Upto X Plan	During XI Plan (Ant.)	Upto XI Plan (Ant.)	Till date (MMI + MI)
1	Andhra Pradesh Telangana	5000.00	3303.22	439.44	3600.21	1203.52	4803.73	10018.12
2	Arunachal Pradesh	0.00	0.00	1.20	1.20	0.00	1.20	152.553
3	Assam	970.00	243.92	68.98	302.69	153.27	455.96	1618.2680
4	Bihar	5223.50	2680.00	279.00	2879.00	175.46	3054.46	9807.3600
5	Chhattisgarh	1146.93	922.50	888.18	1137.00	132.32	1269.32	2284.4000
6	Goa	62.00	21.17	16.48	33.75	21.80	55.55	86.2460
7	Gujarat	3000.00	1430.37	788.13	2230.50	1448.59	3679.09	6308.3840
8	Haryana	3000.00	2099.49	91.87	2193.70	12.59	2206.29	3843.9600
9	Himachal Pradesh	50.00	13.35	2.10	15.45	15.00	30.45	239.1105
10	Jharkhand	1276.50	354.47	23.61	397.77	132.94	530.71	1309.6450
11	Jammu Kashmir	250.00	179.69	249.50	187.30	138.31	325.61	1170.3140
12	Karnataka	2500.00	2121.12	6.63	2637.71	328.12	2965.83	5182.1250
13	Kerala	1000.00	609.49	480.98	669.49	46.20	715.69	1874.8420
14	Madhya Pradesh	4853.07	1386.90	65.00	1931.90	574.53	2506.43	8766.0810
15	Maharashtra	4100.00	3239.00	255.15	3494.15	634.56	4128.71	7696.3100
16	Manipur	135.00	91.15	11.90	106.55	51.95	158.50	291.8630
17	Meghayala	20.00	0.00	0.00	-	-	-	91.5540
18	Mizoram	0.00	0.00	0.00	-	-	-	52.5020
19	Nagaland	10.00	0.00	1.00	-	-	-	146.4250
20	Orissa	3600.00	1826.56	163.41	1974.36	173.00	2147.36	5360.5800
21	Punjab	3000.00	2542.48	62.19	2574.67	109.72	2684.39	6242.1070

S. No.	Name of State/ UT	Ultimate Irrigation Potential	Potential Creation					
			Upto IX Plan	During X plan	Upto X Plan	During XI Plan (Ant.)	Upto XI Plan (Ant.)	Till date (MMI + MI)
22	Rajasthan	2750.00	2482.15	408.20	2861.58	305.55	3167.13	5720.5870
23	Sikkim	20.00	0.00	0.00	-	-	-	53.3514
24	Tamil Nadu	1500.00	1549.31	11.75	1562.56	15.71	1578.27	3910.2600
25	Tripura	100.00	4.90	13.80	14.05	15.20	29.25	197.7640
26	Uttar Pradesh	12154.00	7910.09	871.26	8781.97	506.12	9288.09	35751.220
27	Uttarakhand	346.00	280.30	9.35	288.98	0.00	288.98	2423.1542
28	West Bengal	2300.00	1683.29	86.52	1754.81	146.60	1901.41	6064.9880
29	Union Territories	98.00	6.51	0.00	0.00	0.00	0.00	63.3757
	Total	**58465.00**	**36981.43**	**5295.63**	**41637.86**	**6341.06**	**47972.41**	**126727.45**

Source: Planning & Progress Directorate

Table 2.2

Number of Major, Medium & ERM Projects taken up and completed up to XI Plan

Category	Projects Taken Up			Projects completed			Balance
	Pre-plan	Upto XI Plan	Total	Pre-plan	Upto XI Plan	Total	
Major	74	399	473	74	221	295	178
Medium	143	1136	1279	143	875	1018	261
ERM	-	265	265	-	139	139	126
Total	217	1800	2017	217	1235	1452	565
Source: Erstwhile Planning Commission							

Table 2.3

Plan wise Outlays and Cumulative Growth in Creation of Irrigation Potential
(Major & Medium Irrigation Sector)

Period	Outlay/ Expenditure (in CroreRs.)		Potential created (Mha)		Potential Utilized (Mha)
	During	Cumulative	During	Cumulative	Cumulative
Pre-plan period	-	-	9.70	9.70	9.70
I Plan (1951-56	376	376	2.50	12.20	12.98
II Plan (1956-61)	380	756	2.13	14.33	13.05
III Plan (1961-66)	576	1332	2.24	16.57	15.77
Annual Plan (1966-69)	430	1762	1.53	18.10	16.75
IV Plan (1969-74)	1242	3004	2.60	20.70	18.69
V Plan (1974-78)	2516	5520	4.02	24.72	21.16
Annual Plans (1978-80)	2079	7599	1.89	26.61	22.62
VI Plan (1980-85)	7369	14968	1.09	27.70	23.57
VII Plan (1985-90)	11108	26576	2.22	29.92	25.47
Annual Plans (1990-92)	5459	31535	0.82	30.74	26.32
VIII Plan (1992-97)	21072	52607	2.22	32.96	28.44
IX Plan (1997-2002)	48259	101896	4.09	37.05	31.03
X Plan (2002-2007)	82195	184091	5.30	41.64	33.74
XI Plan (2007-12)	164853	348944	6.34	47.97	35.01
XII Plan (2012-Sept 2018) (MMI + MI)				126.73	

** Anticipated figures under reconciliation with States*

Source: Planning Commission & Report of the Working Group on MMI & CAD for XII Five Year Plan (2012-17)and Planning & Progress Directorate

Number of Major, Medium and ERM projects taken up and completed in the pre-plan and plan period are shown in Fig 2.2, 2.3 and 2.4 respectively.

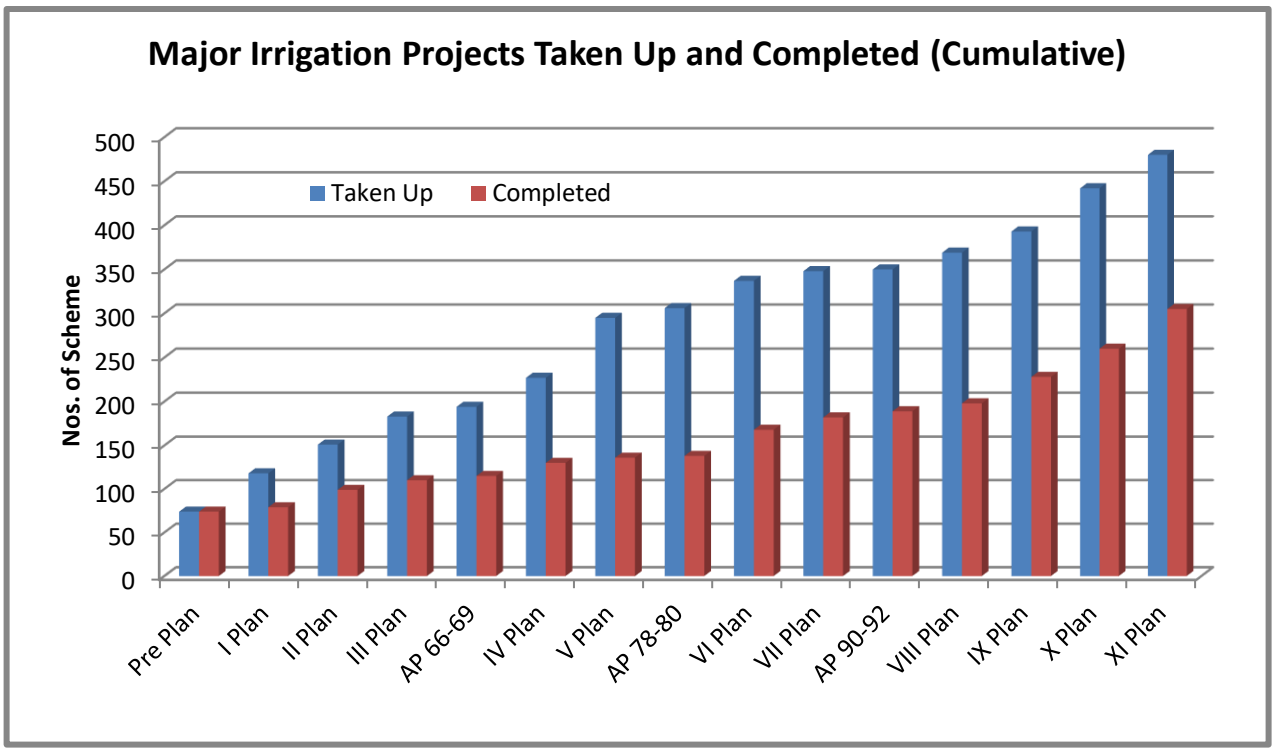


Fig 2.2 Major Irrigation projects taken up and completed (Cumulative)

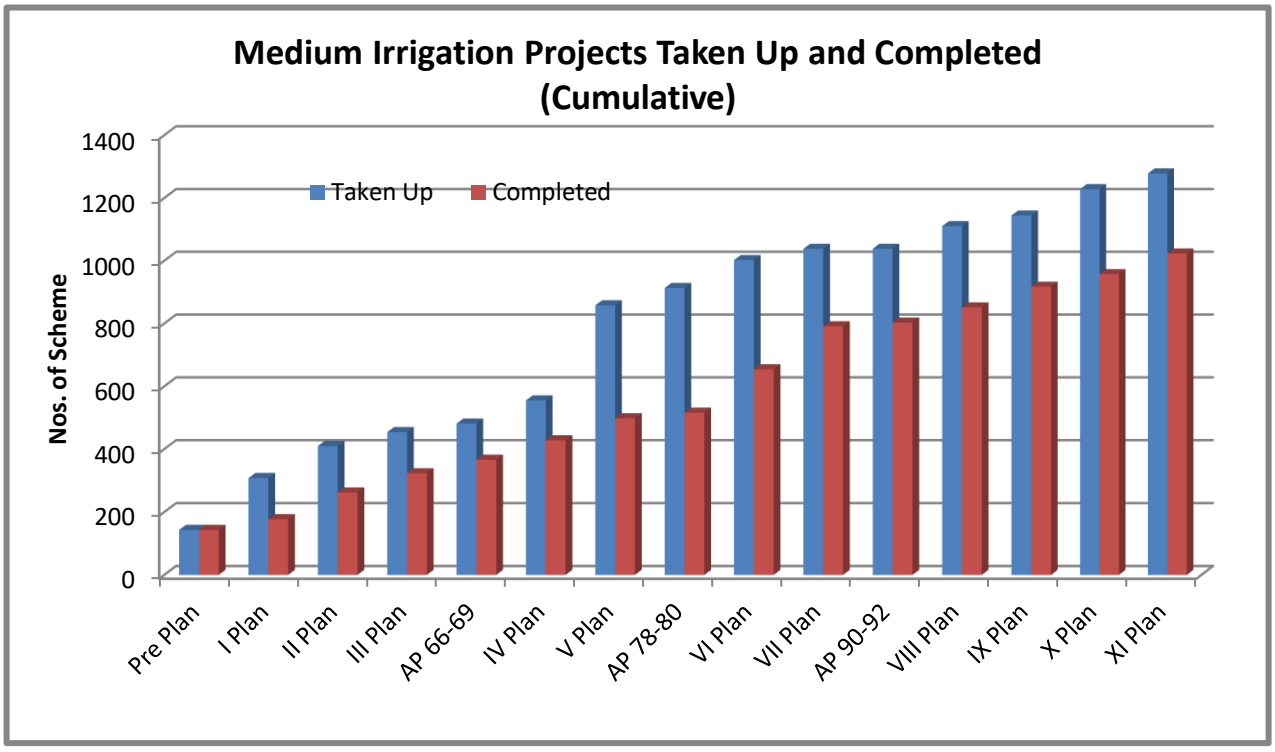


Fig 2.3 Medium Irrigation projects taken up and completed (Cumulative)

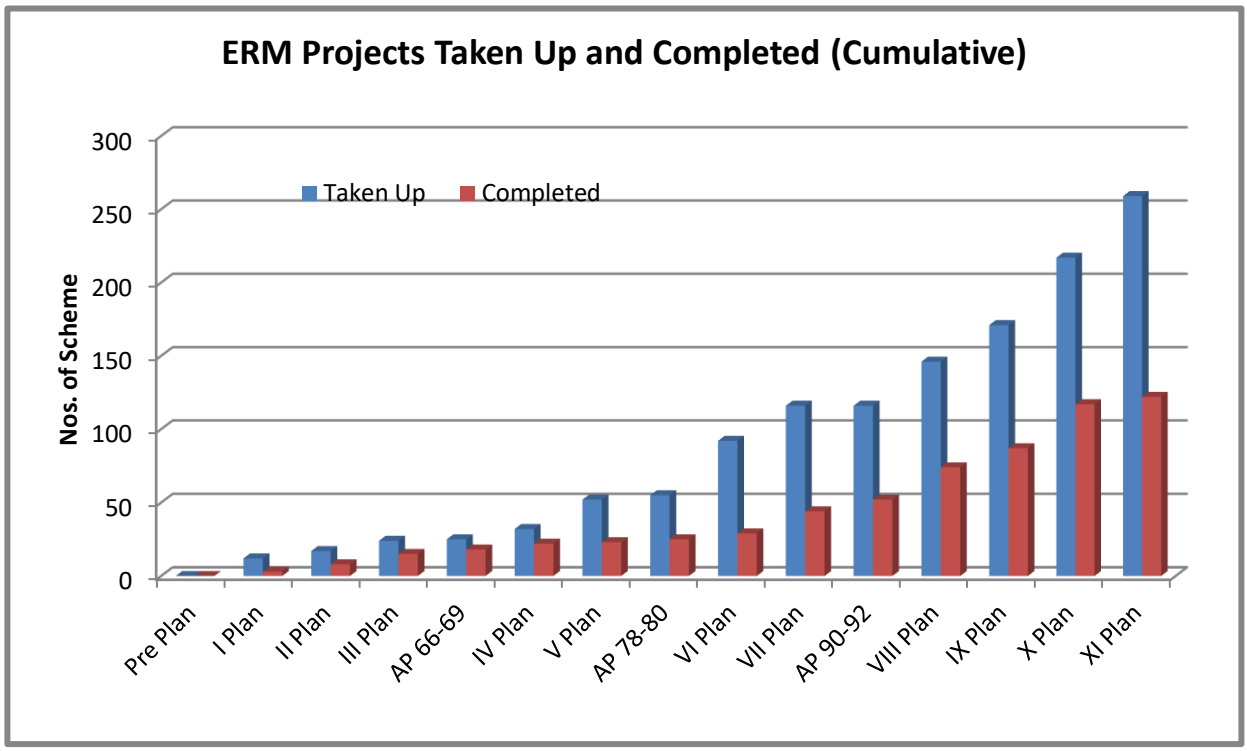


Fig 2.4 Modernization of ERM Projects taken up and Completed (Cumulative)

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Sh. Arjun Ram Meghwal, MoS, MoWR, RD&GR, during IDSC-2019

Indian Delegation interacting with President of Segura River Basin Authority

Sh. S. Masood Husain, Chairman, CWC speaking to media regarding upcoming International Dam Safety Conference at Bhubaneswar on 10.01.19 (Source: Kalinga TV)

Sh. S. Masood Husain, Chairman, CWC, during Plenary Session on Emerging Challenges in Dam Safety Management

CHAPTER-III

RIVER MANAGEMENT

3.1 Systematic Collection and Compilation of Hydrological Data

India has a total geographical area of 329 Mha having an annual precipitation of 4000 BCM with wide temporal and spatial variation. From river basin point of view India has been divided into 20 river basins. The collection of hydro-meteorological data for all the river basin in scientific manner is essential for achieving various objectives viz. planning and development of water resources projects, studies related to assessment of impacts due to climate change, water availability studies, design flood and sedimentation studies, flood level /inflow forecasting, solving of International & Inter-State issues, river morphology studies, Reservoir siltation studies, development of inland waterways, research related activities etc.

Central Water Commission is operating a network of 878Hydrological Observation (HO)stations in different river basins of the country to collect (i) water level, (ii) discharge, (iii) water quality, (iv) silt and (v) selected meteorological parameters including snow observations at key stations.The basin-wise distribution of HO stations is detailed below in Table 3.1.

Table 3.1

Basin-wise number of Hydrological Observation Stations

S. No.	Name of Basin	No. of Sites
1.	Brahmani-Baitarni Basin	15
2.	Cauvery Basin	34
3.	East Flowing rivers between Mahanadi and Pennar	13
4.	East Flowing rivers between Pennar and Kanyakumari	17
5.	Ganga/Brahmaputra/Meghna/Barak Basin/ Teesta Basin	445
6.	Godavari Basin	77
7.	Indus Basin	26
8.	Krishna Basin	53
9.	Mahanadi Basin	39
10.	Mahi Basin	12
11.	Narmada Basin	26
12.	Pennar Basin	8

13.	Sabarmati Basin	13
14.	Subernarekha Basin	12
15.	Tapi Basin	18
16.	Teesta Basin	05
17.	West Flowing Rivers from Tadri to Kanyakumari	29
18.	West flowing rivers from Tapi to Tadri	22
19.	West flowing rivers of Kutchh and Saurashtra including Luni	14

CWC also operates 76 exclusive meteorological observations stations in various basins in the country.

In addition to this, Central Water Commission has opened 720 new sites. However, measurement of few parameters with reduced frequency is being done at these sites due to paucity of required manpower. This will help in addressing the data requirement of the country more precisely and in better scientific manner.

The basic data collected by field units is processed and validated at the Sub-Division, Division and Circle level and the authenticated data in the form of Water Year Books, Sediment Year Books and Water Quality Year Books are published.

Planning & Development Organization at CWC headquarter at Delhi maintains hydrological data pertaining to all rivers of India. The data is provided to the bonafide users on request by following a set procedure and as perGuidelines for release of data by concerned field Chief Engineer of CWC. Computerized data is now available for all basins after the implementation of the Hydrology Project Phase-I. The users of the data include Central/State Government offices, Public Sector Undertaking and Institutions/Societies working under the direct control of Central/State Governments and IIT's and Research Institutions/Scholars.

3.1.1 Water Quality Monitoring

Central Water Commission is monitoring water quality at 531key locations covering all the major river basins of India. At present the water quality network covers 67 main rivers, 138 tributaries and 64 sub-tributaries. CWC is maintaining a three tier laboratory system for analysis of the physio-chemical parameters of the water. The Level-I laboratories are located at 295field water quality monitoring stations on major rivers of India where physical parameters such as temperature , colour , odour specific

conductivity, total dissolved solids, pH and dissolved oxygen of river water are observed . There are 18 Level–II laboratories located at selected division offices throughout India to analyses 25 nos. of physio-chemical characteristics and bacteriological parameters of water. 5 Level-III/II+ laboratories are functioning at Varanasi, Delhi, Hyderabad, Coimbatore and Guwahati where 41 parameters including heavy metals / toxic parameters and pesticides are analysed. As on March 2017, theNational River Water Quality Laboratory, CWC, New Delhi was accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) in accordance with Standard ISO/IEC 17025_2005 in the discipline of Chemical as well as biological testing. As of now, 11 Water Quality Laboratories of CWC have been accredited by NABL in the Chemical discipline. Details of NABL Accreditation status of 23 Water Quality Laboratories of CWC are given in the Table 3.1.1.

Table: 3.1.1NABL Accreditation status of Water Quality Laboratories of CWC

S.No	Name of Laboratory	Level of Lab	Division	Organisation	NABL Accreditation Status	
					Certificate	Period of Accreditation
1	Upper Brahmaputra Divisional Water Quality Laboratory, Assam	II	Upper Brahmaputra Division, Dibrugarh	**B&BBO, Shillong**		
2	Middle Brahmaputra Divisional Water Quality Laboratory, Assam	III	Middle Brahmaputra Division, Guwahati			
3	Lower Brahmaputra Divisional Water Quality Laboratory, West Bengal	II	Lower Brahmaputra Divisiona, Jalpaiguri	**TBO, Kolkata**		
4	Upper Cauvery Water Quality Laboratory, Karnataka	II	Cauvery Division, Bangalore	**MSO, Banglore**	TC-7793	30/08/2018 to 29/08/2020

5	Lower Cauvery Water Quality Laboratory, Tamilnadu	III	Southern Rivers Division, Coimbatore	**C&SRO, Coimbatore**	TC-7437	22/06/2018 to 21/06/2020
6	West Flowing Rivers Water Quality Laboratory, Kerala	II	South Western Rivers Division Cochin		TC-8103	19/11/2018 to 18/11/2020
7	East Flowing Rivers Water Quality Laboratory, Tamilnadu	II	Hydrology Division, Chennai		T-8258	03/01/2019 to 02/01/2021
8	Upper Krishna Divisional Water Quality Laboratory, Maharashtra	II	Upper Krishna Division, Pune	**KGBO, Hyderabad**	TC-8138	26/11/2018 to 25/11/2020
9	Krishna &Godavari River Water Quality Laboratory, Telangana	III	Upper Godavari Division, Hyderabad		TC-6055	01/08/2017 to 31/07/2019
10	Chenab Divisional Water Quality Laboratory, Jammu	II	Chenab Division, Jammu	**IBO, Chandigarh**		
11	Middle Ganga Divisional-V Water Quality Laboratory, Bihar	II	Middle Ganga Division-V, Patna	**LGBO, Patna**		
12	Lower Ganga Divisional Water Quality Laboratory, West Bengal	II	Lower Ganga Division,Berhampur			
13	Mahanadi Divisional Water Quality Laboratory, Chattisgarh	II	Mahanadi Division, Burla	**MERO, Bhubaneswar**		
14	Eastern River Water Quality Laboratory, Odisha	II	Eastern Rivers Division, Bhubaneswar		TC-8255	03/01/2019 to 02/01/2021
15	Wainganaga	II	Wainganaga	**MCO,**		

	Divisional Water Quality Laboratory, Maharashtra		Division, Nagpur	**Nagpur**		
16	Narmada Divisional Water Quality Laboratory, Madhya Pradesh	II	Narmada Division, Bhopal	**NBO, Bhopal**		
17	Tapi Divisional Water Quality Laboratory, Gujrat	II	Tapi Division, Surat	**NTBO, Gandhinagar**		
18	Mahi Divisional Water Quality Laboratory, Gujrat	II	Mahi Division, Gandhinagar		TC-8122	26/11/2018 to 25/11/2020
19	Upper & Middle Ganga River Water Quality Laboratory, Uttar Pradesh	III	Middle Ganga Division, Varanasi	**UGBO, Lucknow**	TC-7416	22/06/2018 to 21/06/2020
20	Himalayan Divisional Water Quality Laboratory, Uttrakhand	II	Himalayan Division, Dehradun			
21	Middle Ganga Divisional Water Quality Laboratory, Uttar Pradesh	II	Middle Ganga Division, Lucknow			
22	Lower Yamuna Water Quality Laboratory, Uttar Pradesh	II	Lower Yamuna Division, Agra	**YBO, Delhi**	TC-7963	10/10/2018 to 09/10/2020
23	National River Water Quality Laboratory, Delhi	III	Upper Yamuna Division, Delhi		TC-5578	12/04/2018 to 11/04/2020

The water quality data generated is computerized in Database system and disseminated in the form of Water Quality Year Books, Status Reports and Bulletins. The data being so collected are put in various uses viz. planning and development of water resources projects, climate change studies, water availability studies, inter-State issues, research related activities, etc.

3.1.2 Online Surface Water Information System (eSWIS):

During the Hydrology Project-I, the Central Water Commission had developed suites of software packages viz. Surface Water Data Entry System (SWDES), Hydrological Modelling Software (HYMOS) and Water Information System Data Online Management (WISDOM). These softwares were primarily being used for data entry, primary and secondary data validation, data processing, data storage and dissemination of Hydro-meteorological data. The application software was developed in a stand-alone environment and in the client server environment, integrating GIS, database and various systems software to provide client applications and a limited web service. Out of these, HYMOS software was the proprietary software.

To overcome the drawbacks which were encountered during the running of above software, Central Water Commission has developed Online Surface Water Information System (eSWIS) software under the Hydrology Project-II (HP-II). The main objectives of development of the new software were to replace obsolete components of existing software, improve its system architecture and add some new components. The development of eSWIS focused on using open source software, by replacing the underlying database system used for central storage of hydro-meteorological data, replacing the existing system for validation and data processing, moving data entry from stand-alone systems to a web environment and providing web services required for data dissemination and to include the facility of Flood Warning functions currently hosted by the WISDOM web site. The benefits of eSWIS software are as under:

- Based on web and desktop applications both.
- Data and functionality will be integrated.
- Easy access to information
- Automatic backup procedure.
- Complete security control over data and functionality
- Data can be entered from anywhere.
- Data access will be controlled and restricted to authorized users
- Time from data-entering to data-dissemination will be largely decreased.
- Data can be entered offline and it will be sent when online connection is available.
- Data Integration is automatic and there is no need to physically send the data for central depository.

The e–SWIS software is operational in Central Water Commission and many HP-II States since 2014-15. It is basically having three primary module viz. eSWDES for entry & processing of hydro-meteorological data, e-FF for dissemination of flood forecast and e-SV for secondary validation. Central Water Commission is using its e-FF module extensively since 2014 while other modules are being used since the beginning of 2015. All the historical data of CWC has already been transferred to eSWIS software. A number of training program on eSWIS has been conducted in CWC during and after HP-II project period. The necessary guidelines for operation of eSWIS have been circulated to all field offices. Further, it is again proposed to upgrade e-SWIS as per latest requirements of CWC and other IAs.

3.1.3National Hydrology Project

Hydrology Project, Phase-I(HP-I) was implemented by Government of India with an objective to establish a functional Hydrological Information System (HIS) and to improve institutional capacity of 9 States viz. Andhra Pradesh, Chhattisgarh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, and Tamil Nadu and 6 Central Agencies viz. Central Water Commission, Central Ground Water Board, Indian Meteorological Department, National Institute of Hydrology, Central Water and Power Research Station and Ministry of Water Resources, River Development & Ganga Rejuvenation. In CWC, the project was implemented in the five regions in peninsular India namely C&SRO, KGBO, M&ERO, Mon(C) and NTBO besides NWA and CWC (HQ). The project was implemented during September, 1995 to December, 2003.

Under HP-I, an Integrated Hydrological Information System (HIS) providing reliable, comprehensive and timely hydrological and meteorological data relating to 56 parameters was established. A total of 916 river gauge stations, 7912 observation wells and 436 hydro meteorological stations, operated by various central and state agencies, collecting data on qualitative and quantitative aspects of both surface water and ground water were covered by the system. 380 Data Centers and 31 Data Storage Centers equipped with specialized hardware and software have also been established for data processing, storage and reliable data communication. Sufficient manpower has been trained for HIS operations and user support. In addition to current data, some of the states have also successfully computerized valuable historic data relating to rainfall and river discharge.

The Hydrology Project-II (HP-II) was a follow up on Hydrology Project-I. The overall project development objective was to extend and promote the sustained and effective use of Hydrological Information System by all potential users concerned with Water Resources Planning and Management thereby contributing to improved productivity and cost effectiveness of water related investments. Four new states viz., Himachal Pradesh, Punjab, Goa and Pondicherry and two new Central agencies viz., Central Pollution Control Board and Bhakra Beas Management Board were included in the Phase-II of the project. HP-II was implementing in five regions of CWC namely NTBO, CS&RO, KGBO, M&ERO, besides NWA and CWC (HQ). The project was started in May, 2006 and closed on May 2014.

The major components undertaken during HP-II comprises of institutional strengthening and vertical extensions of activities under HP-I. The works implemented in CWC under institutional strengthening include, development of Web Based Surface Water Information System, modernisation of Hydrological Observation Stations by installing Acoustic Doppler Current Profiler (ADCP) at fifteen Hydrological Observation Stations, upgradation of National River Water Quality Laboratory at New Delhi, installation of Real Time Water Quality Monitoring Systems on pilot basis at Moradabad on river Ramganga, Agra on river Yamuna & Lucknow on river Gomti, creation of additional infrastructure facilities at NWA, Pune, establishment of Video conferencing facilities at seven locations viz., Lucknow, Coimbatore, Bhubaneswar, NWA, Pune, Hyderabad, Gandhinagar& New Delhi. Under vertical extension, development of Hydrological Design Aids (Surface Water) was undertaken.

Based on the successful outcome of Hydrology Project, Government of India has now undertaken"National Hydrology Project (NHP) with assistance from The World Bank. Ministry of Water Resources, River Development and Ganga Rejuvenation is coordinating the implementation of NHP. There are a total of 47 implementing agencies (IAs) including 8 central agencies, 37 State-level agencies and two River Basin Organizations (RBO) in NHP. Central Water Commission is one of the implementing agencies under NHP which has to play a crucial role ascentral technical coordination agency. Central Water Commission has been allocated funds totalling to about Rs. 275 Crore in NHP for carrying out the various activities. The project proposal for NHP was approved by the Government with overall cost of Rs. 3679.77 Crore on 23.6.2016 as a Central Sector Scheme. The total duration of the project is 8 years and is to be implemented in two stages.

Under NHP, the Central Water Commission will focus on following core area activities.

- **Water Resources Data Acquisition** - RTDAS for CWC & purchase of IT Equipment, Server, software, furnishing, furniture, misc. equipment etc.
- **Water Resources Information System** – Extension /upgradation of eSWIS software, procurement of satellite products and spatial data set for proposed study of IWRM, EHP, sediment & FF.
- **Water Resources Operation and Planning**- IWRM study for various basins, development of stream flow forecasting system, development of Basin-wise EHP model for medium & long term forecast, development of physical based mathematical modeling for sediment rate estimation and sediment transport in the river basin, development of Regional Models for water availability and Aquatic life assessment in major rivers of India.
- **Institution Capacity Enhancement**- Creation of Centre of Excellence at Hyderabad, International Trainings/study tour/awareness program/conference/seminar, R&M of CPMU, Hiring of technical expert/data entry operator/ IT expert/MTS/ other expert etc.

Member(RM), CWC is the Coordinating Officer on the behalf of Central Water Commission. Chief Engineer(P&D), CWC is the Nodal Officer who would exercise overall administrative management and financial control of the project including data storage and dissemination. Director, RDCis the Project Director for implementation of CWC component of the project.

The important achievements of CWC under the National Hydrology Project during 2018-19 are as under:

Extended Hydrology Prediction in Narmada, Yamuna and Cauvery

The Expression of Interest for Extended Hydrology Prediction (Multi-Week Forecast up to 4 week) in three River Basins of India namely Narmada, Yamuna and Cauvery have been invited. Out of 11 bids received, 6 bidders were selected on the basis of selection criteria given in EoI.

Aquatic Habitat Atlas for Major Rivers of India

Terms of Reference has been prepared and approved. This consultancy will be done on single source selection basis. RFP has been prepared and sent to NPMU for review. RFP is to be issued to the selected bidders.

Physical Based Mathematical Modelling for Estimation of Sediment rate and Sediment Transport in Seven River Basin

Terms of Reference for Physical Based Mathematical Modelling for Estimation of Sediment rate and Sediment Transport in Seven River Basin namely Ramganga Basin, Barak Basin, Narmada Basin, Cauvery Basin, Kuttiadipuzha Basin, Peechi Basin & Mangalam Basin has been prepared.

3.2 Flood Forecasting & Warning Services

Flood forecasting and warning system is most important non-structural measure of flood management, which gives advance knowledge of incoming floods. This plays an important role in reducing flood damage by way of better planning of evacuation and rescue/ relief operations. Inflow Forecast also helps in optimum regulations of reservoirs with or without flood cushion.

Flood Forecasting activities in India in a scientific manner made a beginning in 1958 when the erstwhile Central Water and Power Commission (CW&PC) set up a Flood Forecasting Unit (FFU) for issuing flood warnings in the Yamuna at the National Capital, Delhi. This service has since been expanded by CWC to cover almost all major flood prone inter-State river basins of India. At present there are 226 flood forecasting stations, of which 166 are level forecasting and 60 are inflow forecasting stations on major dams/ barrages, spread over 20 States viz. Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Jammu & Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Orissa,Rajasthan, Tamil Nadu, Telangana, Tripura, Uttarakhand, Uttar Pradesh & West Bengal and one Union Territory Dadra & Nagar Haveli and the National Capital Territory of Delhi. It covers 19 major river systems in the country.

On an average, over 6000 forecasts are being issued every year by Central Water Commission during flood season. Normally, these forecasts are issued 6 to 48 hours in advance, depending upon the river terrain, the locations of the flood forecasting sites

and base stations. For the purpose of flood forecasting, hydrological and meteorological data observed at Hydrological Observationsites are used. A network of wireless stations is used for communication of data. Synoptic weather situations, weather forecast/ heavy rainfall warnings etc. are also being collected from Flood Meteorological Offices (FMOs) of IMD for the purpose.

The flood forecasting services is provided by CWC during a designated flood period in a year in order to cover pre monsoon and post monsoon incidents. The designated flood period was last reviewed in 2013 and accordingly the designated flood period for various basins as given below:

Brahmaputra Basin	1st May to 31st October
All other basin up to Krishna Basin	1st June to 31st October
Basins south of Krishna basin (Pennar, Cauvery and southern Rivers)	1st June to 31st December

Depending upon the water level of the river, Central Water Commission has categorized the flood situations at a station into four different categories namely, low, moderate, high & unprecedented flood situation. The details are as under , depending upon with reference to warning level, danger level, and highest flood level.

Low Flood Situation: The river is said to be flowing in "Low Flood Situation" at any station when the water level of the river touches or crosses the Warning Level, but remains below the Danger Level of the station.

Moderate Flood Situation: The river is said to be flowing in "Moderate Flood Situation" at any station when the water level of the river touches or crosses the Danger Level, but remains 0.50 m or more below the Highest Flood Level (HFL) of the station.

High FloodSituation: The river is said to be flowing in "High Flood Situation" at any station when the water level of the river at the station is 0.50 m or less below the HFL of the station. In "High Flood Situation" a special "Orange Bulletin" is being issued by the Central Water Commission to the users agencies which contains the details related to the flood situation.

Unprecedented FloodSituation: The river is said to be flowing in "Unprecedented Flood Situation" at any station when the water level of the river touches or crosses the HFL of the station. A special "Red Bulletin" is being issued by the Central Water Commission to the users agencies which contains the details related to the flood situation.

3.2.1 Flood Forecasting Performance during 2018

During the year, the flood forecasting activity began from 1st May 2018. During the flood season of 2018 (May to December), 6851 flood forecasts (4969 level forecast and 1882 inflow forecasts) were issued out of which 6495 (94.80%) forecasts were found within accuracy limit (± 0.15 m for level forecast and ± 20% for inflow forecast). Using the web-based e-SWIS software, the hydrological data of all Hydrological Observation stations was entered by all Divisions of CWC on real time basis. Based on above data, the current status of the rivers has been monitored on real time basis.

The flood forecast & water level information were made available to common public through the website https://india-water.gov.in/ffs on near real time basis. This service was widely followed up by the flood affected people. The appreciations/ suggestions regarding the service were received from various people during the monsoon season.

The methodology based on rainfall-runoff mathematical model is being progressively used for formulating flood forecasts. Using this methodology, 1-day/ 3-day advisory forecasts are being issued by CWC. During flood season, three days flood advisories are available for all the 19 river basins online since June 2017 on the website http://120.57.32.251. With the availability of such information on severe storms, CWC is now issuing specific advisories giving district-wise advise on anticipated floods to facilitate early NDRF/SDRF deployment and dam-wise advise for operation of reservoir gates and release of water from reservoir, wherever applicable.

CWC started issuing Daily Flood Situation Reports from 18th July 2018 onwards till 12th October 2018. In addition to reports containing the usual daily rainfall situation, rainfall forecast for the next 5 days, daily flood bulletin for the day and the flood situation and advisories for the next few days, GIS based Map indicating the districts affected by flood and reservoirs having inflow forecasts were also continued. Further the report was sent to all beneficiaries including State Governments as well as general public through Facebook (@CWCofficial.FF),

twitter (@CWCofficial_FF) and WhatsApp group. Reports were sent by e-mail on a daily basis from 23rd August 2018 to various beneficiaries.

3.2.2 Significant Flood Situations during 2017

Extreme Flood Situation

During the flood season of 2018, out of 174 level forecasting stations, Extreme Flood Situation was witnessed at 5 stations. Further, 24 more stations, where water level is being monitored by CWC, witnessed Extreme Flood Situation during the period. The details are as under:

Sl. No	State	District	River	Station	Period	
					From	To
	Flood Forecast Stations					
1.	Tripura	North Tripura	Manu	Kailashahar	13/06/2018 08:00 hrs	14/06/2018 00:00 hrs
2.	Assam	Shivsagar	Dikhow	Shivsagar	31/07/2018 2300hrs	01/08/2018 10:00 hrs
3.		Golaghat	Dhansiri (S)	Numaligarh	02/08/2018 06:00 hrs	04/08/2018 17:00 hrs
4.	Tamilnadu	Erode	Bhavani	Savandapur	17/08/2018 01:00 hrs	18/08/2018 04:00 hrs
5.		Erode	Cauvery	Kodumudi	17/08/2018 08:00 hrs	19/08/2018 03:00 hrs

Other Monitoring Stations

a) River Manu at Manughat in North Tripura district of Tripura on 13th June 2018
b) River Dhaleswari at Gharmura in Hailakhandi district of Assam on 13th and 14th June 2018.
c) River Periyar at Vandiperiyar in Idukki district of Kerala on 11th June 2018 and from 14th to 18th August 2018
d) River Meenachil at Kidangoor in Kottayam district of Kerala on 16th July 2018 and 16th to 18th August 2018.

e) River Pamba at Malakkara in Pattanamthitta district of Kerala on 15th August 2018
f) River Pamba at Kallooppara in Pattanamthitta district of Kerala on 16th August 2018
g) River Periyar at Neeleswaram in Ernakulam district of Kerala from 15th to 17th August 2018
h) River Muvattupuzha at Kalampur in Ernakulam district of Kerala from 15th to 18th August 2018
i) River Muvattupuzha at Ramamangalam in Ernakulam district of Kerala on 16th August 2018
j) River Chalakudy at Arangali in Thrisur distric of Kerala on 15th and 16th August 2018
k) River Pulanthodu at Pulamanthole in Palakkad district of Kerala from 16th to 17th August 2018
l) River Bharathapuzha at Mankara in Palakkad district of Kerala on 9th and 16th August 2018
m) River Bharathapuzha at Kumbidi in Palakkad district of Kerala from 16th to 18th August 2018
n) River Kadalundi at Karathodu in Malappuram district of Kerala from 16th to 18th August 2018
o) River Kuttyadi at Kuttyadi in Kozhikode district of Kerala on 16th August 2018
p) River Kabini at Muthankera in Wynadu district of Kerala from 9th to 10th August and from 16th to 18th August 2018
q) River Valapatnam at Perumannu in Kannur district of Kerala from 8th to 9th August and from 14th to 15th August 2018.
r) River Bhavani at Nellithurai in Coimbatore district of Tamilnadu on 16th August 2018
s) River Moyar at Thengumarahada in Nilgiris district of Tamilnadu on 17th August 2018
t) River Cauvery at Kudige in Kodagu district of Karnataka from 14th to 18th August 2018
u) River Cauvery at Chunchunkatte in Mysuru district of Karnataka from 14th to 20th August2018
v) River Bhadra at Holehonnur in Shivamogga district of Karnataka from 14th to 18th August 2018
w) River Tunga at Shimoga in Shivamogga district of Karnataka from 14th to 15th August 2018
x) River Suklai at Suklai in Baksa district of Assam on 26th and 27th September 2018.

Severe Flood Situation

During the year, Severe Flood Situation was witnessed at 74 Level Forecasting stations. The details are as under:

Sl. No	State	District	River	Station
1.	Arunachal Pradesh	East Siang	Siang	Passighat
2.	Assam	Dibrugarh	Brahmaputra	Dibrugarh
3.		Shivsagar	Desang	Nanglamoraghat
4.		Jorhat	Brahmaputra	Neamatighat
5.		Lakhimpur	Ranganadi	N T Road Crossing
6.		Golaghat	Dhansiri(S)	Golaghat
7.		Sonitpur	Jia-Bharali	N T Road Crossing
8.		Sonitpur	Brahmaputra	Tezpur
9.		Nagaon	Kopili	Kampur
10.		Kamrup	Brahmaputra	Guwahati
11.		Kamrup	Puthimari	N H Crossing
12.		Nalbari	Pagladiya	N T Road Crossing
13.		Barpeta	Beki	Road Bridge
14.		Dhubri	Brahmaputra	Dhubri
15.		Dhubri	Sankosh	Golokganj
16.		Cachar	Barak	Annapurnaghat
17.		Hailakhandi	Katakhal	Matizuri
18.		Cachar	Barak	Badarpurghat
19.		Karimgunj	Kushiyara	Karimgunj
20.	Bihar	Madhubani	Kamlabalan	Jhanjarpur
21.		Purnea	Mahananda	Dhengraghat
22.		Khagaria	Burhigandak	Khagaria
23.		Katihar	Mahananda	Jhawa

24.		Gopalganj	Gandak	Dumariaghat
25.		Muzzafarpur	Bagmati	Benibad
26.		Supaul	Kosi	Basua
27.		Patna	Punpun	Sripalpur
28.		Khagaria	Kosi	Baltara
29.		Katihar	Kosi	Kursela
30		Siwan	Ghaghra	Darauli
31		Siwan	Ghaghra	Gangpur Siswan
32		Darbhanga	Adhwara	Kamtaul
33		Patna	Ganga	Dighaghat
34		Patna	Ganga	Gandhighat
35		Patna	Sone	Maner
36		Patna	Ganga	Hathidah
37		Bhagalpur	Ganga	Bhagalpur
38		Bhagalpur	Ganga	Khalgaon
39	Jammu & Kashmir	Anantnag	Jhelum	Sangam
40		Srinagar	Jhelum	Rammunshibagh
41		Baramullah	Jhelum	Safapora
42	Jharkhand	Sahebganj	Ganga	Sahebganj
43	Odisha	Rayagada	Vamsadhara	Gunupur
44		Gajapati	Vamsadhara	Kashinagar
45		Balasore	Burhabalang	Govindapur
46		Bhadrak	Brahmani	Akhuapada
47		Keonjhargarh	Brahmani	Ananadpur
48		Ganjam	Rishikulya	Puroshottampur

49	Uttar Pradesh	Barabanki	Ghaghra	Elgin Bridge
50		Faizabad	Ghaghra	Ayodhya
51		Ballia	Ghaghra	Turtipar
52		Balrampur	Rapti	Balrampur
53		Muzzafarnagar	Yamuna	Mawi
54		Badaun	Ganga	Kachhla Bridge
55		Farukkabad	Ganga	Fatehgarh
56		Moradabad	Ramganga	Moradabad
57		Banda	Ken	Banda
58		Ghazipur	Ganga	Ghazipur
59		Ballia	Ganga	Ballia
60		Kanpur	Ganga	Ankinghat
61		Shahjahanpur	Ramganga	Dabri
62		Rae-Bareli	Sai	Rae-Bareli
63	West Bengal	Coochbehar	Raidak	Tufanganj
64		Coochbehar	Jaldhaka	Mathabanga
65		Coochbehar	Teesta	Mekhliganj
66		Jalpaiguri	Teesta	Domohani Road Bridge
67		Murshidabad	Ganga	Farakka
68	NCT, Delhi	North	Yamuna	Delhi railway Bridge
69	Chhattisgarh	Bastar	Indravathi	Jagdalpur
70	Telangana	Adilabad	Kumaram Bheem Asifabad	Sirpur (Town)
71	Andhra Pradesh	Kurnool	Tungabhadra	Mantralayam
72		Srikakulam	Nagavali	Srikakulam

73		East Godavari	Godavari	Kunavaram
74	Tamilnadu	Tiruchirapalli	Cauvery	Musiri

Above Normal Flood Situation

During the year, Above Normal Flood Situation was witnessed at 35 Level Forecasting stations. The details are as under:

S.No.	State	District	River	Station
1	Assam	Lakhimpur	Subansiri	Badatighat
2		Goalpara	Brahmaputra	Goalpara
3		Dibrugarh	Buridehing	Chenimari
4		Morigaon	Kopili	Dharamtul
5		Kokrajhar	Gaurang	Kokrajhar
6		Barpeta	Manas	N H Crossing
7	West Bengal	Coochbehar	Torsa	Ghugumari
8		Coochbehar	Jaldhaka	N H 31
9	Tripura	West Tripura	Gumti	Sonamura
10	Bihar	Darbhanga	Adhwara	Ekmighat
11		Darbhanga	Bagmati	Hayaghat
12		Munger	Ganga	Munger
13		Muzzafarpur	Gandak	Rewaghat
14		Vaishali	Gandak	Hazipur
15		Buxar	Ganga	Buxar
16	UP	Siddarthnagar	Rapti	Bansi
17		Gorakhpur	Rapti	Birdghat

18		Kushinagar	Gandak	Khadda
19		Ghaziabad	Ganga	Garmukhteshwar
20		Kannauj	Ganga	Kannauj
21		Kanpur	Ganga	Kanpur
22		Rae-Bareli	Ganga	Dalmau
23		Mathura	Yamuna	Mathura
24	Odisha	Cuttack	Mahanadi	Naraj
25		Balasore	Subarnarekha	Rajghat
26	Madhya Pradesh	Mandla	Narmada	Mandla
27	Maharashtra	Bhandara	Wainganga	Bhandara
28	Uttarakhand	Rudraprayag	Alaknanda	Srinagar
29		Dehradun	Ganga	Rishikesh
30		Haridwar	Ganga	Haridwar
31	Telangana	Jayashankar Bhupalapally	Godavari	Eturunagaram
32		Bhadradri Kothagudem	Godavari	Dummagudem
33		Bhadradri Kothagudem	Godavari	Bhadrachalam
34	Andhra Pradesh	Kurnool	Tungabhadra	Kurnool Town
35		East Godavari	Godavari	Dowlaiswaram Barrage

3.2.3 Inflow Forecast for Reservoirs

CWC provides Inflow Forecasts for 75 dams/reservoirs/barrages in various river basins in the country. The forecasts are issued for a dam/reservoir/barrage whenever the inflow to reservoir is more than a threshold inflow value, which is decided by the project authorities considering various factors such as safety of the dam, status of reservoir, downstream channel/ canal requirements. During the year 2018-19, 42

dams/reservoirs/barrages received inflow beyond the threshold inflow value. These dams/reservoirs/barrages are as under:

S.No.	State	District	River	Station
1	Karnataka	Vijayapura	Krishna	Almatti Dam
2		Kalaburagi	Krishna	Narayanpur Dam
3		Ballari	Tungabhadra	Tungabhadra Dam
4		Chikmagaluru	Bhadra	Bhadra Dam
5		Shivamogga	Tunga	Gajanur Project
6		Kodagu	Harangi	Harangi Dam
7		Hassana	Hemavathi	Hemavathi Dam
8		Mysuru	Kabini	Kabini Dam
9		Mandya	Cauvery	Krishnarajasagar Dam
10	Tamilnadu	Erode	Bhavani	Bhavanisagar Dam
11		Salem	Cauvery	Mettur Dam
12		Theni	Vaigai	Vaigai Dam
13		Tiruchirapalli	Cauvery	Upper Anicut
14		Thanjavur	Cauvery	Grand Anicut
15	Jharkhand	Dhanbad	Barakar	Maithon Dam
16		Bokaro	Damodar	Tenughat Dam
17		Dhanbad	Damodar	Panchet Dam
18	Maharashtra	Jalgaon	Tapi	Hatnur Dam
19		Aurangabad	Godavari	Jaikwadi Dam
20	Gujarat	Valsad	Damanganga	Madhuban Dam
21		Mahisagar	Mahi	Kadana Dam
22		Tapi	Tapi	Ukai Dam

23	Haryana	Yamunanagar	Yamuna	Hathnikund Barrage (3-day advisories)
24	Odisha	Sambalpur	Mahanadi	Hirakud Dam
25	Madhya Pradesh	Shahdol	Sone	Bansagar Dam
26		Mandsaur	Chambal	Gandhisagar dam
27	Telangana	Jogulamba Gadwal	Krishna	P D Jurala Project
28		Nizamabad	Godavari	Sriramasagar Dam
29	Andhra Pradesh	Kurnool	Tungabhadra	Sunkesula Barrage
30		Kurnool	Krishna	Srisailam Dam
31		Krishna	Krishna	Prakasam Barrage
32		Srikakulam	Vamsadhara	Gotta Barrage
33		Guntur	Krishna	Dr KLRS Pulichintala Dam
34		Nellore	Pennar	Somasila Dam
35		Srikakulam	Suwarnamukhi	Madduvalasa Reservoir
36		Vizianagaram	Nagavali	Thottapalli Reservoir Scheme
37		Srikakulam	Nagavali	Narayanpuram Anicut
38	Uttarakhand	Champawat	Sharda	Banbasa Barrage
39	Uttar Pradesh	Bulandshahar	Ganga	Narora Barrage
40		Chandauli	Rihand	Rihand Dam
41	West Bengal	Bardhaman	Damodar	Durgapur Barrage
42		Medhinipur	Kangsabati	Kangsabati Dam

3.2.4 Flood Bulletins

Central Water Commission (CWC) has been issuing Daily Flood Bulletins and Special Flood Bulletins during flood season every year based on the information collected from affected State Governments and field formations of CWC. During the year 2018, 245 daily bulletins (once daily), 768 Orange Bulletins for Severe Flood Situation (every 3 hours) and 113 Red Bulletins for Extreme Flood Situation (every hours) were issued by CWC as per Standard Operating Procedure (SOP).

Apart from regular bulletins, CWC also prepared various status notes on occurrence of severe flood events for discussions in NDMA, MoWR, National Crisis Management Committee (NCMC), National Executive Council (NEC) meetings.

3.2.5 Communication System of CWC used for flood forecasting purposes

Various modes of communication namely, wireless (VHF & HF), satellite, VSAT, Telephone, Mobile, Fax and Internet were used by CWC for flood forecasting purposes. Since beginning, Central Water Commission has been operating wireless stations covering almost all river basins to transmit and receive the manually observed data. Sensor based automatically collected data were transmitted from remote observation stations to Earth Receiving Stations (ERS) through Data Relay Transponder (DRT) of INSAT 3E and from ERS to Central Flood Control Room (CFCR) at CWC headquarter, New Delhi and/or Divisional Flood Control Room (DFCR) at Divisional offices of CWC through VSAT. Telephone, Mobile, FAX and E-mail were also used at all the DFCR and CFCR (under FFM Directorate, CWC) for transmission of data. The CFCR at Delhi was operated on 24x7 basis during monsoon. The information regarding Severe and Extreme Flood Situation were also sent to concerned authorities in MoWR,RD&GR, CWC, National Disaster Management Authority (NDMA), Indian Meteorological Department (IMD), National Disaster Response Force (NDRF) etc. through Email, phone, fax and SMS. Bulk SMS service of MTNL was also utilized to disseminate the flood information. The forecast, water level and rainfall information were regularly uploaded on web site http://india-water.gov.in/ffs during monsoon season 2018.

3.2.6 Modernization of Flood Forecasting Services

Central Water Commission is making a constant endeavour in updating and modernizing the forecasting services. The forecasting of flood involves a number of steps; namely, data observation, collection, transmission, compilation and analysis, formulation of forecasts and their dissemination. To make the flood forecasts more accurate, effective and timely, the modernization activities are being taken up on a continuous basis broadly under following functions.

- Installation of telemetry system for automatic sensor based data collection and satellite based data communication.
- Development of mathematical model for forecast formulation using observed hydrological & hydro-meteorological data & rainfall forecast from IMD.
- Web-based system for forecast dissemination.

3.2.6.1 Installation of Telemetry System

The installation of Telemetry System for automatic sensor based data collection and satellite based data communication was initiated during IX Plan and it was installed at 55 stations in Chambal and Upper Mahanadi basins under the World Bank aided Dam Safety Assurance and Rehabilitation Project (DSARP) scheme. During X Plan, telemetry system was installed at 168 stations in six river basins namely, Godavari (63), Krishna (41), Brahmaputra (21), Damodar (20), Yamuna (15) and Mahanadi (8). During XI plan, telemetry system was installed at 222 stations in seven river basins namely, Indus (4), Ganga (63), Yamuna (25), Narmada & Tapi (76), Mahanadi (36), Brahmaputra (14) and Godavari (4). Further, during XII Plan, telemetry system was installed at 65 stations in six river basins namely, Brahmaputra(35), Yamuna (5), Godavari(7), Pennar(5), Krishna(8) and Eastern Rivers(5).

In order to receive and analyse data collected by the telemetry stations, Earth Receiving Stations and Modelling Centres have been installed in various parts of the country during different Plan periods. Till the end of XII Plan, there were 3 Earth Receiving Stations (ERS) in the country at New Delhi, Jaipur and Burla. A total of 23 Modelling centres have been installed in the country till the end of XII Plan. These Modelling Centres are located at Agra, Asansol, Bhubaneswar, Bhusaval, Burla, Chennai, Dehradun, Dibrugarh, Gandhinagar, Guwahati, Hyderabad (Two stations one each for Krishna and Godavari basins), Jaipur, Jalpaiguri, Kurnool, Lucknow, Maithon, New

Delhi (One at headquarter and one for Yamuna basin), Patna, Shimla, Surat and Varanasi. The data reception from all the sites modernized is being monitored from Central Flood Control Room at CWC Headquarter, New Delhi.

During 2017-18, process for installation of telemetry system at 458 stations was under progress. Out of this, the installation of system at about 300 stations has been completed. The work for installation of system at remaining stations is in advanced stage and is likely to be completed before monsoon 2019.

Establishment of five Modelling Centres (MCs) at Bengaluru, Bhopal, Gangtok, Jammu and Lucknow is planned during the period 2017-20. Out of this, establishment of Modelling Centre at four locations have been completed.

3.2.6.2 Development and use of Mathematical Model for Flood Forecasting

In order to improve the flood forecast activity in CWC, the methodology based on mathematical model using windows based Mike-11 software is progressively being used. The flood forecasting model based on the concept of rainfall-runoff module coupled with Hydrodynamic routing will use rainfall forecast for 3 days of IMD to give advance advisories followed by more reliable forecast based on actual observed hourly rainfall in the catchment. This will result in considerable increase of lead time in flood forecasting which in turn increases response time for disaster managers.

3.2.6.3 Web-based system for forecast dissemination

The web based system for dissemination of flood forecast & water level information was operationalized in 2014. The information is available on near real time basis on website https://india-water.gov.in/ffs.

In addition to this, CWC has partnered with Google to disseminate the flood warning through its Public Alert platform based on Common Alerting Protocol (CAP). This service was launched in November 2015 and was available to users during flood season 2016. Common Alerting Protocol (CAP) is an XML-based data format for exchanging public warnings and emergencies between various alerting technologies. CAP allows a warning message to be consistently disseminated simultaneously over many warning systems to many applications. Through this platform, level flood forecasts/ alerts were

disseminated on different Google platforms such as Google Web Search, Google Now Cards in the Google Apps, Google Map and on the Google Public Alerts Homepage and can be accessed on desktop and mobile devices. Further, users can also access other information i.e., likely flood situation, current water level, forecasted water level, recommended action for affected people, website address for current water level information etc. by clicking on the alert help. Availability of near real-time flood information helped affected people in preparing and fighting flood disasters.

3.3 Flood Management Programme

The "Flood Management Programme (FMP)" was initiated by the Government of India in XI Plan for providing Central Assistance to the State Governments for undertaking the works related to river management, flood control, anti-erosion, drainage development, flood proofing including flood prone area development programme, restoration of damaged flood management works and anti-sea erosion works. During the plan period (2007-12), 420 Nos. of schemes of various State Governments with a total estimated cost of Rs. 7857.08 Crore were included for funding under FMP and Central Assistance amounting to Rs. 3566 Crore was released

During XII plan period (2012-17), 102 Nos. of schemes of various State Governments with a total estimated cost of Rs. 5381.29 Crore were included for funding under FMP. During the period, an amount of Rs. 1307.07 Crore has been released.

3.3.1 River Management Activities & Works related to Border Areas (RMBA)

River Management Activities & Works related to Border Areas (RMBA) started as a Central Sector Scheme 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 Pancheswar 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 asAnti Erosion/Flood Management schemes on rivers on

international borders and Union Territories. An expenditure of Rs 478.26 Cr was incurred during XII Plan against outlay of Rs 740 Cr.

3.3.2 FLOOD MANAGEMENT AND BORDER AREAS PROGRAMME (FMBAP)

A comprehensive scheme titled "Flood Management and Border Areas Programme (FMBAP)" with an outlay of Rs 3342.00 Cr (FMP-Rs 2642 Cr &RMBA-Rs 700 Cr) for period 2017-2020 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 has been approved by the Union Cabinet on 07-Mar-2019 and aims at completion of the on-going projects already approved under FMP.

3.3.3 FMP COMPONENT OF FMBAP

A total 522 schemes were approved during XI &XII Plan. Out of these schemes, 235 schemes have been physically and financially completed; 168 schemes were physically completed with outstanding financial liability; 20 schemes foreclosed and shifted, 83 schemes are on-going and16 schemes were dropped due to physical progress less than 50%.A Central assistance of Rs 562.67 Cr was released during year 2017-18.Further a Central assistance of Rs 428.2 Cr has also been released during current year 2018-19. Thus, since start of XI Plan, total Central Assistance released is Rs 5863.94 Cr till 31-Mar-19.An outlay of Rs 2642 Cr has been kept for period 2017-20 under this component.

Central Water Commission coordinates the release of funds for scheme under FMP in areas other than Ganga and Brahmaputra basin. The details of fund released during 2018-19 to States for areas other than Ganga basin is given in Table 3.2.

Table 3.2

State-wise fund released under Flood Management Programme during 2018-19		
Sl No.	Name of State	Amount released (Rs. in Crore)
1	Assam	142.118
2	Bihar	16.583
3	Himachal Pradesh	162.6

4	Jammu & Kashmir	52.198
5	Nagaland	10.841
6	Uttar Pradesh	15.575
7	Uttarakhand	4.633
8	West Bengal	23.652
Total		**428.20**

3.3.4 RMBA COMPONENT OF FMBAP

Following activities are being taken up under RMBA component of FMBAP.

Sl. No.	Activity
1	Hydrological observations and flood forecasting on common border rivers with neighbouring countries
2	Investigation of WR projects in neighbouring countries
3	Pre-construction activities for WR projects on common border rivers
4	Grant in aid to states for bank protection /anti erosion works on common border rivers and Union Territories for flood management /anti sea erosion measurers
5	Activities of Ganga Flood Control Commission (GFCC)
	Total

An amount of Rs 256.48 Cr was released under RMBA component of FMBAP during year 2018-19.

3.4 Morphological Studies

The study of river morphology and implementation of suitable river training works as appropriate have become imperative for our nation as large areas of the country are affected by floods every year causing severe damage to life and property in spite of existing flood control measures taken both by Central and State Governments. Problems are aggregating mainly due to severe erosion of river banks and large quantity of silt/sediment being carried and deposited in its downstream reaches. This

behaviour of the river needs to be thoroughly understood for evolving effective strategies to overcome the problem posed by it.Morphological Studies of three rivers namely, Ghaghra, Satluj and Gandak rivers were completed during the 10th Plan period.

Under the Plan Scheme "R&D Programme in Water Sector", the morphological studies of 15 rivers (namely, Ganga, Sharda, Rapti, Kosi, Bagmati, Yamuna, Bramhaputra, Subansiri, Pagladiya, Krishna, Tungbhadra, Mahananda, Mahanadi, Hoogli, &Tapti) by using Remote Sensing Technology were awarded to various IITs /NITs on consultancy basis during the 12th Plan. Out of these, the Morphological Study of river Tapi has been completed by SVNIT, Surat and the final report was submitted. The studies in respect of other 14 rivers are under progress in various IITs. The final reports are expected to be submitted by March, 2019. The institute-wise status of these studies is given below:

Sl. No.	Institute	Name of Rivers	Status
1.	IIT Roorkee	Ganga, Sharda, Rapti	Final Report Submitted
2.	IIT Delhi	Kosi, Bagmati, Yamuna	Draft Report Submitted (except Kosi)
3.	IIT Guwahati	Bramhaputra, Subansiri, Pagladiya	Draft Report Submitted
4.	IIT Madras	Krishna, Tungbhadra	Final Report Submitted
5.	IIT Kharagpur	Mahananda, Mahanadi, Hoogly	Draft Report Submitted
6.	SVNIT Surat	Tapi	Final Report Submitted

3.5 Coastal Erosion

The Indian coastline is extends upto a length of about 7516 km (as per NHO). Almost all the maritime States/UTs are facing coastal erosion problem of various magnitudes. As per the data reported by various maritime States/UT agencies about 1829 km of coastline of the country is affected by erosion and about 844 km of coastline have protection works. CWC is involved in following activities for providing assistance to the States:

3.5.1 External Assistance: Climate Resilient Coastal Protection and Management Project (CRCP&MP)

During year 2014, an agreement has been signed by the Government of India for Technical Assistance (TA) programme namely TA 8652-IND: Climate Resilient Coastal Protection and Management Project (CRCP&MP) to support mainstreaming of climate change consideration into coastal protection and management at the national level and in the two focal States (of Karnataka and Maharashtra) where the Sustainable Coastal Protection and Management Investment Programme (SCP&MIP) is already operational under external assistance from ADB.

One of the major objectives of this TA is to analyze the climate change impacts in the coastal areas and based on the same, planning & design criteria and guidelines for coastal climate change adaptation are to be prepared. A National Technical Committee (NTC) has been constituted by the Ministry to oversee and guide the implementation of the project and to endorse the project outputs. Further, a Panel of Experts (PoE) was also constituted for review of the draft Guidelines.

As a part of TA, research studies were also awarded to specialist institutes NIO, Goa, IIT Bombay & IIT Delhi. The details of the studies are given below:

Specialist Institute	**Study Performed**
Indian Institute of Technology (IIT), Bombay	Analysis of the downscaled Climate Change Parameters for Wind, Air Temperature and Rainfall from the CORDEX-South Asia* Domain.
National Institute of Oceanography (NIO), Goa	Sea level rise trends and Waves projections
Indian Institute of Technology (IIT), Delhi	Storm Surge Projections

(* - Indian Institute of Tropical Meteorology (IITM), Pune is one of the partner institutes in above initiative)

The Study Reports alongwith the data and analysis of the climate change affected parameters in the coastal areas has been hosted on web-based Water Resources Information System (INDIA-WRIS). The Coastal Climate Information System (CCIS) layer has been created in INDIA-WRIS for this purpose.Two training courses and national workshops in the use of the Guidelines for the maritime States/UTs and other concerned agencies have also been organized.

A Reference Manual on "Climate Change Adaptation Guidelines for Coastal Protection and Management in India" prepared as part of Technical Assistance (TA) grant program

"TA 8652-IND: Climate Resilient Coastal Protection and Management Project (CRCPMP)" was released during the event held in Hotel Leela Palace, Chanakyapuri, New Delhi on 26th March 2019 by Shri U P Singh, Secretary, MoWR,RD&GR in presence of Shri N K Mathur, Member (D&R Wing), CWC, Shri B K Karjee, Chief Engineer(FMO), CWC, Mr. Arnaud Cauchois, Principal Water Resources Specialist, ADB and other dignitaries and officials from MoWR, RD&GR, CWC, New Delhi, ADB and State Govt(s).

3.5.2 Sustainable Coastal Protection and Management Investment Program (SCPMIP)

Realizing the severity of sea-erosion problems in certain reaches of the coastline, MoWR,RD&GR initiated the process of collecting details of severely affected reaches with a view to explore the possibility of preparing a National Coastal Protection Project (NCPP) for taking up the same for external assistance. As an outcome of discussions between the Government of India and ADB, a Project Preparatory Technical Assistance (PPTA) programme for preparing a Sustainable Coastal Protection and Management Project for the states of Maharashtra, Karnataka & Goa was taken up. Under PPTA an investment programme estimating to $404.6 million USD (revised) including ADB loan of $250 million has been envisaged. Further, the multi-tranche facility (MFF) for project was approved by ADB on 29th September, 2010 for an amount of $250 million USD.

Further, the Government of India and ADB signed an agreement for first tranche loan ($51.555 million loan- LN-2679-IND) under the MFF on 17/08/2011 for Sustainable Coastal Protection and Management Investment Programme (SCP&MIP) in the states of Karnataka and Maharashtra. Two projects namely Ullal Coastal Erosion & Inlet Improvement Project in Karnataka and Mirya Bay Coastal Erosion and Protection Project in Maharashtra have been completed.

The State Govt. of Karnataka has submitted Tranche-2 Projects to CWC for techno-economic appraisal. In July 2016, the Tranche-2 Projects have been accepted by Advisory Committee of MoWR, RD and GR at an estimated cost of Rs.374.09 Crore. The project proposal under Tranche - II includes 6 sub-projects involving beach nourishment, sand by-passing, construction of offshore reefs, groynes, revetment etc and 2 community protection subprojects involving plantation works for dune stabilization.

Designs of Someshwara project under Tranche-2 is revised due to site conditions and the revised proposal of Someshwara project is submitted to CWC by the project consultant for TAC approval and the same is under examination in Cost Appraisal Directorate, CWC. The revised proposal will be considered for approval in upcoming TAC meeting to be held in FY 2019-2020.

3.5.3 Coastal Protection and Development Advisory Committee

The Coastal Protection and Development advisory Committee (CPDAC) (erstwhile Beach Erosion Board) has been constituted by Ministry of Water Resources, Government of India in April 1995 under the Chairmanship of Member (RM), CWC. CPDAC provides a common platform to all maritime States/UTs to discuss and solve their coastal erosion problems. Till now, 15 meetings of CPDAC have been held. The last meeting was held on 17thAugust 2017 at New Delhi.

As per decision taken by CPDAC, CWC has compiled and published a Status Report on Coastal Protection and Development in India in December, 2016. The document is available on CPDAC Website (http://cwc.gov.in/CPDAC-Website/index.html)

As per decision taken in 13th CPDAC meeting, a Sub-committee of CPDAC on Coastal Data Collection, Compilation and Publication was constituted. The Report of the Sub-Committee was accepted by CPDAC in its 15th meeting and was published by CWC in December 2017. The document is available on CPDAC Website (http://cwc.gov.in/CPDAC-Website/index.html)

Action taken report (ATR) on the minutes of 15th CPDAC meeting held at CWC (HQ), New Delhi on 17th Aug 2017 & Agenda points for the 16th CPDAC meeting are being collected & compiled from the committee members. 16th CPDAC meeting is going to be held in the FY 2019-2020.

3.5.4 Coastal Management Information System(CMIS)

Considering the importance of collection of data on coastal processes relevant for evolving plans and coastal protection measures, CWC has initiated development of "Coastal Management Information System (CMIS)" under the Plan Scheme "Development of Water Resources Information System (DWRIS)". The CMIS envisages

setting up sites along the coast of the maritime States of India for collecting data of relevant coastal processes.

The activity of establishing a Coastal Management Information System is a field of activity wherein the experience and expertise is needed. Hence, for implementation and creation of CMIS, it has been decided that CWC would suitably associate with the maritime State/UT Governments and Institutes/Agencies who possess similar expertise and experience. In order to hear the views of the maritime State/UT Governments and Expert Institutes/Agencies, a "One day Brainstorming Workshop on Implementation and Creation of Coastal Management Information System (CMIS)" was organized by CWC on 13th May, 2014 at CWC, New Delhi. During the discussions in the work-shop, the preferred implementation model for CMIS was decided to be through signing of a tripartite Memorandum of Understanding (MoU) wherein, CWC would be the 'Project Implementer', the expert agency would be the 'Project Executor' and the concerned State/ UT Government would be the 'Project Facilitator'. Data related to Wave, Tide, Current, Wind, coastal sediment, beach profile, bathymetry, shoreline change etc. are to be collected under this programme.

A) IIT Madras

A tripartite Memorandum of Understanding (MoU) among CWC as project implementer, the Indian Institute of Technology, Madras as project executor and States of Tamil Nadu, Kerala and UT of Puducherry as project facilitator for Tamil Nadu, Kerala and Puducherry respectively has been signed in October 2016 for establishment of one coastal data collection site in each participating State/UT(Devanari-Tamil Nadu, Karaikal-Puducherry and Ponnani-Kerala) over a period of 2 years.

Implementation of CMIS having total cost Rs. 8.96 Crore is in final stage by IIT Madras, Chennai in the State/UT of Kerala, Tamil Nadu and Puducherry for total 3 sites (one site in each state/UT). The 3rd Meeting of Project Monitoring Committee (PMC) was held in July, 2018 at Chettuva, Kerala. 10 days hands on training in CMIS for 23 participants were organized by the support of CWC at IITM,Chennai in November 2018. The 4th Meeting of the PMC was held in March, 2019 at IITM, Chennai. The second National Workshop on Coastal Management Information System (NWCMIS – 2019) was organized at Department of Ocean Engineering, IITM, Chennai with the support of CWC on 11th March, 2019. The project duration has been extended for

completion by June 2019. PMC has advised to continue the project for another one year with the support of IITM,Chennai, and the same is under consideration.

B) CWPRS

CWC explored the possibility of extending CMIS to the other maritime States/UTs and held discussion regarding the same with institutes like National Institute of Oceanography (NIO) Goa, Central Water & Power Research Station (CWPRS) Pune, National Institute of Technology (NIT), Surathkal etc. Consequently, CWPRS Pune had shown interest in taking up the role of Project Executor for Implementation of CMIS at 2 sites, one each in Maharashtra (northern region) and Gujarat (southern region).

Further, CWC made communication with State Govt. of Maharashtra and Gujarat, seeking their concurrence for the implementation of CMIS as per the arrangement of tripartite MoU arrangement.

A meeting was held among the officers of CWC, CWPRS Pune and the representatives of the State Govt. of Gujarat and Maharashtra at CWC, New Delhi on 18/08/2017 wherein detailed discussion, was held regarding the various modalities involved in the tri-partite arrangement for implementation of CMIS and also the various experiences/learning from the on-going implementation of CMIS by IIT Madras. Consequently, the state Govt of Gujarat and Maharashtra accorded their concurrence for the implementation of CMIS in their respective States.The competent authority in MoWR, RD&GR has approved a Project Proposal of CWPRS, Pune amounting to Rs.695.531 lakh for the implementation of Coastal Management Information System (CMIS) at 2 sites, 1 in Gujarat and 1 in Northern Maharashtra and a tripartite Memorandum of Understanding (MoU) among CWC as project implementer, CWPRS, Pune as project executor and States of Gujarat, and Northern Maharashtra as project facilitator has been signed in January 2019 for establishment of one coastal data collection site in each participating State/UT.

C) NIO, Goa

NIO, Goa had also shown interest for taking up the role of Project Executor for Implementation of CMIS at 3 sites, 2 in Goa and 1 in Southern Maharashtra.
A Tripartite MoU for implementation of Coastal Management Information System (CMIS) in Maharashtra (Southern Coast) and Goa at an estimated cost of Rs. 1376.60

lakh was signed among CWC as Project Implementer, National Institute of Oceanography (NIO), Goa as Project Executer and Govt. of Maharashtra and Govt of Goa as Project Facilitator in March 2019.

3.5.5 Salinity Ingress Management Projects

On the intervention of Hon'ble Prime Minister's intervention, a study has been taken up by the Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR, RD & GR) to examine the issues of salinization of land along the coast in a scientific manner and to suggest suitable remedial measures for same.

Coastal land salinization and salt water ingress are major hazards encountered along the Indian coast which can hamper the rapid socio-economic growth of the coastal states and the economy of the country as a whole. As India has a lengthy sea coast spread over nine states and four union territories, the problem of salinity in coastal areas is a national problem. In coastal regions, which are in close proximity to the sea, salinization may lead to changes in the chemical composition of natural water resources, degrading the quality of water supply to the domestic, agriculture and industrial sectors, loss of biodiversity, taxonomic replacement by halo tolerant species, loss of fertile soil, collapse of agricultural and fishery industries, changes in local climatic conditions, and creating health problems; thus, affecting many aspects of human life and posing major hindrance to the economic development of the region.

A technical committee for adopting suitable protection measures for prevention of salinity ingress in the coastal states/union territories was constituted under the chairmanship of Chairman, CWC with Chief Engineer, HSO, CWC as Member-Secretary.

On the direction of Hon'ble Prime Minister during a review meeting taken on 19.06.2014 a Report namely "Problems of Salinization of Land in the Coastal States/Union Territories" was prepared by HSO, CWC, New Delhi and submitted in Aug, 2017.

A meeting to discuss the report was held under theChairmanship of Secretary (MoWR,RD&GR) on 29th Sept, 2017. In the meeting it was decided that (i) CWC will prepare necessary guidelines in consultation with CWPRS, CGWB and other technical agencies for preparation of DPR for salinity ingress Management Projects including

funding pattern, eligibility criteria for funding. (ii) CWC will prepare a comprehensive new scheme for salinity ingress management projects based on the DPRs received from the States/UTs as per guidelines prepared by CWC. (iii) Setting up of National Centre for Scientific Study of Salinity ingress in Delta regions, as recommended in the report.

Further, a Committee was constituted for (i) preparation of DPR (ii) preparation of newscheme for Salinity Ingress Management Projects &(iii) setting up of National Centre for Scientific Study of Salinity Ingress in Delta Regions. 1st meeting of the Committee was held at CWC, New Delhi on 24/04/2018. During the meeting, the preliminary draft guidelines for the preparation of DPR were discussed by the Committee and it was decided to submit comments/observations after a thorough review of the guidelnes. Further, the work was distributed chapter-wise among the various agencies/departments/members of Committee, identified as the Lead and the Supporting agencies for the respective chapters/sub-chapters.

Comments/Observations have been received from few directorates of CWC/agencies and the same has been incorporated in the draft guideline for preparation of DPR which will be finalized in due course.

3.5.6 Desalination

Desalination refers to any of several processes that remove excess salt and other minerals from water. Water is desalinated in order to be converted to freshwater suitable for human consumption. It is used on many seagoing ships and submarines. Most of the modern interest in desalination is focused on developing cost-effective ways of providing freshwater for human use in regions where the availability of freshwater is limited. Large-scale desalination typically uses extremely large amounts of energy as well as specialized expensive infrastructure, making it very costly compared to the use of freshwater from rivers or groundwater. The energy requirement also depends upon the salt content. More salt content requires more energy during desalination process.

A comprehensive report/Status Note and Way Forward including role of CWC on augmenting water availability by desalination of water is being prepared.

3.6 River Management Activities and Works Related to Border Areas

The Government of India has been implementing the Central Sector Scheme "River Management Activities and Works related to Border Areas (RMBA)" under Central Plan for taking up following activities:

Sl. No.	Activity
1	Hydrological observations and flood forecasting on common border rivers with neighbouring countries
2	Investigation of WR projects in neighbouring countries
3	Pre-construction activities for WR projects on common border rivers
4	Grant in aid to states for bank protection /anti erosion works on common border rivers and Union Territories for flood management /anti sea erosion measurers
5	Activities of Ganga Flood Control Commission (GFCC)
	Total

The activities under the scheme arecontinuing during the period 2017-18 also. As per advice of the Ministry of Finance, the activities are proposed to be included under the scheme "Flood Management and Border Area Programme (FMBAP)". The EFC for the scheme with an outlay of Rs. 5285 Cr for 2017-20 period including provision of Rs. 700 Cr for above activities is under consideration.

3.6.1 Grant-in-Aid to States for bank protection /anti erosion works on common border rivers and Union Territories for flood management /anti sea erosion measurers

The details of the ongoing proposal for bank protection /anti erosion works on common border riversbetween India and Bangladesh dealt in Central Water Commission for funding under the above programme is as given below-

(Rs. in Lakh)

Sl. No.	Particular of the scheme	Estimated cost	Fund released upto March 17	Amount released during 2017-18	Status
	Tripura				
1	Jenai to Beltali(Segment-I)	1161.57	871.18	Nil	No proposal for release of funds have been received in CWC during 2017-18
2	Baishnpur to Barunighat (Segment-II)	833.89	625.42	Nil	
3	Anandapara to Chotokhil (Segment-III)	1374.53	1004.26	Nil	
4	Ranirbazar to Ramendra Nager (Segment-IV)	1234.25	923.19	Nil	
5	Harbatali to Amlighat (Segment-V)	909.11	681.83	Nil	
	Total	**5513.35**	**4105.88**	**Nil**	

In addition, the scheme "Flood protection work in Yanam region of UT of Puducherry" was also funded under the Plan Scheme "River Management Activities and Works related to Border Areas". The scheme was initially included for funding under the "Flood Management Programme" and first instalment of Rs. 7.50 Crores was released during XIth plan. Subsequently, the scheme was included for funding under RMBA scheme in 2014 and as per the Court direction, the second instalment amounting to Rs. 13.2563 Crores was released. In total, an amount of Rs. 20.7563 Croreshas been released to this scheme so far.

The completion of the projects got delayed due to some unforeseen reasons. Subsequently, a multi-disciplinary team was constituted by the MoWR,RD&GR to assess the ground reality and to make suitable recommendation for completion of project. The project was inspected by the team on 8th and 9th November 2016 and report was submitted on 8th December 2016. Based on the report of the team, the report was revised by the State Government and submitted to CWC for appraisal. The revised proposal has been examined and it has been decided that the same may be submitted for TAC clearance of MoWRin forth coming meeting.

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Cross-section survey work being carried out in Rāmgangā Basin for for assessment of environmental flows under Indo-EU Joint Working Group

Sh Y.K. Sharma, Member (RM), CWC visited Bhomoraguri GDSQ site on 28th September 2018 and inspected discharge measurement by ADCP

Sh. Y. K. Sharma, Member (RM), CWCand Sh. Bhopal Singh, CE(UGBO), Lucknow overseeing discharge observation through ADCP at Ayodhya site on 18.12.18

CHAPTER-IV

BASIN PLANNING

4.1 National Water Planning

The uneven distribution of water in time and space and the recurring occurrence of floods and droughts in various parts of the country have underscored the need for a national perspective in water resources development involving participation of all concerned. Planning of water resources development and utilization is a multi-level process involving Central and State Governments, Non-Governmental Organizations and beneficiaries with intense interaction among them. CWC is actively involved in aspects related to holistic approach towards development and management of water resources.

4.2 Basin Planning Studies and Related Issues

4.2.1 Reassessment of Basin-wise Water Resources Availability in the Country – Strategy identified under National Water Mission

One of the strategies (Strategy No. I.6) identified for implementation under the Comprehensive Mission Document of National Water Mission is "Reassessment of basin-wise water situation" under present scenario including water quality by using latest techniques, which inter-alia may include:

- Development or adoption of comprehensive water balance based model,
- Fitting models to basin using current data, and
- Assessment of likely future situation with changes in demands, land use, precipitation and evaporation.

In June, 2010 Central Water Commission (CWC) and National Remote Sensing Centre (NRSC) jointly initiated a demonstrative pilot studies in Godavari and Brahmani-Baitarani river basins wherein remote sensing based geo-spatial inputs were used to estimate basin-level mean annual water resources. The pilot study in the Godavari and Brahmani-Baitarani Basin was completed in June, 2013. The report of pilot study was reviewed by a Working Group comprising officers from CWC, IIT and NRSC which has suggested some refinements in the methodology before replicating the same in other basins.

Later, MoWR,RD&GR decided to carry out assessment studies in all basins of the country (including Brahmani- Baitarani and Godavari basins) with refined methodology through regional offices of CWC with support from NRSC.

Accordingly, MoWR,RD&GR sanctioned a proposal for conducting above study with a total estimated cost of Rs. 6.44 Crore in January 2015. The estimated cost was later revised to Rs. 10.33 Crore in March 2016 due to escalation of price of related softwares.

AnMoU was signed with NRSC in July 2016 for their technical guidance and support for the study. The study was started in Aug 2016. Various customized trainings were conducted by NRSC for officers of CWC involved in the study. The study has been completed in July 2017.

The results of the study indicate that the average annual water resource of the 20 river basins of the country is 1999.20 Billion Cubic Meters (BCM). Fully science based state-of-the-art modellingtools and satellite data have been used in the study. During the course of study the methodology forreassessment was reviewed and finalised by a Committee consisting of experts from CWC, NRSC,Indian Meteorological Department (IMD) and Academia. The most distinguishingfeatures of the study are incorporation of rainfall, land use, land cover, properestimation of demand, evapotranspiration, soil moisture and development of basinand sub-basin wise models with the help of the software namely "Water ResourcesAssessment Tool" developed by NRSC. The outcome of this study will be very usefulfor proper planning and development of country's water resources.

The study reports (3 Volumes; Main Volume, Volume-I and Volume-II) are under printing.

4.2.2 Integrated Water Resources Management (IWRM) Plan for Krishna, Godavari and Mahanadi Basins

The institutionalization and implementation of Integrated Water Resources Management (IWRM) in India supported by River Basin Organizations and following the internationally acknowledged river basin planning cycle is a major target for the Government of India. The development of River Basin Management Plans for all Indian River basins takes a key role within this process. Significant steps have already been taken in the past, such as the development of specific projects for assessing water resources availability, the establishment of river basin management concepts and – most recently – the ongoing study for preparation of a Ganga River Basin Management Plan, initiation of process for enactment of Basin Management Act etc.

Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR, RD &GR) aims to develop its ability to manage basins to support optimum use of water resources. The major objectives are to: align water resources development goals in line with the National Water Policy 2012; bring all States on equal footing regarding Hydrological Information System (HIS) and its use; and, specifically, to move towards IWRM process.

To start with, IWRM studies were planned to be conducted in three basins namely, Krishna, Mahanadi and Godavari under the National Hydrology Project. The process for awarding the study through global tendering was undertaken. The proposals received from various international firms were evaluated by the Bid Evaluation Committee. After evaluation, the Committeerecommended for the cancellation of bids.

Later, it has been decided to conduct IWRM studies for 5 basins viz. Mahanadi, Godavari, Krishna, Mahi andSubarnarekha river basins under DWRIS scheme. The proposal in this regard has been prepared andsent to the Ministry forconsideration.

4.2.3 Strategic Basin Planning of Ganga River Basin

The World Bank has engaged M/s Deltares as consultant for conducting the study titled "Strategic Basin Planning for Ganga River Basin in India". The main objectives of the study are to:-

- Significantly strengthen the capability of relevant Central and State government agencies to undertake comprehensive evidence-based strategic basin planning for the Ganga River basin.
- Develop, document and disseminate a set of possible scenarios that balance significant improvement of health of the river maintaining an acceptable level of economic productivity.
- Build stronger and more accessible information and knowledge base to guide ongoing dialogue around and management of Ganga River Basin.
- Establish ongoing multi-stakeholder engagement processes in the basin to support strategic basin planning.

Keeping in view its commitment for adopting a scientific strategy for rejuvenation of river Ganga and to develop a strong evidence base to ensure that the resources are invested effectively and efficiently in the river basin, the Ministry of Water Resources, River Development and Ganga Rejuvenation is supporting the above study. The Central Water Commission is actively involved in the study. The study which was started in June 2015 has been completed and the report of the study was published in November 2018. The final version of the tool developed under this project is likely to be handed over to CWC through World Bank for further usage.

4.3 Water Accounting in India

Water Accounting is the systematic acquisition, analysis and communicationof information relating to stocks, flows and fluxes of water (from sources to sinks) innatural, disturbed or heavily engineered environments. (FAO, 2017).WaterAccounting serves as a tool to evaluate and plan Water Resources

Management, tomonitor changes in Water Resources and to assess the impacts of futureinterventions. Water Accounting (WA) integrates hydrological processes with landuse, managed water flows and the services that result from water consumption inriver basins.

Water accounting (now WA+) has been developed originally by Dr. DavidMolden from the International Water Management Institute (IWMI) and has beenmodified and upgraded with inputs from the Delft University of Technology. Basedon global hydrological models and public domain remote sensing data sets, WaterAccounting Plus (WA+) is a comprehensive depletion accounting framework thatprovides consistent and coherent information on water resources and the serviceswater provides, such as irrigation for agriculture etc. in a river basin or a country. Wateraccounting can help tin creating a common language to interpret and communicatewater resources data for creating measures of performance such as productivity,efficiency and equity. Evidence provided by water accounting can help to manageexcessive and conflicting water demands and negotiate trade-offs especially in adeficit year.

In order to develop capacity in the country for undertaking studies for water accounting, 6 officers from CWC, 2 officers from NRSC, 2 officers from CGWB and 2officers from NIH, Roorkee were imparted training in Water Accounting+. Wateraccounting study of Cauvery River Basin has been completed and a stakeholderworkshop has been conducted at NWA, Pune on 04.09.2018. Further, aCoordination Committee has beenconstituted under the Chairmanship of Member (WP&P), CWC to look after the work of monitoring and coordination of WaterAccounting studies. Presently the WA+ studies of Tapi basin has been taken up by the CWC and is under progress

4.4Extended Hydrological Prediction

Extended Hydrological Prediction (EHP) is the prediction of hydrologicalvariables, most commonly the monthly/seasonal stream flow or in simple term it isthe prediction of water availability in a catchment at the time scale of days to weeksto seasons to come. The skillful and reliable forecasts of stream-flows are highlyvaluable for providing water allocation, managing drought and planning and managingwater use.

Under the National Hydrology Project, it is proposed to undertake study through consultancy with objective to develop tools for Extended Hydrological Prediction (EHP)in the selected basins. The Expression of Interest for Extended Hydrology Prediction (Multi-Week Forecast up to 4 week) in three River Basins of India namely Narmada, Yamuna and Cauvery has been invited. Out of 11 bids received, 6 bidders were selected on the basis of selection criteria given in EoI.

4.5National Water Policy and Related Issues

National Water Policy is prepared to take cognizance of the existing situation, to propose a framework for creation of a system of laws and institutions and for a plan of action with a unified national perspective.The National Water Policy was first adopted in the year 1987. It states that the policy may be reviewed and revised periodically as and when need arises. The National Water Policy was subsequently revised in 2002 and 2012. The "National Water Policy – 2012" was adopted by the National Water Resources Council in its 6th meeting held in December 2012.

4.5.1 National Water Resources Council

National Water Resources Council (NWRC) was set up in March 1983 as a national apex body with the Hon'ble Prime Minister as Chairman. The Union Minister of Water Resources is the Vice-Chairman, and Minister of State for Water Resources, concerned Union Ministers/ Ministers of State, Chief Ministers of all States & Lieutenant Governors/ Administrators of the Union Territories are Members of the council. Secretary, Ministry of Water Resources is the Secretary of the Council. The constitution of the NWRC is given in Figure 4.1. One of the important functions of the Council was to lay down the National Water Policy and to review it from time to time. The Council has held six meetings so far. The 6th meeting of the National Water Resources Council was held on 28th December, 2012.

4.5.2 National Water Board

To review the progress achieved in the implementation of the National Water Policy and to report the progress to the National Water Resources Council from time to time, the Government of India constituted a National Water Board in September 1990 under the Chairmanship of Secretary (WR). The constitution of the Board is given in the Figure 4.2. The Board has held fourteen regular and two special meetings so far. The fourteenth meeting was held on 7th June, 2012 at New Delhi.

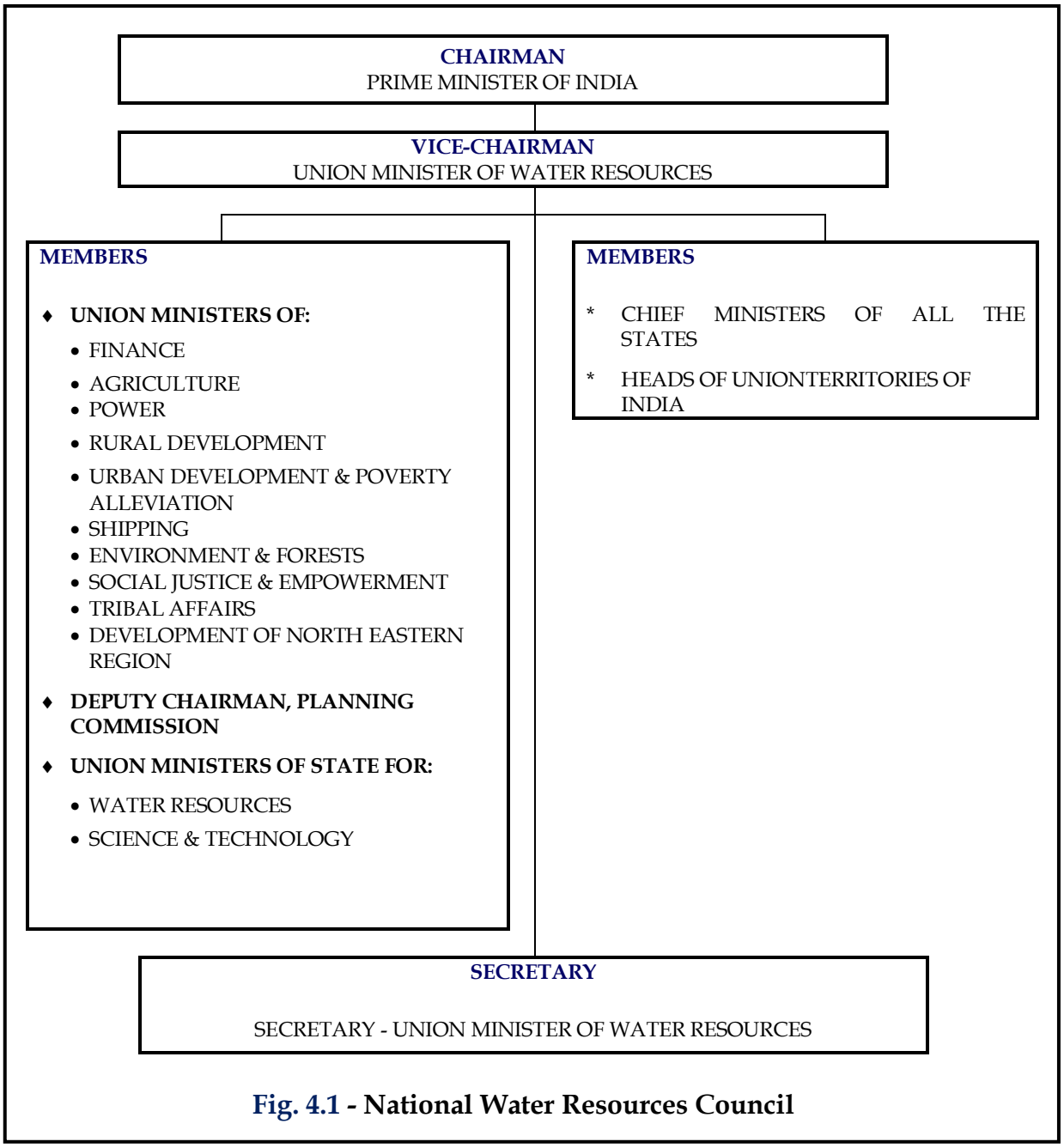

Fig. 4.1 - National Water Resources Council

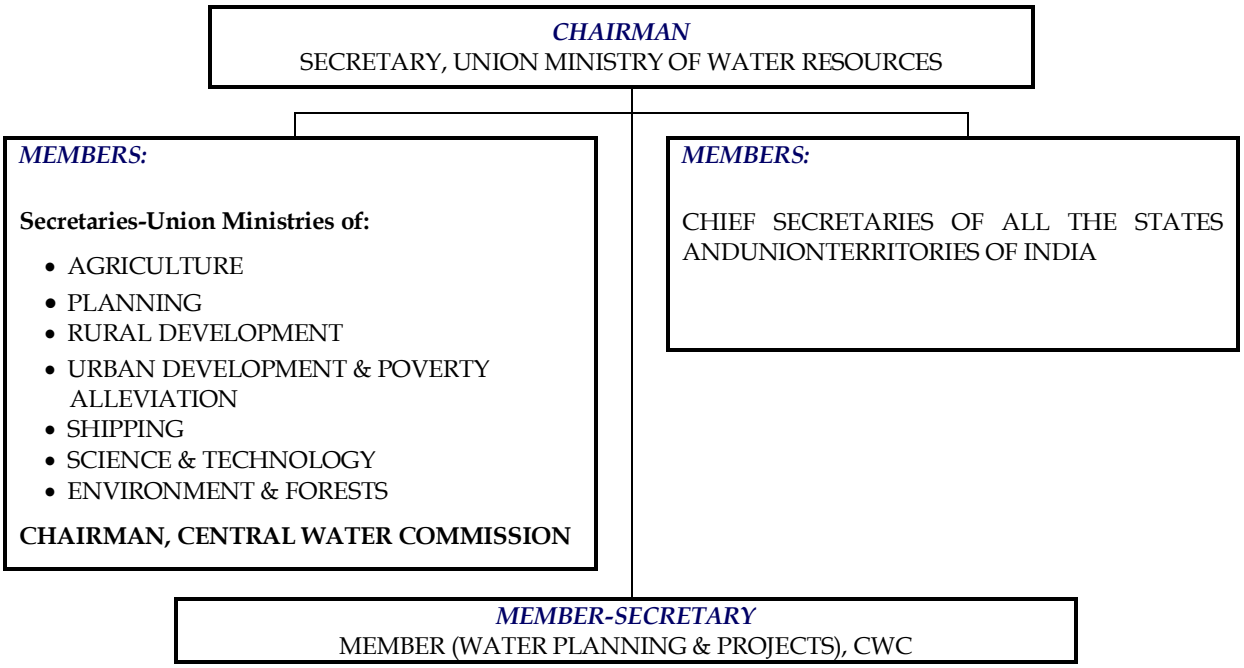

Fig. 4.2- National Water Board

4.5.3 Implementation of National Water Policy

After the adoption of "National Water Policy – 2012" in December 2012, a Committee was constituted by the MoWR for suggesting roadmap for implementation of National Water Policy - 2012 under the Chairmanship of Dr. S.R. Hashim, Former Chairman, UPSC & Former Member, Planning Commission. The Committee has submitted its report in September, 2013.CWC has been closely associated with the process of preparation of the roadmap for implementation of the policy.

Further, the Ministry of Water Resources, River Development and Ganga Rejuvenation has been impressing upon the States / Union Territories (UTs) to formulate their State Water Policies in line with the National Water Policy, 2012 and has been pursuing the same with the States/UTs. CWC is also pursuing with the States which have not formulated their water policies in accordance with National Water Policy, 2012 to either formulate policies or revise their existing policies as the case may be.

4.6 National Water Framework Bill 2016

The National Water Policy (2012) emphasizes the need to evolve a National Water Framework Law as an umbrella statement of general principles governing the

exercise of legislative/executive powers by the Centre, the States and the local governing bodies. Subsequently in July 2012, the Ministry had constituted a Committee under the Chairmanship of Dr. Y. K. Alagh to draft National Water Framework Law. The Committee submitted its Report in May, 2013. The report submitted by Dr. Y. K. Alagh Committee was circulated to the States/ UTs for comments and were also placed before the Forum of Water Resources / Irrigation Ministers of States for wider consultations in its meeting held on 29.05.2013

Later in December 2015, MoWR,RD&GR constituted a Committee under the Chairmanship of Dr.Mihir Shah to examine the provisions of the draft National Water Framework Bill and suggest changes/ modifications therein taking into account inter-alia the emerging challenges in the water sector, reuse of waste water after treatment, the likely impact of climate change on water resources, importance of river restoration/rejuvenation, water contamination issues etc. The Committee submitted its Final Report to the Ministry in July, 2016.

In March 2017, the Ministry of Water Resources River Development & Ganga Rejuvenation has requested all States/UTs to pass suitable resolutions in their State Assemblies in support of the draft National Water Framework Bill, 2016.

4.7 River Basin Management Bill

The National Water Policy, 2012, inter-alia, recommends that there is a need for a comprehensive legislation for optimum development of inter-State rivers and river valleys to facilitate inter-State coordination ensuring scientific planning of land and water resources taking basin/sub-basin as unit with unified perspectives of water in all its forms (including precipitation, soil moisture, ground and surface water) and ensuring holistic and balanced development of both the catchment and the command areas. Such legislation needs, inter alia, to deal with and enable establishment of basin authorities, comprising the States concerned, with appropriate powers to plan, manage and regulate utilization of water resource in the basins. In pursuance, the MoWR, RD & GR had constituted a Committee under the Chairmanship of Justice (Retd.) T.S. Doabia to study the activities that are required for optimum development of river basin and changes required in the existing River Board Act, 1956 for achievement of the same. The Committee submitted its Report in November, 2012 to the Ministry which includes a draft River Basin Management Bill, 2012. The same was circulated among all States, Union Territories and related Union Ministries by the Ministry. The Draft River Basin Management Bill, 2012 proposes establishment of separate River Basin Authorities for regulation and development of waters for twelve major inter-State river basins in the country. It proposes principles of participation, cooperation, equitable and sustainable management, conjunctive use, integrated management, public trust doctrine and demand management for governing river basin development, management and regulation.

Subsequently, a Committee under the Chairmanship of Dr.Mihir Shah was constituted by the Ministry to examine the provisions of the draft River Basin Management Bill, 2012 and suggest changes/ modifications therein taking into account inter-alia the emerging challenges in the water sector, reuse of waste water after treatment, the likely impact of climate change on water resources, importance of river restoration/rejuvenation, water contamination issues etc.

Later, MoWR,RD&GR has constituted an Expert Group in the Ministry to further review and finalize the bill. Director (NWP), CWC is representing CWC in the group.

4.8 Interaction with NWDA on Inter–Basin Transfer of Water

The National Water Development Agency is engaged in carrying out water balance studies, field surveys, investigations and preparation of pre-feasibility reports /feasibility reports /DPRs of links under National Perspective Plan as well as Intra-State links proposed by the States. Chairman, Member (WP&P) and Member (D&R), CWC are members of NWDA Society and Governing Body of NWDA. So far 66 meetings of the Governing Body have been held.The 66th meeting of the Governing Body was held on 27th February, 2019

The water balance study reports prepared by NWDA are also being examined in specialized Directorates of CWC. During the year 2018-19, four(4) Water Balance Reports were examined by CWC and comments were sent to NWDA.

4.9 Climate Change Issues and National Water Mission

Realizing the importance of climate change and to address the related issues, National Action Plan on Climate Change (NAPCC) has been prepared by the Government of India. The Action Plan has laid down principles and identified the approach to be adopted to meet the challenges of impact of climate change through eight Missions in climate sensitive sectors. National Water Mission (NWM) is one of them, for which Ministry of Water Resources (MoWR), Government of India is the Nodal Ministry.

The "National Water Mission" has been formulated by Ministry of Water Resources 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 document was approved by Hon'ble Prime Minister's Council on 30th August 2010 and by the Union Cabinet on 6th April 2011.

The Mission, duly approved by the Government, has set five goals to achieve the above objective, which are:

- Comprehensive water data base in public domain and assessment of the impact of climate change on water resource
- Promotion of citizen and state actions for water conservation, augmentation and preservation
- Focused attention on vulnerable areas including over-exploited areas
- Increasing water use efficiency by 20%
- Promotion of basin level integrated water resources management

Mission Secretariat for operationalizing the National Water Mission for coordinated actions for addressing the impact of climate change on water resources has been established by Ministry of Water Resources. Climate Change Cell has also been set up in Central Water Commission in August 2007 for taking stock of the current development in respect of climate change studies and other related issues. The Morphology and Climate Change Directorate CWC is supporting NWM for coordinating various activities being implemented by CWC as well as in examining the research proposals related to climate change received in NWM Secretariat.

CWC has prepared an "Inventory of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins" through National Remote Sensing Centre, Hyderabad (NRSC) in 2009. From 2011 onwards, CWC is monitoring the Glacial Lake and Water Bodies (GL/WBs) of spatial extent more than 50 Ha on monthly basis during monsoon season (June to October). The report of such monitoring are circulated to all concerned for appropriate actions.

As per the Monitoring Report of October, 2018, 320 GL/WBs for which cloud free data was available, were monitored. Amongst these, 25 GL/WBs have shown decrease, 192 have shown increase and 103 have not shown any significant change (+/-5%) in spatial extent. 6 out of 25 have shown decrease in spatial extent by more than 20% and 83 out of 192 have shown an increase in spatial extent by more than 20%. The Monitoring Report is available on CWC website (http://http://cwc.gov.in/sites/default/files/monitoring-glacial-lake-water-bodie-himalayan-region-annual-report-2018.pdf).

Another work of "Snowmelt runoff forecasting in Himalayan River Basin" has been taken up by CWC and the model development part has been entrusted to NRSC, Hyderabad by CWC. The model has since been developed and installed in CWC at Shimla.Now, NRSC is developing a modified version of the above model for more accurate results.

MoWR,RD&GR has established six Chairs in Academic institutes, namely, 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". A Management Committee under the chairmanship of Additional Secretary and Mission Director, National Water Mission reviews the progress and co-ordinates activities/functioning of Chairs.

4.10 Joint Operation Committee of Rihand Reservoir

Ministry of Water Resources set up a Joint Operation Committee (JOC) for Rihand Reservoir vide their O.M. No. 54/7/92-BM/1172 dated 30.10.1992. The Committee consists of members from Uttar Pradesh JalVidyut Nigam Limited (UPJVNL), Uttar Pradesh Power Corporation Limited (UPPCL), WRD-Bihar, and CEA. Member (WP&P), CWC, New Delhi is the Chairman of the Committee. So far 31 meetings of JOC have taken place. The last meeting (31st meeting) was held in New Delhi on 1st November. 2018 in which the actual releases made from Rihand reservoir during 2017-18 were discussed and the operation plan for 2018-19 was finalized.It was also decided that UPJVNL should co-ordinate with State Load Dispatch Centre (SLDC) in commensuration with the irrigation demand of Bihar and SLDC should also act accordingly.

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Shri Rajiv Pratap Rudy, Chairperson, Parliamentary Standing Committee on Water Resources along with other Members of PSC and officers of Central Water Commission during Aug, 2018 at Kalimpong, West Bengal

From L to R .. Sh. Y.K. Sharma, Member(RM), CWC, Sh. S. Masood Husain, Chairman, CWC, Sh. U.P.Singh, Secretary(WR,RD&GR), Sh. N.K.Mathur, Member(D&R),CWC, Sh. S.K. Haldar, Member(WP&P), CWC

Visit of newly recruited CWES officers to Saguna Baug to see Saguna Rice Technique

Sh. Y. K. Sharma, Member (RM), CWC with participants of training programme on "Satellite Data Analysis using Google Earth Engine" at CWC,HQ, New Delhi under Google CWC collaboration on 5.12.18

CHAPTER-V

DESIGN AND CONSULTANCY

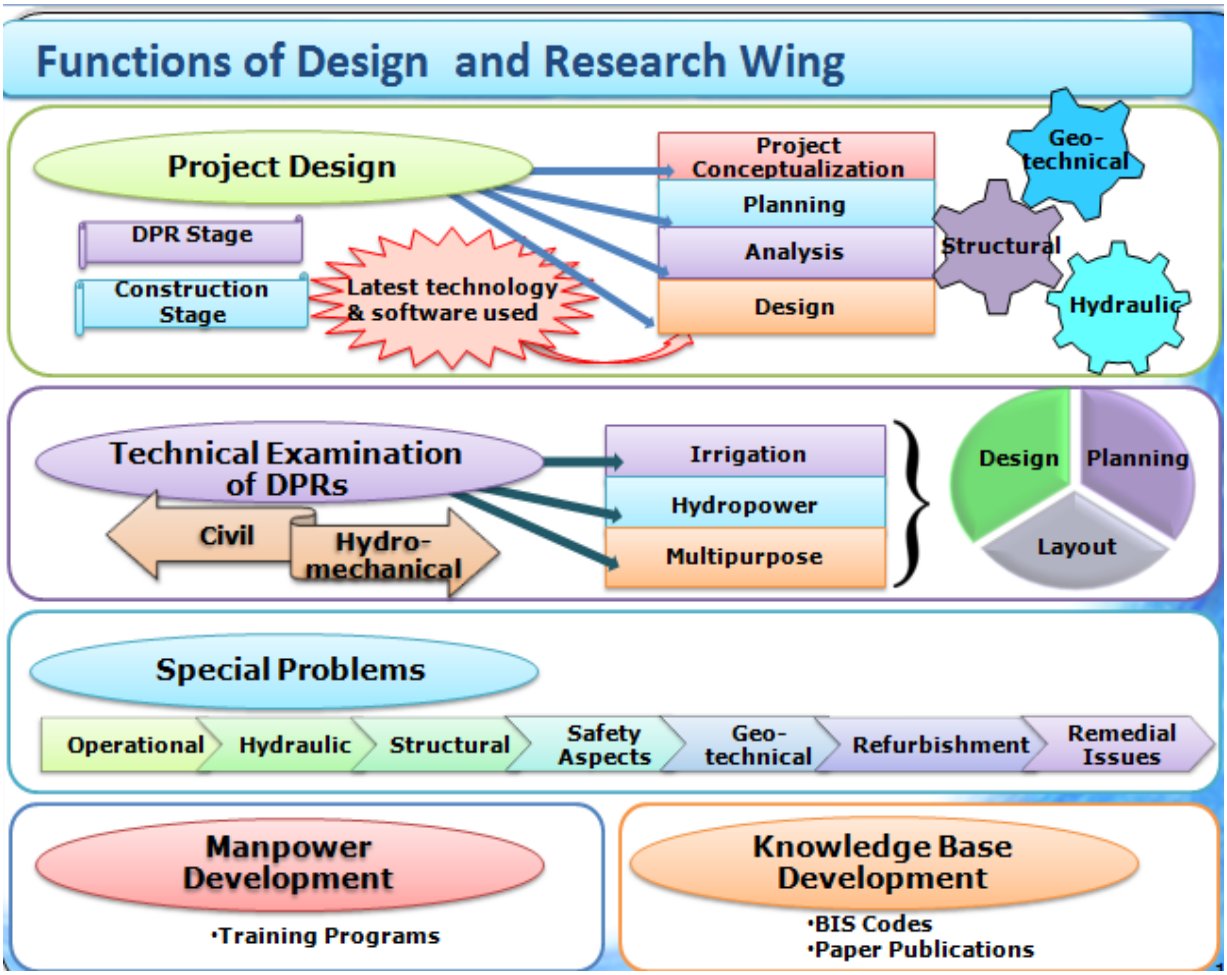
5.1 General

Design and Research Wing of Central Water Commission plays a pivotal role in the field of design and consultancy for water resources projects. Various units of the Wing are actively associated with design consultancy, technical studies and research & development activities in the water resources sector. In addition to above, technical appraisal of Pre-feasibility and Detailed Project Reports of water resources development projects (Irrigation/ Hydro-electric/ Multi-purpose) prepared by different agencies is also carried out in this Wing. Apart from Irrigation / Water Resources Department of States and UTs, the Ministries/agencies utilising the above services of CWC include Ministry of External Affairs(MEA), Central Electricity Authority (CEA), WAPCOS, UttarakhandJalVidyut Nigam Ltd. (UJVNL), Tehri Hydro Development Corporation (THDC), National Thermal Power Corporation (NTPC), National Water Development Agency (NWDA), SardarSarovar Narmada Nigam Ltd.(SSNNL), Narmada Valley Development Authority (NVDA), Farakka Barrage Project, etc. D&R Wing is using and promoting State-of-Art technology for planning and design of water resource projects at par with International Standards. The Wing has contributed significantly towards the development of water sector in the country.

Major activities of D&R Wing comprise of:

1. Planning and design of water resources and hydropower projects.
2. Hydrological studies.
3. Examination and vetting of manufacturers design of hydro mechanical components.
4. Review of safety aspects of existing dams and its monitoring.
5. Special analysis like Dam Break Modeling, foundation problems, rehabilitation of aged & distressed dams, etc.
6. Technical appraisal of Pre-feasibility/Detailed Project Reports of irrigation, hydropower and multipurpose river valley projects.
7. Coordination of research, development and capacity building activities.

8. Attending to distressed structures as applicable to design aspects and suggesting cost effective technical solutions to the agencies for resolution of problems during and post construction of projects..
9. Assisting MoWR,RD&GR in various design issues involved in international and trans-boundary projects, specially in implementation of treaties and water sharing agreements with neighbouring countries like Nepal, Bangladesh and Pakistan.



5.2Planning and Design of Water Resources Projects

5.2.1 Details of Design Organisations of CWC

CWC has four design units toundertake the works related to planning and design of water resources projects. These units are as under:

1. Design (North & West) Organisation
2. Design (East & North-East) Organisation
3. Design (North-West & South)Organisation
4. Design(South East& West) Unit

Three of the above organisations indicated at No. 1 to 3 above have specialised Directorates such as Hydel Civil Design (HCD), Concrete & Masonry Dam Design (CMDD), Embankment Design, Gates Design and Barrage & Canal Design (BCD). The fourth Organisation, which was earlier known as Narmada Basin Project Organization has specialised Directorates namely, Dam and Head Works (D&HW) Design Directorate, Power House and Canal (PH&C) Design Directorate & Hydro Mechanical Design (HMD) Directorate.

These units provide design and consultancy services during various stages of implementation of a water resources projects located in different regions of the country. The various stages of project implementation are (i) DPR preparation for project; (ii)construction of project; (iii) addressing specific problem during construction and operation of project; and (iv) undertaking rehabilitation measures of existing projects under distress. These units also undertakes appraisal of DPR of projects from design aspects. The works allocated to these units are as under:

(1) **Design(N&W) Organization:** The unit provide services to projects located in the States/UTs of J&K, Himachal Pradesh, Punjab, Haryana, Delhi, Rajasthan, Uttrakhand, Uttar Pradesh, Bihar and Jharkhand in the country. It also provides services to projects located in the two neighbouring countries namely, Nepal and Afghanistan.

(2) **Design(E&NE) Organization**: The unit provide services to projects located in the States/UTs of Sikkim, Assam, West Bengal, Meghalaya, Manipur, Mizoram, Nagaland, Tripura, Arunachal Pradesh, Odisha, Andaman & Nicobar Islands in the country. It also provides services to projects located in the neighbouring country namely, Bhutan.The design related support in respect of projects for which survey and investigation is carried out by CWC and Brahmaputra Board is also provided by the unit.

(3) **Design(NW&S) Organization**:The unit provide services to projects located in the States/UTs of Kerala, Andhra Pradesh, Tamil Nadu, Maharashtra, Madhya Pradesh,

Odisha, Chhattisgarh, Gujarat, Rajasthan, Goa, and Andaman and Nicobar Islands in the country.

(4) **Design(South East & West) Unit:** The unit provide services mainly to projects of SardarSarovar Narmada Nigam Ltd. (SSNNL), Government of Gujarat and Narmada Valley Development Authority (NVDA), Government of Madhya Pradesh. These projects include Garudeshwar Weir Project (Gujarat), Halon Irrigation Project (M.P.), Lower Goi Project (M.P.), Bargi Diversion Project (M.P) and Apra Barrage (Chhattisgarh). The design related support in respect of some projects for which survey and investigation is carried out by CWC is also provided by the unit. These projects include KalezKhola HE Project (Sikkim) and 20 Medium Irrigation Projects in Jharkhand.

5.2.2Design Consultancy carried out by Design Organisations

CWC has provided design consultancy services to 84projects during the year 2018-19. These include 76 Nos. of projects located in 20States and 8 Nos. of projects located in neighbouring countries like Bhutan(4), Indo-Nepal(3) and Nepal (1). The details are given below:

Sl. No.	Category	No. of Projects
1.	Projects at construction stage	**27**
2.	Projects at investigation and planning stage (for which detailed project reports are being prepared)	**40**
3.	Projects with special problems	**17**
	Total	**84**

The list of projects is given in Annexure 5.1.

Salient features / details of services provided to some of the important projects designed/ handled during the year are as follows:

A. Projects at construction stage

1) ArpaBhaisajhar Barrage Project (Arpariver), Chhatisgarh:

The Project envisages construction of a barrage across Arpa River for irrigation. Consultancy services for scrutiny of manufacturers Design&Drawings (5 Nos.)andDesign (24 Nos.)in respect of Stoplogs, Sluice Service Gates, Under-Sluice Service Gate has been approved.

ArpaBhaisajhar Barrage Project

2) Garudeshwar Weir Project (Gujarat):

Garudeshwar Weir,being constructed across Narmada river 12.10 KM downstream of SardarSarovar dam, has 389m long rockfill dam on left bank, 1137m long proposed concrete gravity type weir comprising a total of 38 blocks (29 OF blocks and 9 NOF blocks). The purpose of constructing the weir is to create reservoir pool on the

downstream of SardarSarovar dam for enhancing power generation capacity of SardarSarovar Power House using turbine in pumping mode during lean power demand and generation mode during peak demand.Consultancy services were provided for construction stage design and vetting of engineering drawings of various civil and hydro-mechanical components of Weir.

Works completed by CWC during the period 1st April 2018 to 31st March, 2019 are as under:

a. Construction drawings for intake structure of Garudeshwar Weir and its reinforcement have been issued and sent to SSNNL. In addition to this examination of steel liner and intake trash rack drawings were also done.

b. Construction drawings have been issued to the project authorities for overflow & non overflow section of the weir.

Garudeshwar Weir

3) Phina Sigh Medium Irrigation Project, Himachal Pradesh:

CWC is providing consultancy services for vetting of design / drawings of concrete gravity Dam. Project authorities submitted general layout and excavation drawings related to dam complex. Some tests reports are to be submitted by Project Authority.

4) Icha Dam under Subarnarekha M.P.P., Jharkhand

Icha dam is proposed across river Kharkai, a major tributary of Subarnarekha River, near village Icha, District West Singhbhum in Jharkhand state. The project envisages construction of 38.5 m high Dam with Gross storage of 1048 MCM. Consultancy work has been taken up by CWC on the request from State Government.

The preparation of drawings shall be taken up after the receipt of requisite data from Project Authority. No construction work has been started yet.

5) Kharkai Barrage under Subarnarekha M.P.P. Jharkhand:

Subarnarekha MPP envisages construction of two Dams (Chandil Dam &Icha Dam) and two Barrages (Galudih Barrage &Kharkai Barrage) apart from other appurtenant structures envisaged in the project. Design consultancy for Chandil Dam and Galudih Barrage was provided by CWC and construction of these components have since been completed. The project construction thereafter remained dormant for about twenty years and only recently work on remaining pending components has started. Design consultancy for these components namely Chandil Dam and Kharkai Barrage Project isbeing provided by CWC. Project envisages construction of 234 m long barrage across river Kharkai a major tributary of river Subarnarekha near Village Ganjia, Jharkhand.

The work is in active stage of construction. 53 Nos. of construction stage drawings have been issued so far which include 6 Nos. of revised drawings. The construction drawings of main Barrage including Head Regulator have been issued. The construction work of barrage is in full swing. Design & drawing work of Gantry parking platform is under progress.

Further, the Design & Drawing work related to Afflux Bunds of Kharkai Barrage\Project has been prepared and approved. The revised construction drawings for Afflux Bund components have been issued.

6) Halon Irrigation Project (M.P.):

The project envisages construction of an earthen dam of 751.68m long and 31.0 m height with central Spillway. The headwork is designed as a storage reservoir in the left bank

main canal taking off from the reservoir through a sluice located in a saddle between Karanjiya and Jamuntola villages. The 81.50 km long Irrigation canal on left Bank will irrigate an area of 11736 ha with an Irrigation intensity of 143%.Scrutiny of construction stage drawings of Hydro-mechanical components were carried out for the Project Authority.Design and Drawings of Stop-logs Gate, Gantry Crane, Lifting Beam, Service and Emergency Gates for Irrigation Sluice, Lifting Pin and Bracket for Radial Gate, Hydraulic Hoist support structure beam and Cardanicring have been vetted and conveyed to Project Authority.

7) Dolaithabi Barrage Project:

Dolaithabi Barrage Project is an irrigation project, which envisages construction of a barrageacross Irilriver at Dolaithabi in Senapati District of Manipur. The barrage consists of 6 bays of 10m clear span with piers of 2.5m thickness in between. The 6 bays are divided into 2 units of 3 bays each with a double pier at the centre. An intake is provided on left bank from which the main canal takes off which further bifurcate into Right Main Canal and Left Main Canal.

8) Lakhwar M.P.P. Uttarakhand :

Lakhwar Dam

The MoU for technical consultancy services for design and engineering of civil and mechanical works of Lakhwar Multipurpose Project (3x100 MW), Uttarakhand has been signed between CWC and UJVNL on 20/09/2013. Hydraulic design of Stability analysis of OF and NOF sections of Spillway and Stilling basin have been completed. Revised tender drawings have been cleared. Dam section (over flow) is under revision with deep seated spillway.

9) Anandapur Barrage Project::

The Anandapur Barrage is located at village Anandapur in District Keonjhar (Odisha) at Longitude $86^0$8'E and Latitude $21^0$13'N. The scheme envisages construction of a barrage, having total waterway of491.60m with 25nos. spillway bays and 8nos. under sluice bays, across river Baitarani. It also include Left & Right Head Regulators to divert 165.00cumecs water in Baitarani Left Bank Canal (BLBC) to irrigate 1200Ha CCA in Anandapur&Hatadihi Blocks of Keonjhar District and 10.00cumecs water in Baitarani Right Bank Canal (BRBC) to irrigate 5000Ha CCA in Ghasipura Block of Keonjhar District. The Left Bank Canal (Link Canal) carrying 165.00cumecs water outfalls in Salandi River at upstream of existing Bidyadharpur Barrage to provide water to the extended SalandiLeft Ayacut of 53,800 Ha in Balasore District.

10) Tehri Pumped Storage Plant (PSP) (1000 MW), Uttarakhand:

AnMoU between CWC & THDC for providing design consultancy services for the three projects i.e. Tehri PSP (1000MW), VishnugadPipalkotiHEP (444MW) and Dhukwan SHEP (24MW)as Overview Design Consultant was signed inJuly 2017.

Tehri PSP comprising of four reversible pump turbine units of 250 MW each, involves construction of an Underground Machine Hall on the left bank of river Bhagirathi. The Power-house consists of underground cavern of size 25.4m (w) X 57.3m (H) X 201m (L). There are 2 Nos. upstream surge shafts of approx. 21m diameter with approx. height of 145m. There are 2 nos. downstream surge shaft of approx. 18m diameter with approx. height of 101m. There are 2 nos. of Tail Race Tunnel (TRT-3 & TRT-4) with 9.0m diameter of length 1081m and 1176m each respectively. The main feature of the Project is the large variation of about 90m between the maximum and minimum head, under which the reversible units shall operate.The construction drawings are being vetted by CWC as and when the Project Authority requests to do so.

11) VishnugadPipalkoti HEP (4x111 MW),Uttarakhand:

The VishnugadPipalkoti Hydro Electric Project (VPHEP) is located on Alaknanda River, a major tributary of river Ganga, in District Chamoli in the State of Uttarakhand. The project envisages a run of river scheme with construction of a diversion dam of 65 m height across Alaknanda River for power generation harnessing a gross head of 237 m. The reservoir will have a gross storage capacity of 3.63 Million cum, out of which 2.47 Million cum shall be live storage. A diversion cum spill tunnel of 10 m dia. shall divert the discharge of 725 m^3/sec during the construction period.

The water conductor system comprises of 3 Nos. Intake Tunnels, 3 Nos. Underground Sedimentation Chambers (390m each), a Head Race Tunnel (13.4 Km), a Surge Shaft, 2 Nos. Pressure Shafts bifurcating into 4 Nos.Penstocks. The powerhouse comprises of two separate underground caverns for installation of turbines and transformers. The construction drawings are being vetted whenever the Project Authority requested to do so. So far, 3 Nos. of construction drawings in respect of Power House and Surge chamber have been vetted by CWC.

12) Kanhar Irrigation Project, Uttar Pradesh:

CWC is providing consultancy service for scrutiny of manufacturers design and drawings of Stop-log Gate, Spillway Radial Gate, Spillway River Sluice Service Gate and Emergency Gate for the projects. In this regard, 14 Nos. design and 64 Nos. drawings of Stop-logs Gate, Spillway Radial Gates, Spillway River Sluice Gate& Emergency Gate, Pre-stressed concrete anchorages for Spillway Radial Gate were scrutinised by CWC.

13) ArjunSahayakPariyojana, Uttar Pradesh

This project envisages diversion of surplus water available at Lahchura Dam through feeder canal to Arjun Dam and then from Arjun Dam to Kabrai Dam and Chandrawal Dam, to augment inflows into three reservoirs Arjun, Kabrai and Chandrawal.

Under the project, construction drawings pertaining to Right Training Wall and eight other revised drawings were issued by CWC in 2015. Preparation of construction drawings in respect of Spillway Pier, Bridge, Plan & L- section for new dam alignment

on right side, etc. are in progress. Design and drawing work related to right side extension of Kabrai dam along revised alignment is also under progress.

14) Punatsangchhu-I H.E. Project, Bhutan:

Punatsangchhu-I H.E. Project withintercepting total catchment area of 6390 sq. km. envisages construction of a concrete gravity type dam, 130m high above the deepest foundation and 240.0 m long at the top. The overall length of the spillway section of the dam is 120.0 m comprising of seven nos. of sluice spillway bays, each of 8 m width with crest elevation at El.1166.0 m to pass simultaneously Probable Maximum Flood of 11500 cumec + GLOF of 4300 cumec. The length of the concrete non-overflow section on both sides of dam would be about 120.0 m. The dam would provide a gross pondage of 24.92 MCM and live pondage of 12.38 MCM between MDDL 1195m and FRL 1202m to enable the power station envisaged under the project, to cater to dilurnal variations in power requirements. The project has an installed capacity of 1200 MW and construction of the project is underway.

15) Punatsangchhu-II H.E. Project, Bhutan:

The Punatsangchhu-II H.E. Project envisages construction of 86m high concrete gravity dam with an installed capacity of 1020 MW. The dam is located 29Km downstream of the Wangdue Bridge and 3 km downstream of TRT outfall of PHEP-I on WangdueTshirang National Highway. The dam comprises of seven sluice blocks and five non-overflow blocks. The length of the dam is 213.00m. The top of dam is at El.846.00m with FRL at El. 843.00m and MDDL at El.825.00m. Seven sluices of gate size 8m (W) x 13.2m (H) have been provided at EL.797.00m for discharging simultaneously PMF 11723 cumec and GLOF of 4300 cumec. The project has a catchment area of 6835 Sq. Km. The gross storage capacity of the reservoir formed by dam construction is 7.0 MCM and the live storage capacity is 4.64 MCM.

Punatsangchu I & II is an Indo-Bhutan joint venture H.E. Project. In these projects CWC is providing Design Consultancy in civil & hydro mechanical aspects to WAPCOS. CWC Officials visited Punatsangchu-I (6x200 MW) & Punatsangchu-II (6X170 MW) Hydroelectric Project, Bhutan during 6th to 10th June 2018

Punatsangchhu-II H.E. Project, Bhutan

16) Arun-3 HEP (4 x 225 MW), Nepal:

The MoU between CWC & SJVNL for providing design consultancy services for 900 MW Arun-3 HEP in Nepal as Retainer Consultant was signed on 10th Aug 2017.

Arun-3 HEP (4 x 225 MW) is a run-of-the-river project located on Arun River, a tributary of Koshi, in the District of Sankhuwasabha (Eastern Nepal) with a catchment area of 26747 Sq.Km. The project will use 344.68 cumecs of Design Discharge and will generate about 3924.03 GWh energy per annum at 90% dependable year. The project comprises of 70 m high diversion dam, intake structure with four bell mouth opening leading to four no. of intake tunnels of 6m diameter, restricted orifice type Surge Shaft of 24m diameter, two vertical steel lined underground pressure shafts each of 5.5m dia. with bifurcation into four Penstock of diameter 3.2m to feed the four 225 MW capacity Francis Turbines placed in underground Power House of size 179.49m (L) x 22.5m (W) x 49.5m (H). Water after generation has been proposed to be discharged into the river through 10m modified horse-shoe shaped concrete lined TRT tunnel.

Expert team visit to Arun-3 HEP site location

Transient analysis of water conductor system of Arun-3 HEP has been carried out in CWC and the comments/observations on the same were communicated to SJVNL. The proposal for the removal of Desilting Chamber submitted by SJVNL has been studied in detail and acceptedsubject to certain changes in spillway configuration. The River Diversion Arrangement drawings has been examined with respect to hydraulic criteria and cleared by CWC.Design of the TRT Exit Portal Structure is under progress.Right Bank Excavation drawings are also under examination in CWC.

17) Bargi Diversion Project (MP):

Bargi Diversion Project (MP) is one of the 99 prioritized schemes and is lagging behind the completion target due to slow progress of tunnel portion of the Carrier Canal.Project Authority engaged Robbins TBM to complete the tunnelling in April 2017. Subsequently another TBM of H K was deployed in June 2016 to accelerate the progress of tunnel work. However out of 11953m only 4114m tunnel length could be completed. Government of Madhya Pradesh requested to constitute a Committee to improve the progress of tunnel work.

18) Ganol H.E. Project, Meghalaya:

Ganol H.E. Project, Meghalaya is proposed to be located about 1.5 km downstream of the confluence of Rangram and Ganol rivers near Chilbragiri village in the West Garo Hills District of Meghalaya. This project envisages construction of 35m high Concrete Dam, 2.075 km long HRT, 642m long Penstocks and a Power House upstream of Phagugiri Village to utilize a gross head of about 160m for generation of 22.5 MW of Power.

19) Dhukwan Small HE Project (24MW) (U.P.):

On request received from THDC(I) Ltd., CWC has conveyed in principle acceptance to provide consultancy for Dhukwan Small HE Project (24MW) (U.P.) in April 2017. Accordingly, theprocess for entering into MoUfor the same is in progress.

Dhukwan Small HE Project construction stage

20) Polavaram Irrigation Project, Andhra Pradesh:

The Polavaram Irrigation Project is a multipurpose project on Godavari River near Ramayyapeta, Polavaram in West Godavari District, Andhra Pradesh. The project is located 42 Km upstream of Sir Arthur Cotton Barrage on Godavari River. Water from the project is proposed to meet the demands of irrigation, drinking water and power generation. The project is envisaging irrigation benefits to 4.0 lakh acres in East Godavari, Visakhapatnam districts under Left Main Canal and to 3.2 lakh acres in West Godavari, Krishna districts under Right Main Canal.

In addition to irrigation benefits, generation of Hydropower with installed capacity of 960 MW, water supply for industries in Visakhapatnam and drinking water supply to villages & towns are also envisaged under the project. Further, it is also proposed to release 15 TMC of stored water to downstream existing Sir Arthur Cotton Barrage in lean period and 80 TMC of stored water to be diverted to Krishna River through Right Main Canal.

Downstream view of spillway of Polavaram Irrigation Project, Andhra Pradesh

The project components include:

i) Earth dam in Gap I on left bank of river.
ii) Earth cum rock fill dam in Gap II located in main flow channel of Godavari River.
iii) Earth dam in Gap III located on right bank.
iv) Spillway located on right bank along with connecting approach channel and spill channel.

The Ogee Type Concrete Spillway has been proposed on the right bank for PMF of 50 lakh cusecs with FRL of the reservoir at EL. 45.72 m. The concrete dam comprises of 49 nos. of overflow (OF) blocks (including 10 nos. of river sluice blocks), 2 nos. of non overflow (NOF) blocks and 2 nos. of key blocks. Spillway with crest level at EL. 25.72m has 48 Nos. of Radial Gates of sizes 16m(W) x 20m(H) with hydraulic hoist arrangement for lifting. There is provision of 10 nos. of river sluices of sizes 2.1m(W) X 3m(H) in the OF blocks for releasing 15 TMC of water to the downstream.

Central Water Commission has been entrusted with the works of vetting of the designs & drawings of the Polavaram Irrigation Project submitted by the Project Authority. A Dam Design Review Panel (DDRP) has also been constituted for providing suggestions on the technical issues relating to the progress of the project.

B. Projects at DPR Stage

1) Par-Tapi-Narmada Link Project, Gujarat / Maharashtra

The project is located in the State of Gujarat & Maharashtra. The proposed Par-Tapi-Narmada link envisages transfer of surplus water from west flowing rivers between Par and Tapi to water deficit areas in the North Gujarat. There are 7 dams with total catchment area of 2573 sq. Km, 3 weirs, 6 powerhouses andabout 400 Km long conveyance system including two tunnels of total length of about 5.5 Km.

CWC is involved in the preparation of design chapter and drawings for the hydel civil designs aspects of 6 power houses and two tunnel. In this regard, 59 Nos. drawings of 6 power house and one tunnel along with Design Chapter have been completed and providedto NWDA.

2) KalezKhola HE Project (Sikkim):

KalezKhola Hydroelectric Project, a run off the river scheme is located on the KalejKhola, a major tributary of the Rangit River. It will engross the construction of a 41 m high dam onKalejKhola, around 6 Km long and 3.8 m diameter Head Race Tunnel(HRT),an underground with open top Surge Shaft and a surface Powerhouse on right bank of Rangit River to generate about 52 MW(2X26MW).

The proposed surface Powerhouse site lies about 2 Km upstream of Rishi village and about 750 m upstream of Tatopani hot spring at West Sikkim. DPR Stage design and drawings along with Design Chapter for inclusion in the DPR has been prepared after by CWC.

3) Saptakosi&Sunkosi Multipurpose Project, Indo-Nepal

The SaptaKosi High Dam Multipurpose Project, as per the preliminary studies carried out, envisages construction of a 269 m high dam to divert river waters through a dam toe power house with an installed capacity of 3000 MW (at 50% load factor) and irrigation of 15.22 lakh ha. Gross command area through construction of a barrage 1 km downstream of the dam. Field investigation studies and preparation of DPR for SaptaKosi High Dam Multipurpose project & Sun Kosi Storage cum Diversion Scheme has been taken up jointly by Govt. of India (CWC) and HMG Nepal through aJoint

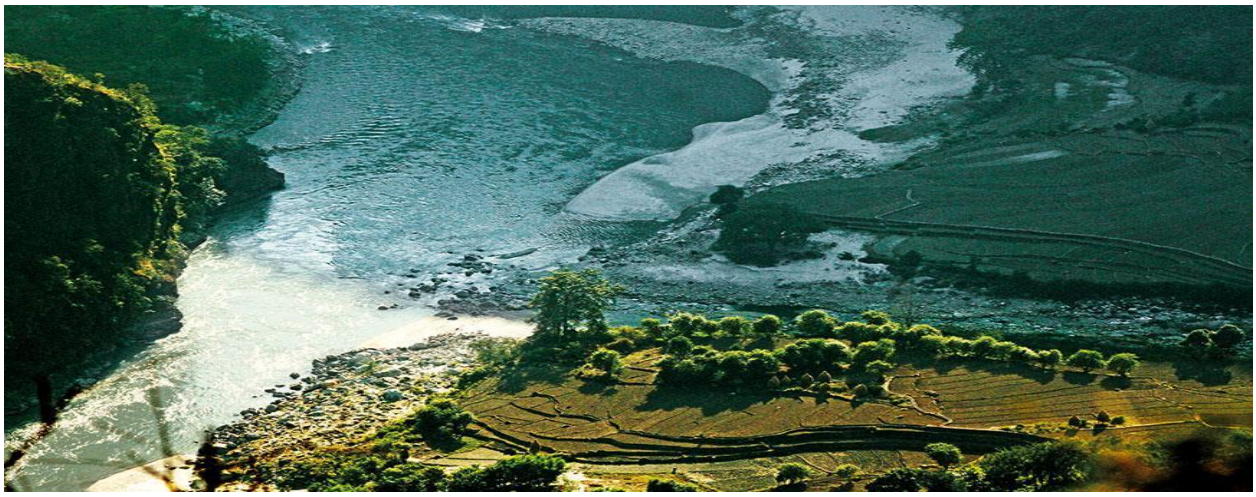
Project Office (JPO) set up in Nepal. DPR stage design and drawings for the project are to beprepared by Central Water Commission.In this regard, the investigations to be carried out have been identified and intimated to the JPO. The same are under progress. Design and drawings works would be prepared after receipt of the data from JPO.

4) Pancheshwar Multipurpose Project (Indo-Nepal):

AnMoU has been signed between CWC and WAPCOS(I) Ltd for providing design consultancy services for preparation/updation of Detailed Project Report (DPR)for PancheshwarMultipurpose Project (PMP) and Rupaligad H.E. Project. In this regard, CWC has issued total 11Nos. of drawings (6 original + 5 Revision)related to Pancheshwar Main RockfillDam, U/S Coffer Dam and D/S Coffer Dam to WAPCOS for inclusion in the updated DPR. The Final Draft DPR received from WAPCOS Ltd. has been technically examined and views of CWC have been communicated to WAPCOS Ltd. The observations of the Government of India were accordingly finalised after consultation among MoWR.RD&GR, CWC and WAPCOS and communicated to Pancheswar Development Authority (PDA).

Subsequently,on the basis of observations received from both the Govt. of India and the Govt. of Nepal, thePDA identified issues required to be resolved for finalisation of mutually acceptable DPR for the project. A Team of Experts (TOE) was subsequently constituted for resolving outstanding issues regarding the DPR. Officials from CWC have been included in the Team of Experts. Two meetings of the Team were held during 21-23 Aug, 2017 in Nepal and during 5-6, Sep, 2017 at Delhi during which almost all technical comments were resolved.

In view of the decision taken during the 6th Governing Body meeting of Pancheshwar Development Authority held in April 2018, Team of Experts/Officals including have visited the project site during 28-30 Nov2018.



PancheshwarProject Dam site

C. Special Problems Projects

1) Bargi Diversion Project (MP)

A Committee has been constituted under the Chairmanship of Chief Engineer, Design (N&W)for Sleemabad Tunnel of Bargi Diversion Project (MP) to suggest measures to sort out hindrances and to improve progress of tunnel work by TBM. The project authority has been requested to submit the details of technical data & geological investigation for examination by the Committee.

2) Sikasar Project, Chhattisgarh

Proposal from Project Authority for construction of 18 m Ogee fall at RD.345 m of spill channel due to subsequent erosion at site has been received and is under consideration.

3) MahanandaBarrage Project

Mahananda Barrage is situated on Mahananda River, a tributary of River Ganga., in the District of Darjeeling (W.B). It is a part of Teesta Multipurpose Irrigation Project, namely,Teesta Barrage Project being implemented by Government of West Bengal and is designed to irrigate 3.42 Lakh Hectare of command area in the 6 districts of northern part of West Bengal. Besides irrigation, hydropower generations through canal fall hydel projects are also the envisaged benefits. Considering its immense importance, the project has been receiving Central Grant under National Project since 2010. It is

observed that sever retrogression in the downstream of barrage resulted in dislodging of d/s protection works and exposure of sheet pile.

MahanandaBarrage Project, West Bengal

4) DaukBarrage Project:

Dauk Barrage is one of the three barrages constructed under Teesta Multipurpose Irrigation Project. It is situated on Dauk River, a tributary of River Mahananda, situated at Baurigach in P.S.-Chopra, Dist.-Uttar Dinajpur. Its geographical coordinates is Lat:26°24'6.31"N and Long:88°22'33.94"E. In the upstream of DaukBarrage at about 600m, Mahananda Main Canal (MMC) joins with Dauk River and thereafter flows as a single channel uptoDaukBarrage. It is observed that sever retrogression in the downstream of barrage resulted in dislodging of d/s protection works and exposure of sheet pile.

5) Indira Sagar Project, Madhya Pradesh

CWC is providing design consultancy for the rehabilitation of slotted roller bucket. Accordingly, the damaged slotted roller bucket type of Energy Dissipation Arrangement was re-designed by CWC with Ski-jump bucket. In this regard, one

drawing indicating the Ski-jump reinforcementswere issued to Project Authority. Rehabilitation of damaged slotted roller bucket is under progress based on drawings issued by CWC. The officials of CWC also visited CWPRS Pune to observe 3-D physical model of the spillway and Energy Dissipation Arrangement to assess its performance.

Indira Sagar Project

6) Temghar Project, Maharashtra

Temghar Project, Maharashtra

Leakages in the TemgharDam werenoticed from the time of its construction. It was observed that the discharge of leakage increases as the reservoir storage level increases.

Accordingly, an Expert Committee has been appointed to study the causes of leakage in the dam and to suggest the leakage control measures by grouting from upstream and downstream face, grouting from top and inspection gallery. CWC is providing its expert technical assistance.

7) Kanupur Irrigation Project, Odisha

Gravel Layers below the constructed earth dam has been noticed. CWC expert opinion for the solution of the problem has been sought. Report on foundation treatment of existing pebble layers in Kanpur Irrigation Project has been sent to Project Authority.

8) Subarnarekha Irrigation Project, Odisha

Design and preparation of Drawings of Slope Protection work including Lining of Subarnarekha Main Canal Odisha from RD 7950m to 8840m (890m) under Subarnarekha Irrigation Project, Odisha.The proposal is under study.

9) Rehabilitation of Garada Dam, Rajasthan

The Garada Dam, an earth fill dam was completed in March 2010 and subsequently breached on 15.08.2010 during initial filling of the reservoir. State Government of Rajasthan requested to suggest rehabilitation/restorations measures in respect of Garada Earth Embankment Dam, Bundi (Rajasthan). CWC has provided drawings for rehabilitation of the Dam and the work is going on. CWC has also carried out the stability analysis of Gararda Earth Dam (Raj) in respect of existing section and new proposed section.

10) Farakka Barrage Project, West Bengal

The FarakkaBarrage on river Ganga was completed in the year 1975. Due to international importance of the project in sharing of waters between India and Bangladesh through Indo-Bangladesh treaty, the upkeep and maintenance of various components is being done by the Farakka Barrage Project Authorities under MOWR. A Technical Advisory Committee (TAC-FBP) under the chairmanship of Member (D&R), CWC takes decisions about the various works to be taken up for safety and efficient working of the project. The TAC-FBP held it 114thmeeting during 3rd-04thDecember, 2018 at Farakka. A Gate Regulation Committee and the Canal Study Group is also

formed to advice regarding the operation of the gates, regulate various flood discharges and suggest solutions to various problems arising in the feeder canal. Since the project was designed by CWC, various technical problems and special studies are referred to it.

Farakka Barrage Project,West Bengal

5.2.3 Technical Examination of Project

The technical appraisal of DPR/PFR of irrigation and multipurpose projects in respect of hydropower component, gravity dam component, embankments, hydro-mechanical structures such as gates, hoists etc., barrages and different components of canal are carried out in the design organization of D&R Wing. The comments/clearances in respect of the projects are communicated to concerned appraisal unit of CWC. Further, the civil components in DPR of Hydro-Electric Projects are also technically examined in D&R Wing and comments/clearances in respect of the projects are communicated to CEA.

During 2018-19, DPRs of 80Nos. projects submitted by the various project authorities were technically examined in CWC. Out of these,73Nos. DPRs of projects were received from 22 Nos. States and 7 Nos. projects were received from Afghanistan (2), Bhutan (1), Nepal (1) and Indo-Nepal (3). During the year, 19Nos. DPRs of projects have been cleared by CWC. DPRs of other projects (61 Nos.) are under various stages of examinations/ consultation with project authorities for improvement to make it technically sound & bankable. The details are given below:

	In India	In Foreign Country	Total
Hydro-Electric Projects			
Total Nos. of projects	32	1	33
Nos. of projects cleared	6	-	6
Nos. of projects in which comment issued	23	1	24
Projects under examination	3	-	3
Irrigation Projects			
Total Nos. of projects		4	39
Nos. of projects cleared			11
Nos. of projects in which comment issued			27
Projects under examination			1
Multi-Purpose Projects			
Total Nos. of projects			8
Nos. of projects cleared			2
Nos. of projects in which comment issued			5
Projects under examination			1

The list of projects is as under:

Sl. No.	Name of the State	Project's Name	Status
	Hydro-Electric Projects		
1	Arunachal Pradesh	Subansiri Upper H.E.Project	Comments issued
2	Arunachal Pradesh	MagochuH.E.Project	Comments issued
3	Arunachal Pradesh	PaukH.E.Project (145 MW)	Comments issued
4	Arunachal Pradesh	OjuH.E.Project (8x231.5+28 MW)	Comments issued
5	Arunachal Pradesh	HeoH.E.Project (240 MW)	**Cleared**
6	Bihar	DagmaraH.E.Project	Comments issued
7	Himachal Pradesh	Thana Plaun H.E. Project (191MW)	Comments issued
8	Himachal Pradesh	NakthanH.E.Project (460MW)	**1st stage cleared**

Sl. No.	Name of the State	Project's Name	Status
9	Himachal Pradesh	Sunni Dam H.E.Project, (355 MW)-PFR	Comments issued /**cleared**
10	Himachal Pradesh	ReoliDugliH.E.Project Stage – I (420MW)	Comments issued
11	Himachal Pradesh	Luhri Stage-II H.E.Project(168 MW)	Comments issued
12	Himachal Pradesh	MiyarH.E.Project (3x40 MW)	Comments issued
13	Jammu & Kashmir	Kirthai Stage-I H.E. Project (390MW**)**	Under examination
14	Jammu & Kashmir	MandiH.E.Project(15 MW)	Comments issued
15	Jammu & Kashmir	PhagaH.E.Project(15 MW)	Comments issued
16	Jammu & Kashmir	KulanRambariH.E.Project (25 MW)	Comments issued
17	Jammu & Kashmir	Kargil-HundermanH.E.Project (25 MW)	Comments issued
18	Jammu & Kashmir	Igo-UpasiH.E.Project (25 MW)	Comments issued
19	Jammu & Kashmir	Sawalkote H.E Project (1856MW)	**Cleared**
20	Jammu & Kashmir	KwarH.E.Project (With respect of Indus Water Treaty, 1960)	**Cleared**
21	Jammu & Kashmir	PakalDulH.E.Project	**Cleared**
22	Karnataka	Sharavanthy Pumped Storage Project (2000 MW)	Comments issued
23	Meghalaya	Mawphu (Stage-II)H.E.Project, 81MW	**Cleared**
24	Meghalaya	MyntduLeshka Stage-II H.E.Project, (140 MW)	Comments issued
25	Meghalaya	UmangotH.E.Project	Comments issued
26	Odisha	Upper Indravati Pumped Storage Project (600 MW)	Comments issued
27	Uttarakhand	Goriganga IIIA H.E.Project (165MW)	**Cleared**
28	Uttarakhand	TiuniPlasuH.E.Project(72MW)	Comments issued
29	Uttarakhand	SirkariBhyolRupsiyabagarH.E.Project (4x250 MW)	Under examination/ comments issued
30	Uttarakhand	SingoliBhatwaniH.E.Project	Under Examination
31	Uttarakhand	Bokang Bailing H.E.Project (330MW)	Comments issued

Sl. No.	Name of the State	Project's Name	Status
32	West Bengal	Teesta Low Dam Project, Stage –I & II (Combined), (81 MW)	Comments issued
33	Bhutan	Dorjilung Hydro-Power Project	Comments issued
	Irrigation Projects		
1	Andhra Pradesh	Remodelling of TBP RBLCC Main Canal, TungaBhadra Board	Comments issued
2	Andhra Pradesh	Chinthalapudi Lift Irrigation Scheme	Comments issued
3	Assam	Protection of Majuli Island	Comments issued
4	Assam	Demow Drainage Development Scheme	Comments issued
5	Assam	Amreng Irrigation Project	Comments issued
6	Assam	Flood Management of River Subansiri along with river training works on both bank embankment	Comments issued
7	Bihar & Jharkhand	North Koel Reservoir Project	Comments issued/ hydraulically cleared
8	Chhattisgarh	DPR of ArpaBhaisajhar Barrage Project on Arpa river	Cleared
9	Gujarat	SauniYojna Phase-II Project (Link 2 & Link 4)	Comments issued
10	Gujarat & Maharashtra	Par-Tapi-Narmada Link Project	Cleared
11	Haryana	New Barrage on river in Faridabad District.	Comments issued
12	Haryana	Remedial measures to check recurring damages on downstram side of HathniKund Barrage	Comments issued
13	Jharkhand	Burhai Reservoir Project	Comments issued
14	Jammu & Kashmir	Akhnoor Steel Bridge	Comments issued
15	Karnataka	Singatalur Lift Irrigation Project	Comments issued
16	Karnataka	Proposed Mekedatu Balancing Reservoir Cum Drinking Water Project	Comments issued
17	Madhya Pradesh	Dudhi Irrigation Project	Cleared
18	Madhya Pradesh	Kotha Barrage Major Project	Cleared

Sl. No.	Name of the State	Project's Name	Status
19	Maharashtra	Bhandhara at Jamni, Near Nagpur	Comments issued
20	Maharashtra	Bhandhara at Tiwasa,Near Nagpur	Comments issued
21	Maharashtra	Bhandhara at Sarwadi, Dt.Wardha	Cleared
22	Maharashtra	Bhandhara at Deoli, Dt.Wardha	Cleared
23	Maharashtra	JiheKathapur Lift Irrigation Project	Comments issued
24	Maharashtra	Gunjawani Irrigation Project	Comments issued
25	Odisha	Nabarangapur Irrigation Project	Comments issued
26	Odisha	Lower ORR Project	Cleared
27	Odisha	Feasibility Report of Khadaga Barrage Project	Comments issued
28	Odisha	Lower Vansdhara Project Stage-I	Comments issued
29	Punjab	Raising the height of old DhussiBundh along the Ravi River	Comments issued
30	Puducherry	Flood Protection Works in YanamPuducherry	Cleared
31	Rajasthan	Eastern Rajasthan Canal Project	Comments issued
32	Rajasthan	Transfer of Rajasthan's share in Yamuna water from Tajewala head Haryana to Rajasthan and its Utilization in Jhunjhunu and Churu District of Rajasthan.	Cleared
33	Rajasthan	ERM works in India Gandhi Main Canal Stage-II (flow area) with Kanwar-Sain Lift Canal Stage-I	Comments issued
34	Telangana	Sita Ram Lift Irrigation Project Phase-I	Cleared
35	Uttarakhand	Song Dam Drinking Water Project	Under examination
36	Myanmar (South East Asia)	Yenwe Irrigation System	Comments issued
37	Myanmar(South East Asia)	KunnChaung Weir and Irrigation System	Comments issued
38	Nepal	Maha Kali Irrigation Project	**Cleared**
39	Republic of Malawi (South Eastern Africa)	Lambilambai Dam	Comments issued
	Multi Purpose Projects		

Sl. No.	Name of the State	Project's Name	Status
1	Bihar	Indrapuri Reservoir Scheme	Under examination
2	Jammu & Kashmir	Bursar Multipurpose Project	**Cleared**
3	Karnataka	Mekedatu Balancing Reservoir cum Drinking Water Project	Comments issued
4	Madhya Pradesh	ShakkarMulti-Purpose Project	**Cleared**
5	Odisha	Tel Integrated Multi-Purpose Project	Comments issued
6	Odisha	Middle KolabMulti-Purpose Project	Comments issued
7	Afghanistan	Shahtoot Storage Scheme/ Shahtoot Dam Storage Project	**Cleared**/ Comments issued
8	Indo-Nepal	PancheshwarM.P.Project	Comments issued

5.3 Hydrological Studies

The Hydrological Studies Organization (HSO), a specialized unit under D&R Wing of Central Water Commission, carries out hydrological studies in respect of most of the irrigation, multipurpose and hydropower projects in the country. The success of the projects is largely governed by the hydrological inputs. The inputs at Detailed Project Reports (DPR) or Pre-Feasibility Reports (PFR) or Feasibility Project Reports (FPR) stage are made available in the form of

i. Water availability/yield studies
ii. Design flood studies
iii. Sedimentation studies
iv. Diversion flood studies

The consultancy services in the field of hydrology are also offered to the State Water Resources Departments, State & Central Agencies at various stages of the project implementation.The details of works carried out by HSO are given below:

(a) Technical Examination of DPRs / Design Flood Review Studies

During the financial year 2018-19, 90 projects were under technical examination in HSO from hydrological studies point of view. Out of this, 59 projects have been cleared. Observations/comments were issued for 21 of the projects and 10 projects are under examination. In addition to above, HSO unit is also carrying out other specialized studies related to hydrology.

Advances in computing the magnitude and characteristic of extreme flood events and revision of the Indian Standards for large dams necessitates re-evaluation of spillway capacities of existing structures. State Governments have been requested to conduct Design Flood Review of all large dams in their respective States/jurisdiction and submit the reports for vetting.Under the proposed Dam Rehabilitation and Improvement Project (DRIP), the Design Flood Review Studies of 250 projects are to be vetted by HSO. In addition, similar studies done by States on their own for otherprojects are also to be examined in HSO. Further, as per request of States, Design Flood Review Studies of 31 projects of Rajasthan & 30 projects of Andhra Pradesh were carried out during the year 2018-19.

(b) Development of flood estimation model for un-gauged catchments

To compute the design flood in un-gauged catchments, country has been divided into 7 zones and further into 26 hydro-meteorologically homogeneous sub-zones and flood estimation models have been developed for each subzone. So far flood estimation reports covering 24 sub-zones have been published. The periodic revisions/updating of earlier reports are carried out whenever additional data are received. Flood Estimation Report for LuniSub-Zone 1(a) has been amended and revised equations/ relations have been circulated to all concerned organisations.

(c) Consultancy works / special studies related to hydrological aspects

Various consultancy works / special studies related to hydrological aspects were carried out / initiated by CWC during 2018-19. The details are as under:

1.Consultancy works / special studies in progress:

i. Preparation of chapter onHydrological Studies for inclusion in DPR of SaptaKosi,Sun Kosiand KamalaDams Projects of Nepal.

ii. Hydrological studies for Karnali Multipurpose Project, Nepal

2.Consultancy works / special studies completed:

i. Water Availability and Design Flood Study of Damanganga-Vaitarna-Godavari Link &Damanganga-Godavari Link Project.

ii. Study ondischarge contribution from Indian side riversin respect of Pancheswar Multipurpose Project, Nepal.

iii. Design Flood & Water Availability Study for inclusion in PFRs of 32 irrigation projects of Jharkhand.

iv. Hydrological Studies of Banas River atcrossing withNarmada Main Canal,Gujarat

v. Hydrological Studies of LutiyaNallah, SawaiMadhopur, Rajasthan

vi. The event of widespread flooding in Kerala during the flood of 2018 was studied and a report titled "Kerala Floods of August 2018" was prepared.

vii. DamBreak Study of landslide dam in River Siang in China was conducted and the results were communicated to all the agencies involved in disaster management in Arunachal Pradesh and Assam in October 2018.

(d) Technical Assistance / Advice tendered

HSO has provided secretariat assistance to various Technical /Expert Committees for undertaking special studies on various aspects related to water resources development and management. It has also participated and provided key role in Committees held by other organisations. Some of the important contributions during the year 2018-19 are as under:

i. In order to study the problem of salination of land along the coast in a scientific manner and to suggest remedial measures, a Technical Committee was constituted under the Chairmanship of the Chairman, CWC with Members from specialized organizations of State Government & Government of India in the related field. The study was completed and the report of the Committee titled "Problems of

Salination of Land in Coastal Areas of India and Suitable Protection Measures" was issued.

ii. The MoWR,RD&GR constituted an Expert Committee on Erosion and Siltation in Rivers under the chairmanship of Director, CWPRS to study the problems of erosion, siltation and requirement of desiltation/ dredging of rivers, particularly, Ganga and Brahmaputra rivers and suggest remedial measures. Chief Engineer(FM) was Member and Chief Engineer(HSO) was Member-Secretary of the Committee. The study was completed and the report of the Committee titled "Report of the Expert Committee on Erosion & Siltation in Rivers" was issued.

iii. A report of the Committee for e-flow study for the reach of River Ganga between Haridwar and Unnao was submitted in May 2018 and the findings were published in Gazzette Notification of Govt of India.

iv. Officials from HSO represented CWC in Expert Appraisal Committee of River Valley Projects of MoEF&CC and provided required inputs regarding hydrology and e-flow aspects in the river valley projects.

(e) Trainings/Workshop/ Seminar

The technical expertise available/developed in HSO is disseminated to other State and Central agencies associated with water resource planning through workshops and training programs where the faculty is drawn from HSO and other concerned organisation. Necessary resource persons are also deputed to National Water Academy, Pune for organizing the workshops/training programmes.

i. Training course on "Design Flood Estimation and Catchment Delineation" was conducted at Udaipur, Rajasthan during18th-19thJuly, 2018.

ii. Training course on "Project Hydrology - Hydrological Aspects in Project Planning and Preparation of DPR" was conducted for CWC/State Government officers at New Delhi from 26thNovember to 1stDecember, 2018.

iii. Training course on "GIS, Design Flood Estimation and Hydrological Modelling" was conducted at Shillongduring3rd-5thOctober, 2018.

iv. Training Program on "Use of Statistics in Hydrology" was organised in New Delhi during 5thto 7thMarch, 2019.

v. Training for Engineers of Water Resources Department on "Design Flood Analysis under DRIP" was organisedat Hyderabad,Telangana during 20th-22nd February,2019.

(f) Paper Submitted/Presented

1. Presentation on Kerala Floods of August 2018" was delivered to World Bank officials, NIDM and NDMA
2. A paper on Environmental flow estimation for river valley projects in Siang Basin at the 1st International Conference on Sustainable water management on 10 Dec 2018 at Chandigarh
3. Technical papers on following subjects were submitted for the International Dam Safety Conference'2018, held at Thiruvananthapuram, Kerala;
   i) Design storm and Design flood study of Kadana Dam
   ii) Back water study for Polavaram Irrigation Project
   iii) Impact of loss rate on Design Flood studies of Mettur Dam.
4. Technical papers on following subjects were submitted for the International Dam Safety Conference'2019, held at Bhubaneshwar, Odisha
   i) Comparison of different catchment area in the design flood estimation
   ii) Complete hydrologic analysis of the devastating Kerala floods of August 2018
   iii) Sensitivity analysis of Muskingham routing parameters on design flood using quasi distributed hydrological modelling.

(g) Plan Schemes

Three projects under National Hydrology Project were under examination.

1. Updated TOR for the Sedimentation studies were finalized during Year 2018-19:
2. Development of Aquatic Habitat Atlas for all Major Rivers of India has been finalized and circulated for comments during 2018-19.
3. Development of Generalized model for Hydrological Studies is under progress.

(h) Review of BIS code

HSO is involved in regular review of ISO/ IS standards for adoption by BIS. A total of 17 BIS codes have been reviewed under WRD-01 and one Draft Indian Standard on the topic "Measurement of liquid flow in open channels- Methods for measurement of characteristics of suspended sediments" based on important features of IS 4890:1968

(Reaffirmed 2001) on "Methods for measurement of suspended sediment in open channels" and ISO 4363 on "Measurement of liquid flow in open channels- Methods for measurement of characteristics of suspended sediments". As a part of exercise under WRD-10; Reservoir and Lake Sectional Committee, a comprehensive review of IS 5477: Methods for fixing the capacities of reservoirs Part 2 Dead storage was done and submitted to BIS for incorporation in the final draft.

5.4Dam Safety Aspects

Dam Safety Organization is looking after issues related to Dam Safety aspects which can be broadly categorized as under:

- Maintenance of National Register of Large Dams.
- Secretariat support for National Committee on Dam Safety and National Committee on Seismic Design Parameters.
- Instrumentation in Dams and Power House Caverns, besides other hydraulic structures.
- Special Analysis like Dam Break Modelling and foundation problems.
- Computer Aided Designs.
- Rehabilitation of aged & distressed dams

The Dam Safety Organisation, CWC is a ISO 9001: 2008 certified Organisation for its Quality Management Systems since 2015.

The various activities carried out by the Dam Safety Organisation are as under:

5.4.1 National Register of Large Dams

The National Register of Large Dams (NRLD) is maintained by CWC. The regular updation of NRLD is carried out from time to time as per information received from the States who are the dam owners. As per the latest information compiled during January, 2018 there are 5701 large dams in the country, out of which 5264 are completed and 437 are under construction.

NRLD is available at CWC website.It is now proposed to keep and maintain the data related to Large Dams and publish the NRLD through CWC's web-based system DHARMA.

Dam Health and Rehabilitation Monitoring Application (DHARMA)

CWC has developed an asset management tool named Dam Health and Rehabilitation Monitoring Application (DHARMA). DHARMA is a web-based software tool, designed to support the effective collection and management of dam safety-related information in India.The data available with CWC, in the form of NRLD, has already been put in DHARMA. However, the scope of DHARMA is much bigger than mere database. Once completed, it will be a repository of knowledge about the assets and enable the dam owner as well as state/ central organisation in proper management of these assets. Also, State Govts./dam owners have been facilitated to upload pre-post monsoon reports on DHARMA itself.

5.4.2 National Committee of Dam Safety (NCDS)

The Government of India, Ministry of Irrigation constituted a Standing Committee in1982 to review the existing practices and to evolve unified procedures of dam safety for all dams in India, under the Chairmanship of Chairman, Central Water Commission. Subsequently Government of India, Ministry of Water Resources reconstituted the Standing Committee in 1987 as the National Committee on Dam Safety to:

a) Monitor the follow-up action on the report on Dam Safety Procedures both at the Centre and State level,
b) Oversee dam safety activities in various States and suggest improvements/remedial measures to bring dam safety practices in line with state-of the art practices consistent with Indian conditions, and
c) Act as a forum for exchange of views on techniques adopted for remedial measures to relieve distress in dams.

The Committee has been reconstituted in October, 2015 and now consists of 31 members from 18 States and 5 other organizations. The 39th meeting of NCDS was held on 12th February, 2019 at Bhubaneswar, Odisha. The minutes of meeting had been circulated in March, 2019.

5.4.3 Dam Rehabilitation & Improvement Project (DRIP)

Ministry of Water Resources, Government of India is implementing 'Dam Rehabilitation and Improvement Project (DRIP)' with financial assistance from the

World Bank. Presently, DRIP involves rehabilitation of about 198 dam projects in seven States i.e. Madhya Pradesh, Orissa, Kerala, Tamil Nadu Karnataka, Jharkhand(DVC) and Uttarakhand (UJVNL). In addition, DRIP also involves institutional strengthening (for dam safety) of all participating States as well as at central level in Central Water Commission. The total approved estimated cost of the project is Rs. 2100 Crore. However, a proposal for revision of the cost of the project to Rs. 3466 Crore, mainly due to increase in the cost of rehabilitation of dams has been motted.

Project has become effective from 18th April 2012. Initially, the project was to be implemented over a period of six-years. Now, the project has been granted time extension of two years by the Government of India and the World Bank and officially the program will close by the end of June 2020.The main implementation agencies for DRIP are the owners of dams – i.e. Water Resources Departments and State Electricity Boards in the participating States. Overall responsibility for project oversight and coordination rests with the Central Project Management Unit (CPMU) created in Central Water Commission at New Delhi. CPMU is assisted by an Engineering and Management Consultant (M/S EGIS EAU, France).

The progress made under DRIP up to 31.03.2019 is highlighted as below:

- Design flood reviews of all the DRIP dams have been completed for checking the hydrological adequacy of the dams.
- Main rehabilitation works in respect of 198 dam projects have been awarded and are under various stages of implementation. As per award of work till March 2019, the total committed cost for various works awarded is Rs. 2696.00 Crore. So far, Rehabilitation works for 146dams have been completed.
- Training programs with focus on DRIP implementation were initiated well in advance for building up in-house technical capabilities of participating states. One Hundred and Eighteen (118) trainings conducted by the CPMU, wherein about 3926 officials trained on different aspects of DRIP implementation. Five international training programs benefiting 101 officials were also organized from 2016to 2019 in collaboration with Worlds' two leading and renowned organizations namely, Bureau of Reclamation, USA and Deltares, Netherlands. With the assistance from The World Bank and in cooperation with Japan Water Agency, knowledge sharing seven (7) exposure visits have been organized to Japan. Fifty (56) participants from Central as well as State agencies have been provided exposure on seismic, desiltation, instrumentation and other dam safety related issues during these visits. One exposure visit to Australia has also been

organized in 2018 on dam safety issues for the senior level officers of the States and Central Government.

- A web-based asset management software tool "Dam Health and Rehabilitation Monitoring Application (DHARMA)"has been developed and launched. DHARMA program will enable collection and compilation of basic as well as engineering information for all dams and allow the systematic presentation and interpretation of data for effective monitoring of the health of dams.
- So far, Eleven guidelinesand manuals on various aspects of dam safety, such as "Guidelines for Developing Emergency Action Plans for Dams", "Guidelines for Operation and Maintenance Manual of Dams", "Guidelines for Safety Inspection of Dams", "Guidelines for Mapping Flood Risks Associated with Dams", "Guidelines for Instrumentation in large Dams", "Rehabilitaion Manual of Dams","Guidelines for Assessing and Managing Reservoir Sedimentation", "Guidelines for Assessing and Managing Risks Associated with Dams","Inspection Manual for Dam Field Engineers after Seismic Events, Maithon Dam, DVC, Jharkhand", "Technical Specifications ofHydro-meteorological, Geodetic,Geotechnical and SeismicInstruments", "Inspection Manual for Dam Field Engineers After Seismic Events, Ichari Dam, Uttarakhand"have been published with the guidance of specialists working in the respective fields and published. Work on six more guidelines are under progress.
- Three National Dam Safety Conferences i.e. IIT Madras (March 2015), IISC Bangalore (January 2016) and Roorkee (February 2017) and two International Dam Safety Conferences at Thiruvanantpuram (January 2018) and Bhubaneswar (February 2019) have been organized under the project, so far. These conferences received overwhelming response from the dam safety professionals, researchers, academicians, industries from the country as well as overseas.

- MoUs have been signed with the nine premiers academic and research institutes namely, IIT Madras, IISc. Bangalore, IIT Roorkee, MNNIT Allahabad, NIT Rourkela, Anna University, NIT Calicut, CET Trivandrumand MANIT Bhopal, for their capacity building in the dam safety areas such as analysis of dams, foundation, retrofitting, flood forecasting, dam break analysis & preparation of emergency action plan, instrumentation and other related issues.. These academic institutions will be providing consultancy services to State Implementing Agencies as well as conducting training programmes in dam safety related areas. In this regard, six MoUs have been signed under the project with the leading seismic

agencies such as NGRI Hyderabad, CWPRS Pune and IIT Roorkee with the Implementing Agencies for rendering all technical advice for selection of seismic instruments, finalizing their location at specific dams and processing / analysis of data of instruments. Also two Central Agencies i.e. Central Soil and Materials Research Station (CSMRS) and Central Water and Power Research Station (CWPRS) have joined DRIP.

- So far twenty (22) meetings of Technical Committee for DRIP have been held so far. Eight meetings of National Level Steering Committee for DRIP have also been held so far. World Bank has also completed its thirteen Review Missions, wherein road blocks as well as way forward in project implementation have been discussed.
- Many new initiatives are being taken under the project. The details are as under:

    - Emergency Action Plan/Disaster Management Plan to handle any emergency situation for minimizing losses of life and property damages is being prepared for all the dams under DRIP. In this regard, Dam Break Analysis and inundation mapping have been prepared for about 173 no. and Emergency Action Plans have been prepared for 96 no. of DRIP dams so far.

    - Studies of Seismic Hazard Mapping for Peninsular India is being prepared by the IIT Roorkee and is in the last phase of development of Seismic Hazard Assessment Information System (SHAIS) and validation part is being complete which is the last activity of SHAIS. CWC has also signed MoU with CWPRS to take up the study for Seismic Hazard Mapping for rest part of the country.

    - Study of unusual dam behavior and distress of Idukki Arch Dam has been completed. FEM Studies for Crack analysis of Konar Dam of DVC is completed.

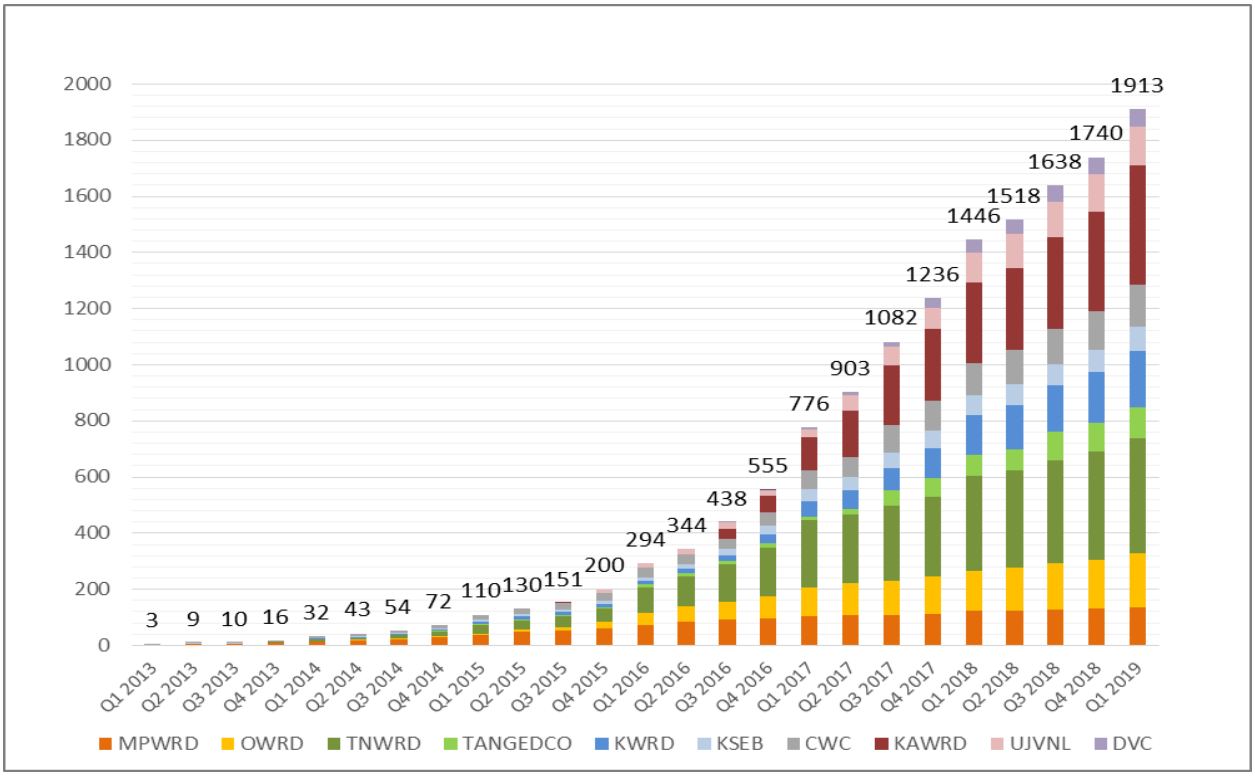
- As on March, 2019, the total fund utilization under DRIP is Rs. 1915.00 Crore.

The DRIP has been successful in bringing greater awareness on dam safety issues and addressing the serious problems by introducing novel solutions and technologies.

DRIP Phase-II and Phase – III

Keeping in view that the project at present covers only 5% of large dams in India and based on success of ongoing DRIP, World Bank has concurred to the newly initiated DRIP Phase-II and Phase-III proposal of Ministry on February 26, 2019.Presently, 18 States and two Central Organisations are included to be a part of DRIP Phase-II and Phase-III. The total financial outlay for the Project is about₹ 10,200 Crore, out of which the loan assistance from the World Bank is about ₹ 7,000 Crore; The shares of State and Central agencies are about ₹ 2800 Crore and ₹ 400 Crore respectively. The funding patterns are 70:30 (General Category States), 80:20 (Special Category States) and 50:50 (Central Agencies). The first part is to be financed by World Bank; and balanced to be financed by participating States and Central Government. More than six hundred dams are proposed to be taken up in these States.

The Project is to be implemented over a period of 10 years, in two phases, with each phase of 6 years duration and an overlap of 2 years over each other.



Quarter wise Fund utilization during first phase of DRIP

5.4.4 SITE VISITS

Total 94 site visits were conducted during FY 2018-19.

The apllication of protective coating on the upstream face of the piers is seen in progress. The same is being carried out from bottom of the pier upwards using hanging cradle in Almati Dam of KaWRD

Rebound Hammer test Construction of wing walls at d/s of Spillway work at TNWRD and Labours handling large riprap using crowbars to move and adjust the stones in place at UJVNL

DRIP CPMU Officials Inspected Poringalkuthu dam, KSEB, Govt. of Kerala

Poringalkuthu dam is one of DRIP dam, is a masonry gravity structure, 36.90m high and 365.76m long, built across the Chalakudy River. The construction of the dam was completed in 1957. The gross storage is 32 MCM. The spillway and sluice openings are

capable of passing the original design flood of 2265 cumec at FRL which has further been revised to 3811 cumec during ongoing DRIP. The dam was overtopped during Kerala flood of August 2018 on account of excessive precipitation in the catchment area resulting in to heavy floods. The severity of the overtopping was very extreme as water level raised approximately about 2-2.5m above dam top and lasted about 24-26 hours. The dam was also overtopped earlier in the year 2008.

A team of CPMU Officials inspected the Poringalkuthu dam on 27th September 2018 to review the on-going rehabilitation works under DRIP as well as impact of August 2018 unprecedented flood of about 3000 cumec in context of safety of dam along with team of KSEB officials.

Downstream view of Poringalkuthu dam, showing damaged left training wall as well as damaged dam top road near left bank portion, and scoured dam toe during August 2018 Kerala flood

CPMU, CWC Team alongwith KSEB Kerala officials on the PoringalKuthu dam, inspection on September 27, 2018.

Inspection ofTehriAndKoteshwar Projects

A comprehensive inspection and review of all the components of Tehri and Koteshwar Projects was done by officer of Central Water Commission, THDC India Limited and Russian Expert Agency M/s Hydroproject Institute (HPI), Moscow during 16-19th July, 2018. ShriNarendra Singh Shekhawat, Deputy Director, Hydel Civil Designs (N&W) Directorate, and ShriGauravSanghai, Deputy Director, DSR, Directorate have represented CWC.

Inspection of Tehri and Koteshwar projects

Cross Section Work In Ramganga Basin

Cross-section survey work being carried out in Ramganga Basin for Hydro-dynamic studies to be carried out for assessment of environmental flows under Priority Area-2 of Indo-EU Joint Working Group. The 2 days visit from 23rd to 24th October 2018 was to two sites in Ramganga basin i.e. downstream of Kalagarh Dam and on river Ramganga at the confluence of River Kho to it (Downstream of Kho Barrage)

Cross-section survey at Ramganga for assessment of environmental flows

Field visit to Vaigai dam on 20.11.2018 as part of TC Meeting:

Delegates Visited Vaigai dam as a part of 22nd TC Meeting Of Drip At Madurai On 20.11.2018

5.4.5 Consultancy Services on Instrumentation in Hydraulic Structures

Detailed Project Report / Compliance Report of 6 river valley projects in various states namely Odisha, Maharastra and Uttarakhand have been examined, out of which two projects have been cleared with respect to instrumentation aspect and observation for four projects have been sent to the project authority for compliance.
During the year, consultancy services towards planning and preparation of instrumentation specification / construction drawings / vetting of drawings/ preparation of instrumentation chapter for DPR purpose have been provided as under:

(i) Preparation of Instrumentation Drawings for projects:

- Four instrumentation drawings of Parwan Multipurpose Project, Rajasthan have been vetted and submitted to project authorities.
- Four new instrumentation drawings of Punatsangchuu-I HE Project, Bhutan have been prepared and submitted to project authorities.
- Two instrumentation drawings ofChheligada Irrigation Project, Odisha have been vetted and submitted to project authorities.

5.4.6 Technical Examination of Projects for Seismic and Foundation Aspects

Detailed Project Reports of 12 nos. of river valley projects in various states namely Meghalaya, Himachal Pradesh, Uttarakhand, Maharashtra, Odisha, Arunachal Pradesh, Karnataka and Bihar were examined with respect to geological investigations related to foundation engineering and Seismic aspects. Two numbers of DPR's have been cleared and compliance from the project authorities is awaited for the remaining projects.

5.4.7 National Committee on Seismic Design Parameters

The National Committee on Seismic Design Parameters (NCSDP) was constituted by MoWR Order dated 21st October, 1991 with the objective to recommend the Seismic Design Parameters for the proposals received from the dam owners. Member (D&R), CWC is the Chairman of the Committee with 11 other experts from various engineering disciplines from different technical institutions and Government organizations as its Members. Director FE&SA, CWC is the Member Secretary of NCSDP.

During 2018-19, 34th meeting of NCSDP was held on 26th February, 2019, wherein the site specific seismic study reports of 04 projects were discussed and cleared by the Committee.

5.4.8Special Studies

CWC undertakes special studies e.g. Dam Break Analysis, GLOF studies, etc. for water resources projects. Dam break analysis is carried out to prepare the inundation map and disaster management plan in the unlikely event of dam failure. It estimates the maximum water level at the downstream locations of the dam in the event of a hypothetical failure of the dam. Glacial Lake Outburst Flow (GLOF)studies are carried out to account for the flood, resulting from the breach of moraine dams, in the design of the projects. During the year, the GLOF study report of Tiuni-plasu HEP, Uttarakhand has been examined and observations on some have been issued..

5.4.9 Dam Safety Legislation

Owing to India's sizeable number of dams – of which substantial proportions are ageing – legislation on the dam safety has been desired by various forums to ensure the safety of the dams in the country. The need for legislation was first underlined by the Standing Committee constituted in 1982 to review the then existing practices and to evolve unified procedures on dam safety in India (CWC, 1986). The need has also been repeatedly emphasized by the National Committee on Dam Safety. The States of Andhra Pradesh and West Bengal have adopted resolutions in their respective Assemblies for enactment of dam safety legislation for regulation in their States by an Act of Parliament. In pursuance of the above, Ministry of Water Resources formulated a (Draft) Dam Safety Bill 2010, which was introduced in the Parliament on 30th August 2010. The Bill was referred to the Parliamentary Standing Committee on Water Resources for the examination of the Bill, which had submitted its recommendations in June 2011. The observation and recommendations of the Parliamentary Standing Committee on Water Resources were examined by Ministry of Water Resources for necessary compliance. However, with the dissolution of the 15thLokSabha, Dam Safety Bill (2010) lapsed.

Seeing the limitation of the Dam Safety Bill (2010) in terms of its initial applicability to the two states of Andhra Pradesh and West Bengal and the Union Territories only,

CWC in June 2014 had submitted a new draft of the Dam Safety Bill to the Ministry seeking national level applicability of the Bill. Accordingly, Dam Safety Bill 2017 has been prepared with all India applicability under Entry 56 and 97 of list I on the basis of opinion obtained from Solicitor General of India. Draft Dam Safety Bill 2017 was also shared with the concerned line Ministries /Departments. The comments on the same have been received from these Ministries. As per suggestions of NITI Aayog, the draft Bill was circulated to State Governments in August 2016. Comments were received from 19 States and 4 dam owning organizations. The comments of the States were deliberated in the meeting of National Committee on Dam Safety (NCDS) held under the Chairmanship of Secretary (WR, RD & GR) for finalization of draft Bill. All States, except a few, have largely supported the bill. The National Dam Safety Bill 2017 has been put up for approval of the Cabinet.

The proposed legislation on dam safety is intended to provide for proper surveillance, inspection, operation and maintenance of all large dams to ensure their safe functioning, and thereby protect persons and property against risks associated with dam failures. The legislation seeks to enjoin responsibility on Central Government, State Governments and owners of specified dams to set up an institutional mechanism for ensuring safety of such dams and reporting the action taken. It defines the duties and functions of these institutions in relation to perpetual surveillance, routine inspections, operation and maintenance, maintenance of log books, instructions, funds for maintenance and repairs, technical documentation, reporting, qualifications and trainings of concerned manpower etc. Provisions have been made concerning the necessities of periodical inspections, instrumentations and establishment of hydrological and seismological stations. The Bill addresses the issues of emergency action plan and disaster management, and also enlists the requirements of comprehensive dam safety evaluation.The Dam safety bill has been introduced in LokSabha in 12th, Dec 2018. The discussion couldn't take place and hence bill was lapsed and was suspended for next session of the house.

5.4.10Formulation Of Indian Standards:

Central Water Commission, being an apex technical body in the water resources sector, has been playing an important role in formulation of standards in field of water resources development and management and allied areas through its participation in activities of Water Resources Division (WRD) and Civil Engineering Division (CED) of

BIS. Chairman, Central Water Commission is presently the Chairman of Water Resources Division Council (WRDC).

CWC is represented by its officers of the rank of Chief Engineer and Director in the 16 Sectional Committees of WRDC and 13 Sectional Committees of CEDC. FE&SA is the Nodal Directorate in CWC dealing with works of WRDC & CEDC of Bureau of Indian Standards, respectively at CWC.

The approval of draft codes and Amendments to IS Codes for adoption and printing are being processed in CWC for approval of Chairman, CWC. During the current year, 6 Nos. of draft standards/amendments to IS Codes have been approved by Chairman for adoption and printing.

5.5International Cooperation:

Expertise in Design helps D&R wing in providing technical advise to Government on issues related to international cooperation and international disputes. The activities in this area includes:

- Special Technical studies for unresolved issues of projects under Indus Water Treaty.

- Preparation of technically sound arguments in support of India's position during meetings of Permanent Indus Commission, Secretary Level Talks, proceedings of Neutral Experts & Court of Arbitrations. Most part of the Counter Memorial and Counter Rejoinder are prepared by CWC as and when such issues arise.

- Technical assistance to government for Cooperation with China, Bangladesh, Nepal, Bhutan andAfghanistan and technical evaluation of impacts of the projects on neighbouring countries.

5.6Assistance in Inter-State Dispute Resolution:

D&R wing provides technical advice and assistance to Committees setup by Court/ Tribunal for resolution of Water sharing related disputes. It provides its services for impartial/unbiased assessment of Water availability studies and Backwater assessment to give fair picture for submergence concerns. Site inspections and preparation of

reports for Government on critical issues related to Inter-State Projects are undertaken by CWC.

5.7Development, Dissemination And Standardisation Of State of Art Technology and Capacity Building:

D&R Wing is assisting BIS in formulation/amendment of codes for WRD Projects. Research component of D&R Wing is an integral part of the planning and design of the projects. The experience gained during /after the execution of the project is the basis of the modification/improvement in the prevalent design methodology/technology. This input is also given to BIS codes through the WRD Committee meetings to modify the relevant clauses in the codes. Technical papers on the relevant subjects are also contributed by this Wing in this regard.

D&R wing is also planning to come out with its own Technical E-Journal which will highlight the technology being used/developed in planning & design of WR Projects.

D&R Wing has also technically contributed in framing Guidelines for Use of Geo-textiles in Flood Management Works; Reassessment of Hydropower Potential of the country; Hydro-research; Advisory Role in Operation & Maintenance of FBP; etc. It is also contributing towards disaster management by assessing hazard potential of landslide dams, providing mitigation measures for Landslides, Land subsidence.

D&R wing is imparting training to Water Resources Professionals of the country for planning, design & development of WR Projects by organizing training programme in CWC and at NWA, Pune. Most of the faculty in training programmes of NWA in this field is provided by D&R Wing, CWC.

5.8Technical Papers/Presentations/ Lectures/Trainings:

Sl No.	Name of programme/course/ presentation	Unit/Dte	Venue and Date
1.	Training course on Design Flood estimation and Catchment Delineation	HSO Unit	18-19th July 2018 at Udaipur, Rajasthan
2.	Training course on "Project Hydrology - Hydrological Aspects in Project Planning	HSO Unit	26th Nov to 1st Dec, 2018 at CWC, New Delhi

	and Preparation of DPR"		
3.	Training course on GIS, Design Flood estimation and Hydrological Modelling	HSO Unit	3rd-5th Oct 2018 at Shillong, Meghalaya
4.	Training Program on the topic "Use of Statistics in Hydrology"	HSO Unit	5th to 7th March, 2019 at CWC, New Delhi
5.	Training on Design flood analysis under DRIP	HSO Unit	20-22 february,2019 at Hyderabad, Telangana
6.	Presentation on Kerala Floods of August 2018" was delivered to World Bank officials, NIDM and NDMA	Hyd(S) Dte.	New Delhi
7.	A paper on Environmental flow estimation for river valley projects in Siang Basin at the 1st International Conference on Sustainable water management	Hyd(DSR) Dte.	10 Dec 2018 at Chandigarh
8.	Technical paper on Comparison of different catchment area in the estimation of design flood.	Hyd(S) Dte.	13-14 Feb, 2019, International Dam Safety Conference'2019, held at Bhubaneshwar, Odisha
9.	Technical paper on Complete hydrologic analysis of the devastating Kerala floods of August 2018	Hyd(S) Dte.	13-14 Feb, 2019, International Dam Safety Conference'2019, held at Bhubaneshwar, Odisha
10.	Technical paper on Sensitivity analysis of Muskingham routing parameters on design flood using quasi distributed hydrological modelling	Hyd(S) Dte.	13-14 Feb, 2019, International Dam Safety Conference'2019, held at Bhubaneshwar, Odisha
11.	Delivered Lecture in 30Th Induction Traning Program (ITP)	Sh. Anil Jain Director Emb (NW&S)	20-11-2018 at NWA Pune
12.	A Technical Paper published on "Evaluation of Settlement Behaviour of Clay Foundation improved using Stone Column" and "Settlement Risk Assessment of Dams founded on Soft Clay".	Sh. Anil Jain Director & DDs Emb (NW&S)	International Dam Safety Conference at Odisha, Feb. 2019
13.	Lecture in 30Th Induction	Sh. Aditya	NWA Pune during

	Traning Program (ITP) as a faculty for "Design of Gates: Hydro-Mechanical Equipment".	Mishra Dy. Director Gates (NW&S)	17.12.2018 to 18.12.2018.
14.	Lecture in 30Th Induction Traning Program (ITP) at NWA Pune	ShriKayum Mohammad. Director CMDD(NW&S)	17.12.2018 - 18.12.2018. NWA Pune
15	Lecture on "Auto CAD" at CWC Library Building	Shri V.K Rastogi, H'D'man, CMDD (NW&S)	17.09.2018-18.09.2018 CWC Library Building
16	Training on "Dam Break Analysis and Formulation of Inundation Maps"	DSR Dte.	22-25 October 2019 in Computer Room, CWC Library Building, New Delhi
17	Technical paper on "Drip Guidelines for Assessing and Managing Risks Associated With Dams in India"	DSR Dte.	IDSCBhubaneswar, Odisha during 13-14 February 2019
18	Technical paper on "Third Party Quality control testing for DRIP Rehabilitation works and challenges in rectification of concrete structures"	DSR Dte.	IDSC Bhubaneswar, Odisha during 13-14 February 2019

5.8.1. 2nd International Dam Safety Conference, Bhubaneswar, Odisha:

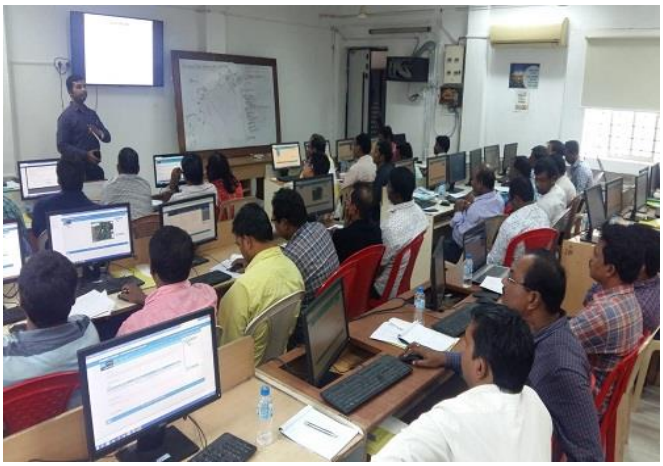
2ndInternational Dam Safety Conference was organized during 13thand 14thFebruary 2019 at Bhubaneswar, Odisha. The Conference was jointly organized by Central Water Commission (CWC) and Odisha Water Resources Department (OWRD) under the aegis of ongoing Dam Rehabilitation and Improvement Project (DRIP). A total of 725+ delegates including about 100 from 29 overseas countries and leading dam owners, policymakers, dam professionals, Scientists & academia took part in the Conference.
An exhibition showcased products, technology, instruments related to dam safety.

2nd International Dam Safety Conference

5.8.2 Training and Capacity Building by DRIP:

During the year 2018, 24 training programmes covering 96 training days were organized in which 706 participants belonging to various Implementing Agencies participated.

During the year 2018, Nine DHARMA training sessions were conducted at Thiruvananthapuram for four DRIP agencies (KWRD, KSEB, TNWRD, TANGEDCO) and also at Rajasthan. Over 349 participants were trained to enter the data in DHARMA.



13thWorld Bank support and Review Mission: Thirteenth World Bank Review Mission for Dam Rehabilitation and Improvement Project on January 24, 2019 at Thiruvananthapuram, Kerala.



Training Programme during the Month February, 2019

Training Programmes on Dam Safety, Portfolio Management and Risk Assessment were conducted by M/s Enturafrom 19 February to 03 March 2019 and a total of 25 participants attended the programme.


Training Program on Flood Estimation was organized during 20-22 February 2019 for DRIP-II in Hyderabad, Telanganaand a total of 25 delegates participated.

39th NCDS meeting held in Bhubaneswar on 12thFebruary, 2019

NCDS meeting was chaired by Chairman, CWC in which Chief Engineers / Engineer-in-Chiefs from State Water Resource Departments attended the meeting. A presentation on DHARMA was made for the benefit of NCDS Members.

5.8.3 International Study Tours

Two-week Training and Capacity Building Program on Dam Safety and Reservoir Management including Exposure visit at Entura, Hydro Tasmania was facilitated in association with M/s Deltares in Delft, Netherlands during May 2018 for 22 Officials.


Case DAMSAFE, India
Monitoring
Deltares

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CHAPTER-VI

WATER MANAGEMENT

6.1 Monitoring of Reservoir Storage

Central Water Commission monitors the live storage of important reservoirs of the country. The information is used by the Crop Weather Watch Group constituted by the Ministry of Agriculture for reviewing the crop planning strategy based on the availability of water in the reservoirs.

During the Water Year 2018-19, Central Water Commission hasmonitored the live storage of 91 important reservoirs of the country having total live storage capacity (at FRL) of 161.993BCM which is about 63% of the live storage capacity created in the country as per the assessment carried out in 2010. The status is given in Table 6.1.

Table 6.1
Storage Status of Current Year vis-a-vis Previous Year

Description			Water Year	
			2017-18	2018-19
Number of Reservoirs			91	91
Total Designed live storage in BCM			157.799	161.993*
ACTUAL STORAGE	On June, 1st (Start of Monsoon)	In BCM	33.407	27.384
		In % of Designed Live Storage	21	17
		In % of last 10 Years Average Live Storage	105	86
	On September, 30th (End of Monsoon)	In BCM	104.099	123.316
		In % of Designed live Storage	66	76
		In % of last 10 Years Avg. live Storage	87	106

*Increase in Live Storage Capacity is due to change in height of dam of Sardar Sarovar Project from 121.92 m to 138.68 m in 2017.

A bulletin on the status of reservoir storage monitored by CWC is being issued every week. The weekly bulletin contains current storage position vis-à-vis storage status on the corresponding day of the previous year and average of last 10 years on the corresponding day.

In order to expeditiously collect the data required for preparation of reservoir bulletin, automation of storage data collection for reservoirs being monitored by CWC is proposed through existing telemetry systems installed by concerned authorities of reservoirs or by installing new telemetry system. It is also proposed to increase the no. of reservoir under monitoring from 91 to 149.

6.2 Interaction with Ministry of Agriculture

Central Water Commission is representing the Crop Weather Watch Group meetings (CWWG) of Ministry of Agriculture in which the water storage status of 91 important reservoirs being monitored by CWC is used as an important input for crop planning strategy.

The ICAR- CWC Joint Panel was constituted in March 1979 by the ICAR mainly to deal with the issues relating to efficient use of water for irrigation and suggest measuresfor maximizing the return from investment on irrigation in areas covered under major, medium, minor and other irrigation programmes.The functions of the Panel include providing adequate and efficient agricultural research, education and extension services in irrigation commands. The Panel also reviews the work done by Agricultural Universities/ Research Institutes, Command Area Development Authorities, Central and State Ground Water Organizations and others with a view to optimized the yield per unit of water.

Director General, ICAR is the Chairman of the Panel in the first and third years while Chairman, Central Water Commission is the Chairman of the Panel in the Second year. The panel has been reconstituted by the ICAR on 02.08.2016.The 1st meeting of reconstituted ICAR-CWC Joint Panel was held under the Chairmanship of Secretary, DARE & Director General, ICAR and co-chairmanship of Member (WP&P), CWC on 2nd June 2017.

6.3Reservoir Sedimentation-Capacity Survey of Reservoirs

6.3.1 Hydrographic Survey/Capacity Survey

Capacity Survey of reservoirs has been a continuing scheme, known as hydrographic survey of major reservoirs, initiated during the VIII plan and continued in subsequent Plans. Up to the end of XII plan, the capacity survey work of 36 reservoirs has been completed by CWC.

During 2017-20, the capacity survey work of 15 reservoirs has been targeted. Process for awarding work for capacity survey of 8 reservoirs is under progress. Estimate for work of these 8 reservoirs has been approved by the PMC and RFP document for the same has been prepared.

6.3.2 Capacity Survey using Remote Sensing Technique

The study "Estimation of Sedimentation in Reservoirs using Remote Sensing Technique" is being carried out by CWC under the Plan Scheme "Research & Development Programme in Water Sector" since 11th Five Year Plan.

The details of progress of studies during 2018-19 is as under:

i.) CWC conducts in house Sedimentation Assessment Study of reservoirs using Remote Sensing Techniques. During the period 2017-20, study in respect of 10 reservoirs has been proposed. In this regard, the sedimentation Assessment Study of Tandula Reservoir (Chhattisgarh)and Kabini has been completed. Sedimentation Assessment Study of Matatila Reservoir (UP) is under progress.

ii.) It is proposed to carry out Sedimentation Assessment Study in respect of 40 more reservoirs using Remote Sensing Techniques during 2017-20 through consultancies. The work of the same has been awarded to Maharashtra Engineering Research Institute (MERI), Nashik. The work is expected to be completed by June '2020.

6.4Project Performance Evaluation

Performance Overview and Management Improvement Organization (PO&MIO), Central Water Commission is undertaking Post Project Performance Evaluation studies of completed major/medium irrigation projects in the country. It is also involved in benchmarking of completed irrigation projects and promotion of Water Audit and Water Conservations in all the three sectors viz. domestic, industrial and irrigation in the states.

The Post Project Performance Evaluation study of Completed Irrigation Projects includes i) Evaluation of system performance, ii) Agro-economic, iii) Socio-Economic and iv) Environmental impacts of project along with economic analysis with the central objective of identifying deficiencies and recommending corrective measures for

improving the performance of projects for achieving the envisaged objectives and targeted benefits.

There is a Technical Advisory Committee (TAC) under the chairmanship of Member (WP&P), CWC for guiding, supervising and approving the studies. During 2018-19, the Post Project Performance Evaluation Study of "Giri Medium Irrigation Project, Himachal Pradesh" has been completed.

6.5 Other important works

Study Report on Water Requirement for maintaining Son Gharial Sanctuary

In O.A. No 146 of 2014 - Nityanand Mishra Vs State of Madhya Pradesh & Ors., NGT Bhopal directed CWC to conduct a study for determining minimum acceptable flow in Son Gharial Sanctuary, downstream of Bansagar Dam. The study report was prepared and submitted in November, 2016. A report in this regard was also submitted by Madhya Pradesh Government.

The NGT further directed CWC to reconcile the two reports and make its recommendations. The 1st meeting of the Committee to study the report submitted by Madhya Pradesh Government was convened on 23.01.2017, wherein, it was decided to constitute a new Committee to reconcile the two reports. Accordingly, a new Committee was constituted involving representatives from State Governments of UP, MP & Bihar and also MoEF&CC. A meeting of the new Committee was convened on 16.02.2018. Representatives of all the 3 State Governments attended the meeting. In the meeting, it was decided that the HSO Unit of CWC will carry out this analysis to find out the quantity of water to be released from Bansagar Reservoir after taking into account the 95% dependable flows in the d/s tributaries of Son River. The study is underprogress.

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CHAPTER-VII

APPRAISAL OF PROJECTS

7.1 Project Appraisal

One of the important activities assigned to Central Water Commission is techno-economic appraisal of irrigation, flood control and multipurpose projects proposed by State Governments. This task is performed and coordinated by Project Appraisal Organisation (PAO) of CWC. After establishment of techno-economic viability of the project, the Advisory Committee of MoWR, RD&GR on Irrigation, Flood Control and Multipurpose Projects headed by Secretary, MoWR, RD & GR considers the projects for acceptance and thereafter recommends the same for investment clearance. Since 1976, about 1533 projectshave been considered and accepted by the Advisory Committee of Ministry of Water Resources on Irrigation, Flood Control and Multipurpose projects till March 2019.

Besides these, the Hydro-power projects proposed by State Power Corporations / Electricity Boards / Private Sector Organisations for Techno-economic clearance by Central Electricity Authority (CEA) are also scrutinised in CWC from the view point of hydrology, civil design, inter-state issues and cost aspects of civil components. Technical aspects of water supply schemes and cost aspects of Flood Control Schemes (except projects for Ganga Basinand Brahmaputra Basin) are also appraised as and when referred to by State Governments.

7.2 Appraisal of Major / Multipurpose Irrigation Projects

During the year 2018-19, 39 major/ multipurpose projects (32 new &7 revised) have been appraised up to 31st March 2019. Out of that, 11 major / multipurpose projects have been accepted by the Advisory Committee of MoWR. A Pie Chart showing state-wise distribution of major irrigation / multipurpose projects under appraisal during 2018-19 is shown at **Fig-7.1.**

7.3 Appraisal of Medium Irrigation Projects

During the year 2018-19, 15 medium projects (12 new &3 revised) have been appraised in field units of CWC. Out of that, 2 medium projects (revised) have been accepted by the Advisory Committee of MoWR. Necessary assistance was provided by PAO, CWC

to the concerned regional offices for processing the projects for acceptance by the Advisory Committee.

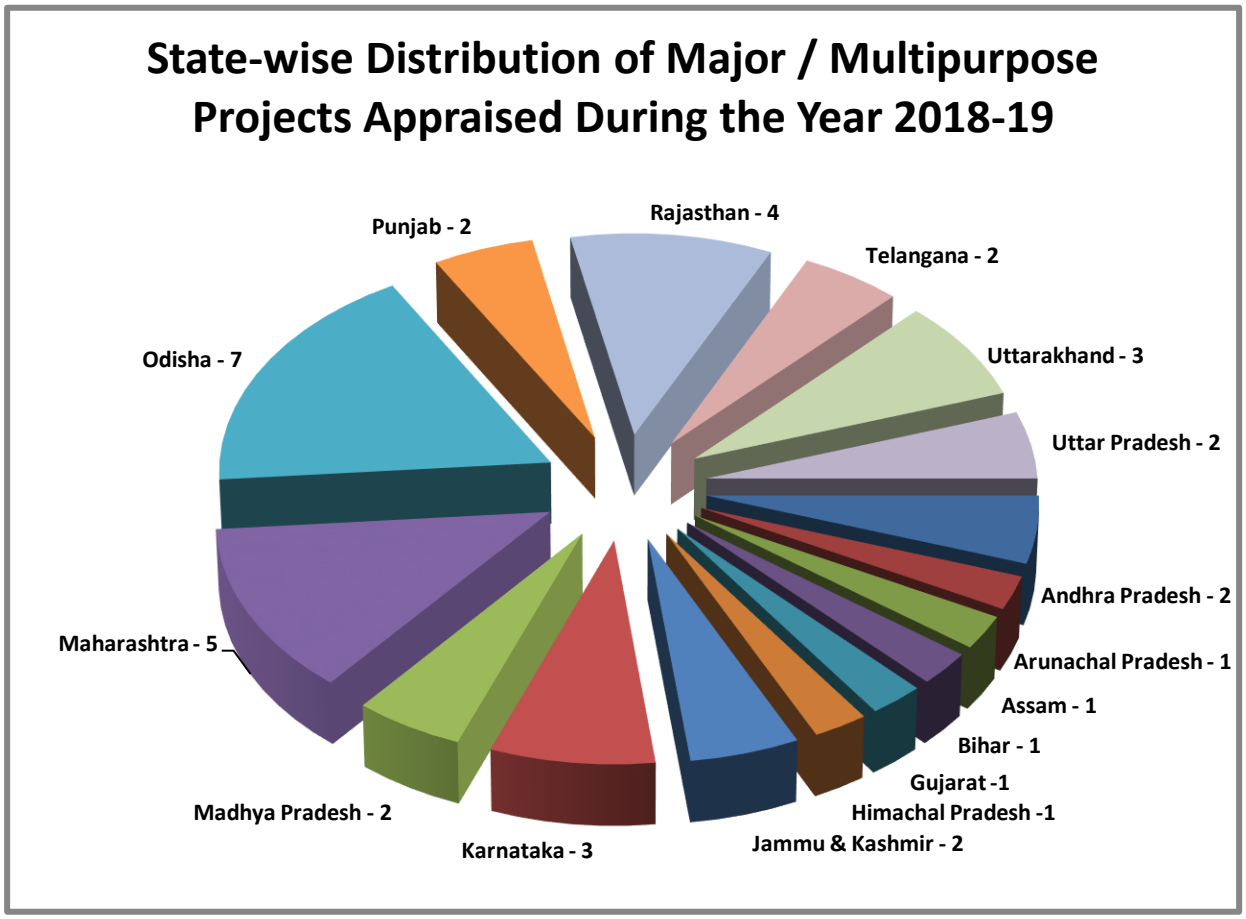

Fig. 7.1State-wise distribution of major irrigation / multipurpose projects under appraisal during 2018-19

7.4Interaction with State Governments/Project Authorities

To expedite the appraisal process, Central Water Commission interacts frequently with State Govt. Engineers and interstate/review meetings are convened to resolve issues having a bearing on project clearance. For that purpose, CWC calls upon review meetings and collectively many State Governments are invited to discuss on project issues. During the year 2018-19, following review meetings were held and issues were resolved:

a) Fifth Review meeting was held under the Chairmanship of Chairman, CWC on 10.04.2018 to review the status of 31 Major Irrigation and Multipurpose including National andExternally Aided projects.

b) Sixth Review meeting was held under the Chairmanship of Chairman, CWC on 24.05.2018 to review the status of 9 Major Irrigation /Multipurpose /Flood Management projects including Externally Aided projects

c) Inter-State meeting in respect of Baksoti Barrage Project (Bihar) was held at CWC-HQ, New Delhi on 28.06.2018.

7.5 Meeting of the Advisory Committee

During year 2018-19, the Advisory Committee of MoWR,RD&GR, under the Chairmanship of Secretary (WR) accepted 24 projects comprising 13 Major & Medium Irrigation / Multipurpose projectsand 11 Flood Control schemes in 6 meetings. The list of major & medium irrigation / multipurpose projects and flood control schemes accepted by the Advisory Committee of MoWR is enclosed as **Annexure-7.1** and **Annexure-7.2**respectively.

The irrigation projects accepted during 2018-19 envisages annual irrigation benefits to 20,53,031hectare in 7 States of the country. The Flood Control Scheme, accepted during 2018-19 envisages protection to a population of about 68,04,554persons & area of about 10,65,459 hectares in the 5 States of the country. Pie Chart showing State-wise distribution of 13 Nos. major & medium irrigation / multipurpose projects accepted by the Advisory Committee during the current year is enclosed as **Fig. 7.2.**

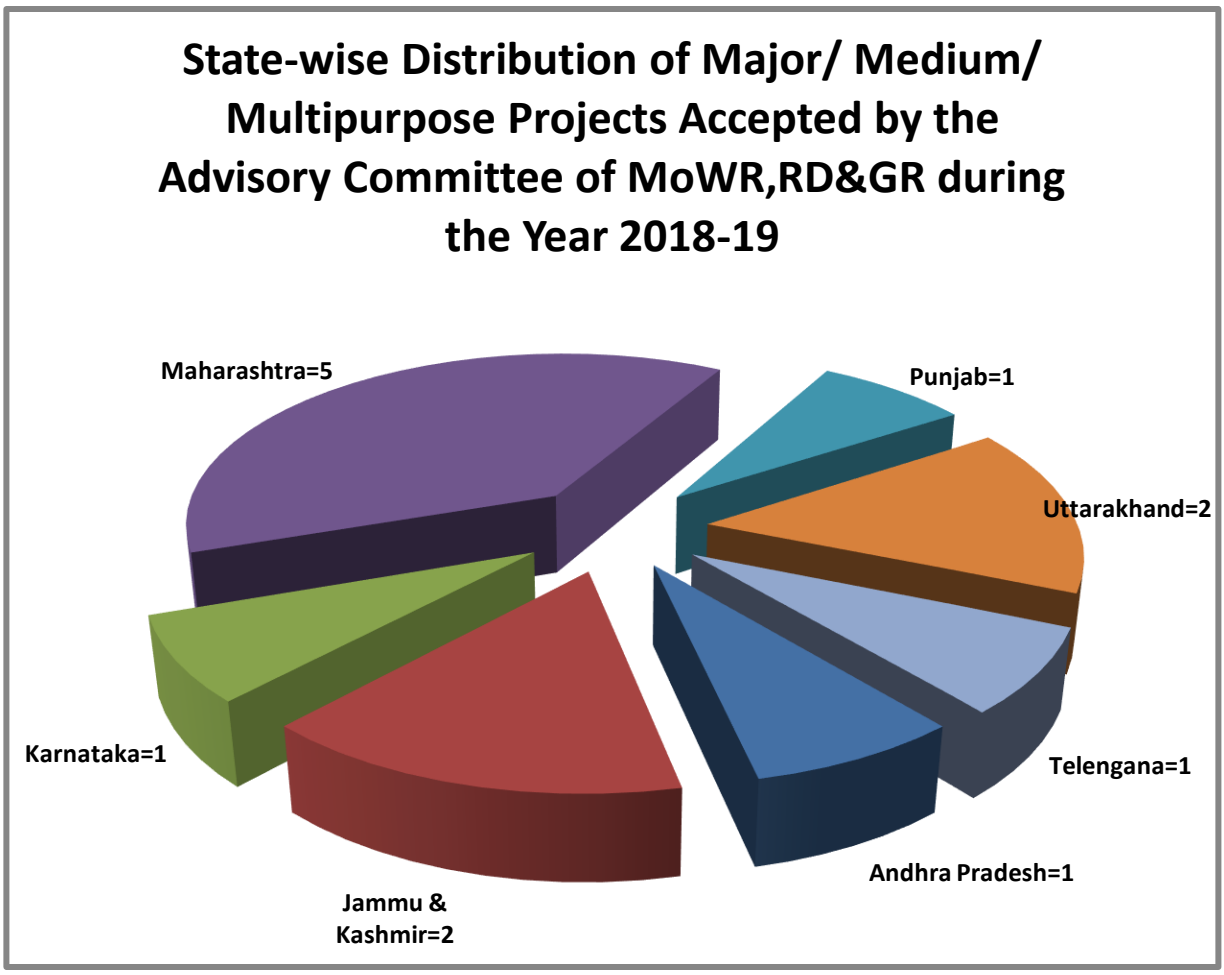

Fig. 7.2: State-wise Distribution of Major/ Medium/Multipurpose Projects Accepted by the Advisory Committee of MoWR,RD&GR during the Year 2018-19

7.6 Appraisal of Hydro-Electric Projects

Apart from the appraisal of Irrigation and Flood Control projects, civil components of hydro-electric projects are also appraised by Central Water Commission. The said activity is coordinated by PAO, CWC. Cost finalisation of civil component of 10 Hydro-Electric Projects has been done in CWC during 2018-19. Other aspects of Hydro-Electric Projects are appraised in Central ElectricityAuthority (CEA) and Techno-Economic Clearance (TEC) to the project is also accorded by the CEA. During 2018-19, CEA has accorded TEC to 3 Nos. Hydro-Electric Projects having total installed capacity of 2746 MW.

The list of H.E Project accepted by TEC is enclosed at **Annexure- 7.3**

7.7 National Projects

Government of India is implementing the scheme of National Projects since XIthPlanwith a view to expedite completion of identified National Projects for the benefit of the people. So far, Central Government has declared 16 water resources projects as National Project. The list of projects is at **Annexure 7.4**.

Ministry of Water Resources, had issued guidelines for implementation of scheme of National Projects in February 2009. Later, the Ministry had issued modification in the guidelines of the same on 28.09.2012.

As per guidelines, the criteria for selection of National Projects are as under:

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

(b) 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.

(c) Inter-State projects with additional potential of more than 2, 00, 000 hectare (ha) and with no dispute regarding sharing of water and where hydrology is established.

(d) Extension, Renovation and Modernization (ERM) projects envisaging restoration of lost irrigation potential of 2,00,000 ha or more would be eligible for inclusion as a National Project subject to :

- (i) The command Area Development and Water Management (CAD&WM) works shall be ensured in the entire command area of the ERM project.
- (ii) The CAD&WM works shall be taken up simultaneously with the ERM works so as to facilitate achievement of the benchmark efficiency for water use.
- (iii) The management of command area system by Water User's Association (WUA's) after the ERM works will be necessary. The WUA's may be entrusted with the responsibility for the collection of irrigation service fees and for undertaking annual repairs by retaining a part of the fee collected.

(iv) 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.

An ERM Project of a State Government may be included in the scheme of National Projects only on completion of one ERM Project already being funded in the state under the category of National Projects.

Initially, such projects were provided financial assistance @ 90% of cost of irrigation & drinking water component of the project in the form of central grant for its completion in a time bound manner. As per the approval for continuation of scheme of National Project in XIIth Plan issued on 12.09.2013, the proportion of central assistance has been revised and the same was to be provided as 75% and 90% of the cost of balance works of Irrigation and Drinking Water Component for Projects of Non-Special Category State and Special Category States, respectively. The provision of financial assistance for National Projects has been included in the recently launched PMKSY. The proportion of Central share has now been reduced to 60% except in case of projects in eight North Eastern States and three Himalayan States which will continue to obtain 90% of the cost.

The Government of India declared 14 projects as National Projects in February 2008. The Cabinet Committee on Infrastructure approved inclusion of SaryuNaharPariyojna in the scheme of National Project on 3rd August, 2012. Later, Government of India also declared Polavaram Irrigation Project as a National Project in its Gazette published on 01.03.2014.

Out of 16 projects included in the scheme of National Projects, five projects, namely, GosikhurdProject of Maharashtra, Teesta Barrage Project of West Bengal, SaryuNaharPariyojna of Uttar Pradesh and IndirasagarPolavaram Irrigation Project of Andhra Pradesh are under implementation. Goshikhurd and ShahpurKandi projects have been provided grant amounting to Rs. 3350.35crore and Rs. 26.04 crore, respectively, up to March, 2019. Teesta Barrage Project started receiving funds under the scheme of National Project during 2010-11 and grant amounting to Rs. 178.20 crore has been provided for the project till March 2018. SaryuNaharPariyojana started receiving funding under the scheme of National Project since 2012-13 and an amount of Rs. 1526.59Crore has been released upto March 2019. The IndirasagarPolavaram Irrigation Project started receiving funding under the scheme of National Project since 2014-15 and an amount of Rs. 6764.46 Crore has been released upto March 2019. SaryuNaharParyojna (Uttar Pradesh) and Gosikhurd Irrigation Project (Maharashtra) have been included under the 99 priority project under PMKSY-AIBP.

The Status of other projects are as under:

1. Lakhwar Multipurpose Project (Uttarakhand) was accepted by Advisory Committee of MoWR, RD & GR in its 116thmeeting held in December 2012. The project was accorded investment clearance for an amount of Rs. 3966.51 Cr by Investment Clearance Committee (under the Chairmanship of Secretary, MoWR, RD & GR) in its meeting held on 24.02.2016. Further, RCE of Lakhwar Multipurpose Project was again submitted to CWC for appraisal. The same was accepted by Advisory Committee of MoWR, RD & GR for Irrigation, Flood Control & Multipurpose Projects in its 141stmeeting held on 11.02.2019 for Rs. 5747.17 Cr (PL-July, 2018).

2. Ken Betwa link Project Phase-I (Madhya Pradesh) has been accepted by the Advisory Committee of MoWR, RD & GR during the 129th meeting held on 08.07.2016. Project was accepted for investment clearance of Rs. 18,057.08 Crore (2015-16 PL) on 10.02.2017 by Investment Clearance Committee of MoWR, RD & GR. The DPR of Ken Betwa Link Project Phase-II is under active appraisal in CWC/CEA.

3. Ujh Multi-Purpose Project (J&K) was agreed "In Principal" by the Advisory Committee of MoWR, RD & GR in its 131st meeting held on 17.11.2016 at New Delhi with a condition that a team consisting of concerned officers from CWC and other experts shall visit the project site/area and explore the alternate options with reduced submergence/displacement alongwith minimum loss of power and irrigation benefits, so that the potential of east flowing river may be fully utilised, as envisaged in Indus Water Treaty.Accordingly, the optimized proposal the project,ensuring utilisation of full potential of east flowing river as per Indus Water Treaty, prepared as per suggestion of the above team was to be re-submitted to Advisory Committee of MoWR, RD & GR after Environment and Forest Clearance. The team has visited the project in March, 2017.The Team submitted its report in May, 2017 with suggestion for reduction in Full Reservoir Level of Dam by 6mto reduce submergence from 41 sq km to around 34.50 sq kmThe Modified DPR was then prepared and submitted to CWC for appraisal. The same was accepted by Advisory Committee of MoWR, RD & GR for Irrigation, Flood Control & Multipurpose Projects in its 139thmeeting held on 07.01.2019 for Rs. 5850 Cr (PL July, 2017).

4. Renuka Dam Project (Himachal Pradesh) was accepted by the Advisory Committee of MoWR, RD & GR in its 132nd meeting held on 06.03.2017 at New Delhi.The Project Authority has now submitted its Revised Cost Estimate which is under active appraisal in CWC.

5. DPR of Kishau Multipurpose Project (Himachal Pradesh &Uttarakhand) was submitted to CWC in 2010 by UJVNL for appraisal. Compliances to most of the observations of CWC/CEA are awaited since 2011. Special Purpose Vehicle (SPV) as Joint Venture between Uttarakhand& Himachal Pradesh was constituted for project execution and the first meeting of SPV was held in February, 2017. Thereafter, no progress in submission of compliances was observed. The matter was reviewed in a meeting held inMoWR,RD&GR and UJVNL was requested to establish Executive Committee to resolve day to day issues. UJVNL agreed to incorporate the same in agenda of Board meeting of Kishau Corporation Limited.

6. The DPR of NoaDihing Project was considered in 135thmeeting of Advisory Committee held on 12.03.2018. As the ownership of the project and the source of funding were not clear and overall economic viability of the project have not been established, the Advisory Committee decided to defer the approval of project and directed to place the matter for consideration of the Advisory Committee after resolving above issues. Thereafter, Govt. of Arunachal Pradesh vide communication dated 09.01.2019 confirmed that the project ownership will be of Govt. of Arunachal Pradesh. However, the information regarding source of the funding is yet to be submitted for establishing power tariff and overall economic viability of the project.

7. DPR of Kulsi Dam Project (Assam) is under appraisal in CWC / CEA. Ownership of the project is yet to be decided. Concurrence/Agreement/MoU between Assam and Meghalaya is also required.

8. Bursar Project (J&K) is also under appraisal in CWC/CEA.

9. Two projects, viz. Upper Siang Project and Gyspa Project (Himachal Pradesh) are at DPR preparation stage. Remaining one project, viz. 2nd Ravi Beas Link Project is at conceptual stage.

High Powered Steering Committee

The Union Cabinet in its meeting held on 7th Feb, 2008, constituted a "High Powered Steering Committee for Implementation of the Proposals of National Projects" withSecretary (WR) as Chairman and Chief Engineer (PPO), CWC as its Member-Secretary. The terms of reference of the Committee are as under:

i. To recommend implementation strategies for National Projects.

ii. To monitor implementation of National Projects.

iii. To examine the proposal for inclusion of new projects as National Projects and make appropriate recommendation to the Government.

Elevenmeetings of High Powered Steering Committee for implementation of National Projects have been held so far. The last meeting was held on 11th June, 2018.

7.8 Repair, Renovation and Restoration (RRR) of Water Bodies

Government of India hadapproved two schemes on Repair, Renovation and Restoration of water bodies (i) with external assistance with an outlay of Rs. 1,500 Crore and (ii) with domestic support with an outlay of Rs. 1,250 Crore for implementation during XI Plan Period.

Under the scheme with domestic support, a total of 3341 water bodies were taken up for restoration in 12 States. So far, restoration of 3114 water bodies has been completed. A total central grant amounting to Rs. 917.259 Crore has been released till date to the States for the completion of works on these water bodies.

Under the scheme with External Assistance, 8747water bodies were taken up for restoration in the States of AndhraPradesh/Telengana (2364), Karnataka (1047), Odisha (324) and Tamil Nadu (5012).So far, restoration of 8054 water bodies has been completed.

The scheme for continuation of RRR of Water Bodies for XII Plan envisaged to provide Central Assistance for the restoration of about 10,000 water bodies with an earmarked central share outlay of Rs. 6235 crore which includes Rs 250 Crore for the spill over works in respect of water bodies taken up during XI Plan. Out of 10,000 water bodies, 9000 water bodies in rural areas and balance 1000 water bodies in urban areas were to be covered. The proposal of water bodies where the Integrated Water Management Programme (IWMP) is implemented/proposed to be implemented were to be considered for inclusion under the XII Plan scheme of RRR of water bodies.

The Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) was launched in 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. Har Khet Ko Pani (HKKP) is one of the components of

PMKSY. The scheme of RRR of Water Bodies has now become a part of PMKSY-HKKP. Under PMKSY, the Cabinet has approved an outlay of Rs. 9050 Crore for PMKSY-HKKP component with a target to create 21.0 lakh Ha of irrigation potential including 1.5 lakh Ha from RRR of Water Bodies scheme.

The funding of projects under PMKSY-HKKP in respect of General Category States/UTs is shared between Central and State Governments in the ratio of 25(Central) : 75(State). However, the said ratio for special areas i.e, undivided Koraput, Bolangir and Kalahandi (KBK) districts of Odisha, Bundelkhand region of UP & MP, Marathwada & Vidharbha region of Maharashtra, Naxal affected areas, DPAP areas, Tribal areas,Flood Prone Area, Desert Development Programme(DDP) area of General Category States/UTs is 60(Central) : 40(State) and that for 8 North Eastern and 3 Himalayan States is 90 (Central):10 (State).

Further, as per "Guidelines for the Scheme on Repair, Renovation and Restoration (RRR) of Water Bodies under PMKSY-HKKP" issued in June, 2017, approval of the Empowered Committee is not required after approval of proposals of RRR of Water Bodies by the State TAC & SLSC. The proposals for funding under the scheme arealso to be forwarded to MoWR,RD&GR directly by the concerned Field Office of CWC. A copy of proposal is also to be sent to CWC HQ for maintaining overall status of scheme.

Since XII Plan, restoration works in respect of 2064 water bodies has been included for funding under the scheme of RRR of Water Bodies (as on 31.03.2019), out of which,works in respect of 1233water bodies have been reported to be completed. So far, Central Assistance of Rs. 369.12Crore has been released to the States for completion of works of these water bodies. The details are given in Table 7.1. During FY 2018-19, restoration works in respect of 237(Andhra Pradesh -100, Bihar-27, Gujarat- 61, Tamil Nadu – 49) water bodies were included for funding under scheme of RRR of water bodies. The details are given in Table 7.2. Total Central Assistance of Rs. 24.8Crore was released during 2018-19.

Table 7.1
Status of Water Bodies & Funds released under Scheme ofRRR of Water Bodies Since XII Plan (as on 31.03.2019)

Rs. in Crore

Sl. No.	Name of State	No. of Water Bodies	Estimated Cost	Irrigation Potential to be restored (ha)	Central Fund Released during 2018-19	Total Central FundReleased since XII Plan	No. of Water Bodies Completed	Irrigation Potential Restored (ha)
1	Andhra Pradesh	100	66.77	5611	2.70	2.70	-	-
2	Bihar	27	64.93	10112	6.26	6.26	-	-
3	Gujarat	61	102.91	11364	8.81	8.81	-	-
4	Madhya Pradesh	125	183.24	33305	-	37.70	121	25000
5	Manipur	4	65.44	1197	-	10.37	-	-
6	Meghalaya	9	11.43	1096	-	5.18	4	849
7	Odisha	863	449.03	51261	-	110.65	734	44252
8	Rajasthan	68	187.80	13197		50.23	31	7340
9	Tamil Nadu	153	77.75	3798	7.03	16.25	104	-
10	Telangana	575	459.18	29010	-	104.56	239	2541
11	Uttar Pradesh	74	83.41	3447	-	16.41	-	-
12	Uttarakhand	5	12.49	450	-	-	-	-
Total		2064	1764.38	163848	24.80	369.12	1233	79982

Table 7.2
Details of projects included for funding under the scheme for RRR of Water Bodies during 2018-19

Sl. No	State	No. of Water Bodies	Estimated Cost (Rs in Crore)
1	Andhra Pradesh	100	66.77
2	Bihar	27	64.93
3	Gujarat	61	102.91
4	Tamil Nadu	49	23.43
Total		237	258.04

7.9 Surface Minor Irrigation (SMI) Scheme

The scheme "Surface Minor Irrigation (SMI)" is a part of PMKSY - HarKhetKoPani (PMKSY-HKKP). Since XII Plan, 5801 SMI schemes have been taken up under the programme (till 31.03.2019). Out of this, 2804 schemes have been reported to be completed. So far, Central Assistance amounting to Rs. 6468.39 Crore has been released for completion of these schemes (till 31.3.2019). Out of this, an amount of Rs. 725.21 Crore was released during 2018-19 (till March 2019). The details are as given in **Table 7.3.**

Table 7.3

Details of Projects under implementation since XII Plan under Surface Minor Irrigation Scheme (till 31.03.2019)

Rs. in Crore

Sl No.	Name of State	No of schemes included	Irrigation Potential Planned ha	Estimated Cost	Committed Central Share	CA Released during 2018-19	Cumulative CA released during XII plan & onwards	Cumulative expenditure	No of Schemes comple-ted	Irrigation Potential Achieved ha
1	Arunachal Pradesh	919	41928	716.316	644.684	22.25	208.48	209.421	185	18616
2	Assam	1010	423480	4975.356	4477.82	428.34	2857.57	3122.67	546	233992
3	Bihar	176	75908	351.620	274.071	32.28	147.57	224.065	143	65135
4	Chhattisgarh	147	50513	722.17	433.2		200.37	641	102	50500
5	Himachal Pradesh	154	25525	499.265	449.339	66.195	148.995	171.04	21	5855
6	Jammu & Kashmir	417	112233	1277.65	1149.88	31.706	523.33	569.60	123	82217
7	Jharkhand	82	8982	75.324	56.493		19.38	62.522	44	4127
8	Karnataka	465	39104	594.9188	456.342		162.42	481.519	271	33811
9	Madhya Pradesh	276	111343	1817.39	1191.58		987.69	1680.11	256	66130
10	Manipur	102	12904	170.37	153.333	0	104.55	108.63		12200
11	Meghalaya	260	41200	702.651	632.191	31.50	285.18	345.21	97	15321
12	Mizoram	36	2343	42.47	38.222	0	10.24	13.81		138
13	Nagaland	704	29398	519.701	467.731	35.33	307.64	299.286	434	22874
14	Sikkim	381	12380	115.02	103.519	16.61	82.24	94.36	225	11374
15	Tripura	21	3890	47.323	42.591		17.75	19.722	12	438
16	Uttarakhand	651	42092	520.616	468.55	61	404.995	434.56	345	31102
Total		**5801**	**1033223**	**13148.16**	**11039.55**	**725.21**	**6468.39**	**8477.53**	**2804**	**653830**

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CHAPTER-VIII

MONITORING OF PROJECTS

8.1 Monitoring of Major and Medium Irrigation Projects

A three tier system of monitoring of major/medium irrigation projects at Centre, State and Project level was introduced in 1975. At Central level, this work was entrusted to CWC. The main objective of monitoring is to ensure the timely achievement of physical and financial targets regarding creation of irrigation potential. Monitoring System is also expected to contribute in identification of the inputs required, analysis of the reasons for any shortfalls/bottlenecks and suggest remedial measures, etc., with a view to complete the projects in a time bound manner.

As per the present arrangement in CWC, Inter-State, Externally Assisted and Centrally Aided Projects are being monitored by Monitoring Units at Headquarters and other projects by respective Field Units. During 2018-19, a total of 47(20 Major and 27 Medium) projects under general monitoring and 99on goingpriority projects under AIBP were targeted for monitoring by CWCField Units. Out of this, 13 Inter-State Major Projects, part of which is being monitored under AIBP by CWC field Units, will also be monitored from CWC(HQ). CWC made monitoring visits to the projects in accordance with these targets.State-wise and project-wise list of these projects proposed for General and AIBP monitoring is given at **Annexure-8.1 &Annexure - 8.2** respectively and that of 13 Interstate Major Projects is given at **Annexure - 8.3**. State-wise summary of monitoring visits to projects under AIBP is given at **Annexure - 8.4**.

All the projects identified for monitoring are to be visited by CWC officers. Thereafter, based on the field visit to the project and discussions with the State Government Officials, a detailed Status Report is prepared thereby highlighting various constraints impeding construction & suggestions for remedial measures, points needing attention of the State Government etc. to expedite progress for early completion of the project. The status of monitoring visits to the projects made by CWC duringthe year 2018-19 is as under:

S. No.	Item	Target	Achievement
1	General Monitoring by Regional Offices	47	4
2	AIBP Monitoring by Regional Offices	99	129

Monitoring visits are made to those projects which are active and wherein substantial progress has been made since last visit. Rest projects are monitored on the basis of progress report submitted by the respective project authority.

8.2 Accelerated Irrigation Benefits Programme

Central Government, during 1996-97, launched Accelerated Irrigation Benefits Programme (AIBP) to provide Central Loan Assistance (CLA) to major/medium irrigation projects in the country, with the objective to accelerate the implementation of those projects which are beyond resource capability of the states or are in advanced stage of construction. While selecting the projects, special emphasis was to be given to Pre-Fifth and Fifth Plan projects. Priorities were also given to those projects which were benefiting Tribal and Drought Prone Areas. Under the revised AIBP Guidelines from the year 1999-2000 onwards, Central Loan Assistance under AIBP wasalso extended to minor surface irrigation projects of special category states (N.E. States & Hilly States of H. P., Sikkim, J&K, Uttaranchal and projects benefiting KBK districts of Orissa). However, later w.e.f. 1.4.2005. The programme was extended to non-special category states also and minor surface irrigation projects with potential more than 100 ha with preference to tribal areas and drought prone areas which fully benefit dalits and adivasis could be included. Grant component was introduced under the programme during 2004-05 and Centre provided both loan portion and grant component of Central Assistance. However, as per the present policy, Centre is providing the grant component only from 2006-07 and States are authorised to raise loan component by market borrowing.

The Government has further relaxed the criteria for central assistance under the AIBP in Dec 2006. The earlier guidelines stipulating completion of an ongoing project under AIBP for including a new project under AIBP has been relaxed for projects benefiting a) drought prone areas, b) tribal areas, c) States with lower irrigation development as compared to National average, and d) districts identified under the PM's Package for agrarian distress districts.

During the 12th Plan, AIBP guidelines has been further re-modified and implemented from October, 2013. As per the new guidelines, the pari-passuimplementation of Command Area Development (CAD) works were given more emphasis for the fullutilization of the Irrigation Potential Created. The eligibility criteria for new projects was continued but the advanced stage of construction has been defined in terms of at least 50% of physical and financial progress on essential works like Head-Works, Earth Works, Land Acquisition, R&R etc. Further, funding pattern and mode of disbursement has been slightly modified. As per the new guidelines, the central assistance will be in the form of central grant for new and ongoing projects which will be

(i) 90% Central Assistance (CA) of project cost (works Component) in case of special category States, and KBK region of Odissa
(ii) 75 % CA of project cost in Special Area i.e. Major/Medium projects benefiting drought prone area, desert prone area, tribal area and flood prone area in non special category states and
(iii) 25% CA of project cost in case of Non-special category States except for (ii) above. The same could be enhanced upto 50% for new projects subject to condition that the States carry out water sector reforms

The balance funds are to be arranged by the State Government from its own resources. MoU between Central and State Government has also been slightly modified with insertion of the Para for the CAD works.Central Water Commission has been assigned the responsibility to comprehensively monitor the projects receiving CLA/Grant.

So far, 297 projects from 25 States have been included for funding under AIBP. Out of 297 projects, upto 31.03.2016, 143 projects have been completed and 5 projects deferred. **Annexure - 8.5** gives State-wise list of Major & Medium projects completed under AIBP.

Government of India launched the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) during 2015 with the motto of 'Har Khet Ko Pani' ensuring access to some means of protective irrigation to all agricultural farms in the country, to produce 'per drop more crop', thus bringing much desired rural prosperity. The ongoing programmes as being implemented by the Government of India, viz Accelerated Irrigation Benefits Programmes (AIBP), Repair, Renovation and Restoration (RRR) of Water bodies and Command Area Development and Water Management (CADWM) have been subsumed in Pradhan Mantri Krishi Sinchayee Yojana (PMKSY).

In order to overcome the bottlenecks faced in completion of project under AIBP, MoWR, RD&GR identified 99 priority projects amongst the 149 ongoing projects under AIBP for early completion. Under the dedicated funding mechanism i.e. Long Term Irrigation Fund (LTIF), a special window has been created in NABARD which could be utilized by the Central and State Governments to bridge the requirement of funds for completion of the 99 priority projects including CAD works for central assistance as well as state share component. Out of these 99 priority projects,34 projects have been reported completed and another 40 projects are scheduled for completion by June 2019. A list of 34 projects reported as complete is given at **Annexure - 8.6.**

Central Grant totalling to Rs. 2849.07Crores has been released to 43 Projects under PMKSY-AIBP during 2018-19. Since its inception, the cumulative total Central Loan Assistance / Grant provided to States under AIBP/PMKSY-AIBP is Rs. 65351.70Crores till 31.03.2019 to 297 projects.

As reported by the State Governments,9.79993Mhaof additional irrigation potential has been created under AIBP since the start of the scheme till March, 2018.

8.3 Assessment of Irrigation Potential created under AIBP

8.3.1 Use of Satellite Technology

To supplement the existing monitoring mechanism by providing authentic and objective data base on existing irrigation infrastructure, it was felt necessary to utilize the Remote Sensing Technique for the assessment of Irrigation Potential Creation in AIBP assisted projects. At the instance of Planning Commission, pilot studies of two projects i.e. Upper Krishna in Karnataka and Teesta Barrage in West Bengal were carried out successfully using Satellite Data by NRSA, Hyderabad. The study results of the assessment were found satisfactory and compared well with ground realities.

In view of importance and utility of results arising out of pilot study, it was decided by Planning Commission to take up the projects on a national scale covering about 10 Million Ha. of Irrigation Potential spread across different States in India. In the first phase, the assessment of Irrigation Potential Creation through mapping of irrigation infrastructures to monitor the progress was assigned to NRSA, Hyderabad in respect of 53 on-going AIBP assisted projects covering area of 5447.743 Th. Ha during 2007-08. The

study has been completed during 2009-10. It provides the critical gap areas for further effective monitoring.

In the second phase, the assessment of irrigation potential of 50 AIBP projects using cartosat satellite data covering an area of 851.428 Th Ha has been completed by NRSC, Hyderabad during2013-14. All the 50 reports have been submitted by NRSC, Hyderabad along with a summary report and deliverables agreed as per MOU for work awarded to NRSC for the 50 projects spread over 14 States.

It was proposed to build in-house capacity in CWC to carry out this study on regular basis each year for selected projects, which would supplement the existing monitoring mechanism, put in place a web enabled online monitoring system for all the projects being monitored at central level under General, Vigorous or AIBP Category by the end of 2nd year of the XII plan i.e. by 2013-14.Accordingly, 13 projects on pilot basis were identified for in house practice. The satellite based online monitoring of these projects were carried out using BHUVAN web services (SatAIBP) wherein processed Cartosat imageries of all the 13 projects were hosted by NRSC. During studies, it was observed that the Cartosat imageries hosted on Bhuvan Portal by NRSC though partially supplement the existing monitoring mechanism by providing authentic and objective data base for canal network up to distributaries but the same is yet not suitable for identification of small minors, gaps and structures etc. due to its low resolution.

It has now been decided to take services of Bhaskaracharya Institute for Space Application and Geoinformatics (BISAG) under Department of Science & Technology, Government of Gujarat for assessment of year wise/ season wise cropped area in the command of 99 PMKSY-AIBP projects from 2012-13 onwards till 2016-17. Requisite details of command of the projects in the digitized format have been provided to them and study is underway.

BISAG has agreed to make a GIS based application for monitoring of 99 AIBP projects. As per the agreement, the following activities will be done through BISAG:

1. Development of GIS based application for monitoring of 99 prioritized projects under AIBP:
    i. The available Google satellite imagery shall be used by BISAG to digitize the works completed in respect of all 99 prioritized projects. NIC shall provide the concerned file with sequence of the projects in this regard to MIETY/BISAG.
    ii. The provision for incremental progress to be digitized on monthly basis based upon availability of updated data from Google shall be made by BISAG.

iii. A separate layer would be generated for the status of drought prone areas of Bundelkhand, KBK, Marathwada, Vidarbha etc.

iv. A provision for generating status report for projects benefitting the drought prone areas shall be made.

v. A mobile app for capturing the geo-tagged photographs which has already been prepared by NIC shall be integrated with the above application.

2. Analysis of cropped area under prioritized projects using LANDSTAT data

3. Development of an MIS/GIS based application for water bodied included for funding under RRR scheme. The mobile application shall have facility for capture of geo-tagged photographs/videos of such water bodies.

8.3.2 Use of Drone technology

The possibility of using drones for monitoring progress of irrigation projects is being explored in consultation with States, as the projects and its command are spread in large areas. One project of Maharashtra "Lower Dudhna" has been shortlisted for pilot study. TOR for the same is in the process of being finalised by State in consultation with the Union Ministry of Water Resources, River Development and Ganga Rejuvenation.

8.3.3 Impact Assessment of AIBP

In the wake of substantial expenditure by the Government towards creation of irrigation potential in the country, there is a need for a holistic assessment of the extent of actual benefits realized under the same. Such a study will assess the changes that can be attributed to a particular intervention, such as a project, programme or policy both the intended ones as well as ideally the unintended ones. The objective of the study is to conduct a critical evaluation of the performance of 10 AIBP projects selected from 5 regions. The study will also help in identifying gaps in the implementation structure of AIBP towards its overall streamlining.

Union Ministry of Water Resources, River Development and Ganga Rejuvenation has awarded the work for undertaking impact assessment studies of 10 completed projects, from 5 regions of the country to Academy of Management Studies (AMS).The list of 10 completed projects selected for the impact assessment study is given at **Annexure - 8.7**. Thefinal report in this regard has been submitted by the Academy of Management Studies (AMS).

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Monitoring visit to SMI schemes of 60 & 64 cluster in Karbi Anglong Autonomous Council, Assam on 12.9.2018

Sh. V D Roy, Director(M&A), CWC & Sh. Jeeta Ram, DD(M&A) on Monitoring visit to Dholaithabi Barrage Project r on 20.11.2018

CHAPTER-IX

CONSTRUCTION EQUIPMENT PLANNING AND MANAGEMENT

9.1 Construction Equipment Planning and Management

CWC is actively involved in various aspects of construction equipment planning and management which involves techno-economic appraisal of DPR from Plant Planning angle, consultancy in equipment planning, assistance in procurement of equipment and spare parts, contract management and preparation of cost estimates.

9.2 Project Appraisal

During the year, DPR of 24 projects of various states of the country as well as international projects were technically examined from construction scheduling and plant planning aspects. Out of these, 7 projects reports were accepted from plant planning and other aspects. In respect of the remaining 17 project reports,observations/comments were conveyed to the project authorities for compliance and further review.

9.3 Consultancy

No consultancy work for equipment planningin Irrigation and Multipurpose project was taken up during the Year 2018-19.

9.4 Manpower Planning

The study on "Employment Generation in Major and Medium Irrigation Projects during Operation & Maintenance Stage for 5 years from 2010-11 to 2014-15" has been initiated. Data in this regard has been sought from concerned project authorities in respect of 167 selected Major & Medium Irrigation projects in the country. Data in respect of 7 (1 Major & 6 Medium) irrigation projects has been received so far.

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Sh. R.K.Pachauri , CE (PPO), CWC, Sh. Anant Kr. Gupta, Director, CWC, Sh. S.P. Singh, DD, CWC, Lucknow and Sh. M. K. Makwana, NITI Ayog visited Saryu Nahar Pariyojana(National Project) during 5.2.19-7.2.19

Shear zone in the foundation of the Non Over Flow portion

CHAPTER-X

INTER-STATE MATTERS

10.1 Inter-StateRiver Water Disputes

CWC provides technical assistance to MoWR, RD&GR to settle water related disputes among the States amicably through negotiation. During the year 2018-19, a number of references were received in CWC involving various States. These references were examined and comments/views of CWC were communicated to concerned authorities. The details of some important reference and action taken thereof have been given in subsequent paras.

10.1.1Cauvery River Water Disputes - Implementation of Final Order of Cauvery River Water Disputes Tribunal

As per direction of Hon'ble Supreme Court, the Central Government framed the Cauvery Water Management Scheme to implement the Tribunal Award as modified by the Hon'ble Supreme Court vide Order dated the 16th February, 2018. As per scheme, the Cauvery Water Management Authority (CWMA) and Cauvery Water Regulation Committee (CWRC) has been constituted for the said purpose. Further, the Headquarters of CWMA has been located at New Delhi whereas CWRC has to function from Bengaluru. During the year 2018-19, two(2) meetings of the CWMA was held on 02.07.2018 and 03.12.2018 at New Delhi. The Authority unanimously worked out revised monthly quantum of water at Billigundulu site of CWC in a normal year during the meetings. During 2018-19, five (5) meetings of the CWRC were also held on 05.07.2018, 19.07.2018, 09.08.2018, 28.09.2018 and 12.12.2018 at New Delhi. CWC has provided all requisite support for conduct of the business of Authority and Regulation Committee.

10.1.2 Godavari River Water Disputes - Monitoring of implementation of order of Supreme Court on BabhaliBarrage :

In compliance to the Hon'ble Supreme Court Judgement dated 28-02-2013 in the matter of Original Suit No. 1 of 2006 - State of A.P vs Maharashtra & Others on Babhali Barrage issue, a three Members Supervisory Committee was constituted by MoWR, RD&GR to supervise the operation of Babhali Barrage vide its O.M. dated 24th October 2013. The composition of the Committee is as under:

(a)	Member, CWC	- Chairman Ex-officio
(b)	Principal Secretary to Government(Projects), Irrigation & CAD Deptt., Government of A.P.	- Member Ex-officio
(c)	Principal Secretary, WRD, Government of Maharashtra.	- Member Ex-officio

Later as per order of the Hon'ble Supreme Court, the composition of Committee was modified to include the representative of Telangana also.

Powers and functions of the Committee as laid down by Hon'ble Court are as follows:

i) The Committee shall supervise the operation of Babhali Barrage.

ii) The Committee shall ensure that;

a) Maharashtra maintains Babhali Barrage storage capacity of 2.74 TMC of water out of the allocation of 60 TMC given to Maharashtra for new projects under the agreement dated 6.10.1975.

b) The gates of Babhali Barrage remain lifted during the monsoon season, i.e. July 1 to October 28.

c) During the non-monsoon season i.e., from October 29 till the end of June next year, the quantity of water which Maharashtra utilizes from Babhali Barrage does not exceed 2.74 TMC of which only 0.6 TMC forms the common submergence of Pochampad Reservoir &Babhali Barrage.

d) Maharashtra does not periodically utilize 2.74 TMC from time to time.

e) Maharashtra releases 0.6 TMC of water to A.P. on 1st March every year.

Five meetings of Supervisory Committee have been held on 27.02.2014, 30.06.2014, 17.10.2014, 4.2.2015 and 23.6.2016. No meeting of the Committee was held during the year 2018-19. However, as per direction of Member (WP&P), CWC and Chairman of Supervisory Committee on Babhali Barrage, the opening and lowering of the gates at the beginning and end of monsoon period and releasing of the water on 1st March as per the order of the Supreme Court were carried out during 2018-19.

10.1.3 Mahanadi River Water Dispute

With reference to complaint of State of Odisha under Section 3 of ISRWD Act, 1956, a Negotiation Committee was constituted by MoWR,RD&GR for resolution of the Mahanadi River Water Dispute on 19.1.2017. Negotiation Committee comprises of members from Basin States and concerned Ministries of Central Government, CWC, IMD and NIH with specified Terms of Reference. Two meetings of the Negotiation Committee were held on28.02.2017 and 22.05.2017. However, the State of Odisha did not participate in the 2nd meeting of the Negotiation Committee. Both the States, Odisha and Chhattisgarh, also did not provide the requisite data to the Committee. On the basis of available data, the Negotiation Committee prepared its report and submitted the same to MoWR, RD & GR.

Later, the State of Odisha has filed an Original Suit (No 1 of 2017) on the Mahanadi Water dispute before Hon'ble Supreme Court. The final hearing of the case was concluded on 23.1.2018. In the final hearing, the Original Suit was disposed and direction was given to Central Government for constitution of Water Dispute Tribunal for adjudication of the water dispute between the partyStates within a period of one month from the date of order. Accordingly, MoWR,RD&GR constituted the Mahanadi Water Disputes Tribunalvide its notification dated 12/3/2018.The complaint of the State of Odisha and reference from Government of Jharkhand have been referred to the Tribunal.

10.1.4 Vansadhara River Water Dispute:

The State of Orissa filed a complaint under Section 3 of the Inter-State River Water Disputes Act, 1956 with the Ministry of Water Resources, Government of India on 14.2.2006 seeking constitution of an Inter-State Water Disputes Tribunal and to refer the water dispute between the State of Orissa and Andhra Pradesh in respect of inter-State river Vansadhara and its valley for adjudication. Pursuant to the order passed by the Supreme Court, the Central Government constituted the Vansadhara Water Disputes Tribunal (VWDT) by issuing a Gazette Notification on 24.2.2010 and the complaint of Odisha and Andhra Pradesh were referred to the Tribunal by Central Government.

The Tribunal has submitted a report and decision under Section 5(2) of the Act on 13.9.2017. The report of the Tribunal was examined in CWC and certain issues requiring clarifications from Tribunal were identified and submitted to MoWR,RD&GR in November 2017. Accordingly, the Central Government has filed a reference under Section 5(3) of the ISRWD Act, 1956 on 12.12.2017. The matter is under adjudication in the Tribunal.

10.1.5 Mahadayi Disputes Water Tribunal:

The Mahadayi Water Disputes Tribunal was constituted in November, 2010 under the provisions of the ISRWD Act, 1956 for adjudication of water disputes among party States i.e. Goa, Karnataka and Maharashtra in respect of Mahadayi basin. During the year, Justice J.M. Panchal, Chairman, Mahadayi Water Disputes Tribunal has submitted Tribunal's report under Section 5(2) of the said Act to the Government of India on 14.08.2018. The report of the Tribunal was examined in CWC and nine (9) issues requiring clarifications from Tribunal under Section 5(3) of the said Act were identified and submitted to MoWR, RD&GR.

10.1.6 Misc. Inter-State Consultations:

- Two inter-State meetings between Bihar and Jharkhand States regarding Baksoti Barrage Project (Bihar) were held on 11.04.2018 and 28.06.2018. In the meeting held on 28.06.2018 under the Chairmanship of Chairman, CWC, no objection from inter-State aspect for Baksoti Barrage Project was accorded while restricting the surface

water utilisation from Sakri and Nata sub-basins to 159.2 MCM and 16.59 MCM respectively. Govt. of Bihar was requested to revise the project planning based on the decision taken in the meeting and submit the same to CWC for further appraisal.

- An inter-State meeting between the States of Jharkhand and West Bengal was held on 21.06.2018 under the Chairmanship of Chairman, CWC to facilitate resolution of the issue regarding construction of Sidheswari-Noon Beel Dam by West Bengal under Mayurakshi-Siddheswari-Noonbeel agreement of 1978 which was signed between West Bengal and erstwhile Bihar. It was decided in the meeting to facilitate further technical discussions between Jharkhand and West Bengal.

10.2 Regional Conferences of States on Water Resources

10.2.1 Regional Conference of Southern States at Hyderabad

The Regional Conference of Southern States on Water Resources was held at Hyderabad on 20.02.2018. As follow up of the decision taken during the Conference, a meeting was convened under the Chairmanship of Chairman, CWC to discuss inter State issues with regard to Parambikulam Aliyar Project (PAP) agreement, environmental clearance to Attapady Valley Irrigation Project (AVIP), Neyyar project and Shenbagavli Anicut.

10.2.2 Regional Conference of Eastern States at Kolkata

The Regional Conference of Eastern States on Water Resources was held at Kolkata on 16.04.2018. The issues related to lean season flow in Ganga, Tilaiya-Dhadhar Diversion Scheme, Batane Reservoir Scheme, Upper Mahananda Irrigation Scheme, Fulwari Barrage, revision of Mayurakshi - Sidheshwari - Noonbeel Agreement, unified and scientific control of all the reservoirs under DVC, Mahanadi Basin Water Issue - ensuring free flow of water in Mahanadi River, Khadga Barrage and Tel Irrigation Project etc. were discussed during the Conference. Officials from MoWR, RD&GR, CWC, CGWB, State Govts. from Eastern States, Damodar Valley Corporation, Ministry of Power, GoI participated in the discussion. Follow up action on decision taken in the Conference on Inter-State issues were taken and status of the same was informed to MoWR, RD & GR from time to time.

10.2.3 Regional Conference of Western States at Mumbai.

The Regional Conference of Western States on Water Resources was held on 18.06.2018 at Mumbai. During the Conference various issues raised by States related to NWDA proposal of intra-State Links, Godavari-Cauvery Links, Kalasa-Bandura NalaDiversion Project, Expeditious completion of Dudhganga Project, CADWM Programme of Government of India, AIBP Projects included for funding under PMKSY, works of RRR of water bodies in Saurashtra Region, Intra-State Link Project namely, Damanganga-Sabarmati – Chorwad(DSC) Link Canal Project, finalization of Memorandum of Understanding to be signed among the States of Maharashtra, Gujarat and Union Government regarding inter-State River Links namely Par-Tapi- Narmada and Damanganga-Pinjal, Use of Tapi re-generation flow between Maharashtra and Madhya Pradesh etc were discussed. CWC took further follow up action on the decision taken in the Conference and status of the same was informed to MoWR, RD & GR from time to time.

10.3 Publishing ofImportant Documents Related to Inter State Matters in Public Domain:

A large volume of information related to inter-state issues are available in different directorates of CWC. This includes reports of Tribunal, important judicial decisions, decisions of Central Government etc.CWC has compiled various such important documents and published on CWC websitein Public Domain.Some of these documents available on CWC website are as under:

1. Report of Cauvery Water Disputes Tribunal (Vol.-I to Vol.-V)
2. Supreme Court Order dated 09.12.2016regarding Cauvery Water Disputes Tribunal
3. Supreme Court Order dated 16.02.2018regarding Cauvery Water Disputes Tribunal
4. Further Report of Godavari Water Disputes Tribunal (1980)
5. Report of Krishna Water Dispute Tribunal-I (1973) (Vol.-I to Vol.-III)
6. Further Report of Krishna Water Dispute Tribunal-I (1976)
7. Report of Krishna Water Dispute Tribunal-II (2010)
8. Further Report of Krishna Water Dispute Tribunal-II (2013)
9. Final Order and Decision of the Narmada Water Dispute Tribunal

10. Further Report of the Narmada Water Dispute Tribunal(1979) (Vol.-I & II)
11. Report of Ravi- Beas Water Tribunal Report (1987)
12. Report of Vamsadhara Water Dispute Tribunal (Vol.-I to Vol.-III)
13. Report of Narmada Water Disputes Tribunal(Vol.-I to Vol.-IV)
14. Decision of Cabinet Committee on dependability of projects

10.4 Inter-State Projects- Control Boards/ Committees

10.4.1 Bansagar Control Board

In pursuance of an inter-state agreement among the Chief Ministers of Madhya Pradesh, Uttar Pradesh and Bihar, the Bansagar Control Board was constituted vide resolution of erstwhile Ministry of Agriculture & Irrigation in January, 1976 for efficient, economical and early execution of Bansagar Dam and connected works. The headquarter of the Board is located at Rewa (Madhya Pradesh).

The Union Minister of Water Resources is the Chairman of the Board and the Union Minister of Power, Union Minister of State for Water Resources, Chief Minister and Minister in charge of Irrigation and Finance of the concerned three States and Minister-in-charge of Electricity of Madhya Pradesh are its Members. Chairman, CWC is the Chairman of the Executive Committee of Bansagar Control Board, which manages the day to-day affairs of the Board.

Bansagar Damon Sone River, a joint venture of the States of Madhya Pradesh, Uttar Pradesh and Bihar was executed by Water Resources Department, Madhya Pradesh under the directions of the Bansagar Control Board. Execution of the canal works in respective territorial jurisdiction was carried out by the concerned States independently and work of Power Houses was executed by MPEB. The benefits and cost of the dam including land acquisition and rehabilitation are to be shared by Madhya Pradesh, Uttar Pradesh and Bihar in the ratio of 2:1:1(MP : UP : Bihar). The latest estimated cost of project is Rs. 1582.94 Crore at 2009 price level. The total expenditure of Rs. 1969.94Crore has been incurred on the projectup to March, 2019.

The total catchment area of the Sone river is 69,281 Sq. Km of which 47,848 Sq. Km or about 69.06 % lies in Madhya Pradesh and rest in Uttar Pradesh, Bihar and Jharkhand. The catchment area up to dam site is 18,648 Sq. Km. The rainfall in the upper part of the catchment area is fairly high and river has sizeable water resources.

River Sone has immense potential for development of irrigation and power to benefit the famine and scarcity hit areas in addition to providing much needed power for exploiting the industrial potential of the area which is rich in minerals. The project will cater for the irrigation needs of large parts of chronic scarcity affected areas in Shahdol, Sidhi, Satna and Rewa Districts of Madhya Pradesh, Mirzapur District of Uttar Pradesh and Palamau District of Jharkhand.

The project will provide annual irrigation to 2.49 lakh hectares in Madhya Pradesh, 1.50 lakh hectares in Uttar Pradesh and 0.94 lakh hectares in Bihar towards stabilizing its existing Sone Canal System. The State Governments of Madhya Pradesh, Uttar Pradesh and Bihar fund the project in the ratio of 2:1:1. The details of share due/received in relation to the expenditure incurred as on 31.03.2019 of Rs. 1969.94crore is as under:

Status of Contribution of Fund as on 31.03.2019

(inCroreRs.)

Period	Total Expen-diture	Share Due			Share Received			Balance Share		
		MP	UP	Bihar	MP	UP	Bihar	MP	UP	Bihar
Up to 31.03.18	1906.26	953.13	476.57	476.57	1070.24	409.97	426.05	117.11 (+)	66.61 (-)	50.52 (-)
During 2018-19	63.68	31.84	15.92	15.92	-4.12	47.80	20.00	4.12(-)	31.88 (+)	4.08 (+)
Total as on 31.03.19	1969.94	984.97	492.48	492.48	1066.12	457.77	446.05	112.99(+)	34.73 (-)	46.44 (-)

The dam at its full height has submerged 336 villages. Approximately 1.5 lakh PAPs of 54,686 families have been affected. Total 58,753.40 hectare land is coming under submergence, out of which 37,090.40 hectare is private land; 17185 hectare is revenue land and 4478 hectare is forest land. The private land of 37,090.40 hectare has been fully acquired along with the property compensation. Development of residential plots in required numbers in model villages have already been done and handed over to the PAPs. R&R Programme has been implemented based on norms approved by the Executive Committee and orders issued by Government of Madhya Pradesh; Comprehensive R&R policy for the project has been finalized and implemented.

The last (76th) meeting of the Executive Committee of Bansagar Control Board was held on 11.06.2018. The details of important aspects discussed during the meeting are given below:

Finalisation of the Reservoir Operation Manual of Bansagar Dam

In the 63rdmeeting of the Executive Committee (EC) held on 9.1.2002, the draft resolution of constitution of Committee as finalized by the Ministry of Water Resources (MoWR) was approved. The constitution was accordingly, notified by the MoWR vide letter No. 15/5/2001-MI/BM dated 8.3.2002.

Subsequently, the Draft Bansagar Reservoir Regulation Manual has been prepared and circulated to all the three co-basin States for their comments/views. Water Resources Department, Government of Madhya Pradesh observed that rule curve levels of draft Bansagar Reservoir Regulation Manual were of static nature and desired that it should be of dynamic nature.

To incorporate the issues raised by the Water Resources Department, Government of Madhya Pradesh, the Executive Committee decided that, two curves viz. Lower and Upper Guide Curve could be developed and Engineer-in-charge of Reservoir Regulation may operate the reservoir within these two rule curve levels which would give the flexibility in reservoir operation.

The Draft Guidelines for Reservoir Regulation of Bansagar Dam has been modified as per decision taken in the 74th meeting of Executive Committee. The Reservoir Operation Manual was approved in the75thmeeting of the Executive Committee.

In the 76th meeting of Executive Committee, Chief Engineer, WRD, MP informed the Committee that Bansagar Dam was not operated as per Reservoir Operation Manual in the last monsoon. Chief Engineer (BPMO), CWC pointed out that necessary data such as detail of storms, channel capacity, stream flow data, maximum observed peak etc. has not been provided / incorporated by the Project Authority in the Reservoir Regulation Manual of Bansagar Dam as per the assurance given by Project Authority in the last meeting of Executive Committee. In the absence of the aforesaid data, flood cushion and its adequacy to moderate various floods could not be carried out.

Chairman, CWC directed the Project Authority and Government of Bihar to provide the requisite information / data as desired by BPMO/HSO, CWC within two weeks.

Revised Cost Estimate of Bansagar Dam Project and proposal for O&M setup required after completion of the Dam

It was decided in the 74th meeting of Executive Committee that Engineer-in-Chiefs of all the co-basin States will finalise the project construction cost and get it vetted from Chairman, Executive Committee and close the account by 31.03.2014. However, in the meanwhile, MoWR, RD & GR vide it's Office Order No. 14/2/2015-Estt.IV/965 dated 2.6.2015 constituted a Committee under the Chairmanship of Chairman, CWC to work out the cost of Bansagar including the cost of rehabilitation and related issues of O&M Cost. The Committee circulated its draft report to all concerned for their views/observations.

The views/comments of three co-basin States on the above report were received. The views/comments on the report from all the three co-basin Stats were found to be divergent in nature, and, as a result, the report of the Committee could not be finalized.

During the 75th meeting of EC, it was decided that a meeting of Engineer-in-Chiefs of all of the three co-basin States may be convened by CWC under the chairmanship of Member, WP&P, CWC. Thereafter a meeting of Principal Secretaries of WRD of three co-basin States may also be convened in MoWR, RD & GR.

In pursuance of the decision taken in 75th meeting of Executive Committee, a meeting was convened on 6.2.2017 under the Chairmanship of Member (WP&P), Central Water Commission. In the meeting, the draft report of CWC was discussed and some modifications were suggested in the original draft report. In the draft report, annual benefit for power has been calculated by considering all four power houses whereas in the modified proposal, power benefit was taken only from three power houses. The Government of MP once again does not agree with the proposed cost apportionment as suggested in this meeting.

Another meeting under the chairmanship of Secretary (WR, RD & GR), was held on 21.7.2017 to discuss the conclusions/decisions emerged in the meeting held on 6.2.2017 under the Chairmanship of Member (WP&P), CWC. On the basis of discussion, a note on "Apportionment of cost of Bansagar Multipurpose Project" was finalized and circulated for concurrence/views to co-basin States. The sharable cost of dam as per rationalization of establishment cost (without cost apportionment between irrigation and power) was once again not acceptable to WRD, Govt. of MP.

Further, to discuss the views/observation of the co-basin States on the draft Note, another meeting was held on 9.3.2018 under the chairmanship of Secretary, MoWR,

RD&GR, in which the sharable cost of dam (without apportionment of cost and without rationalization of establishment cost) and the O&M cost (including O&M set up) were discussed. The summary record of the discussion of the meeting was circulated by MoWR,RD&GR for comments/observation. The comments/observation of WRD, Govt. of Bihar and WRD, Government of Uttar Pradesh has been received by Ministry.

In this meeting, it was decided that a Committee will be constituted by MoWR,RD&GR comprising representatives of the party States and the Ministry to assess the realistic manpower requirement for the O&M works of Bansagar project. The Committee will review and decide the O&M cost for the next ten years from 2018-19 onwards, review the status of work charged and daily wages employees and take appropriate decision to reduce their numbers. The constitution of the Committee is under process / finalization.

Bansagar Reservoir Regulation Committee

Para 7 of the Agreement of Bansagar Project states "Rules for regulation of filling and use of Bansagar Reservoir will be drawn up by a Committee consisting of Chairman, Central Water and Power Commission, and Chief Engineer of Irrigation of the three States". In accordance with the agreement, Ministry of Water Resources, Govt. of India vide Resolution dated 8.3.2002 had constituted "Bansagar Dam Reservoir Regulation Committee".

As per Terms of Reference (TOR) of the Regulation Committee, the Committee shall draw up rules for regulation of filling and use of Bansagar Reservoir with a view to meet the requirement of members States within the provision of Agreement of Bansagar Project.

The 4thmeeting of BansagarDam Reservoir Regulation Committee was held on 7.8.2018 to discuss the issues related to releases of water as per their 10 daily requirements corresponding to their allotted share from Bansagar reservoir as per Bansagar Reservoir Manual

10.4.2 Betwa River Board

In accordance with the inter-state agreement of 1973 between Uttar Pradesh and Madhya Pradesh, the decision was taken to constitute a Control Board for the execution of the Rajghat Dam Project, an inter-state project of Uttar Pradesh and Madhya Pradesh. Accordingly, Betwa River Board was constituted under the Betwa River Board Act –

1976 for efficient, economical and early execution of the project. The Headquarter of the Board is at Jhansi (Uttar Pradesh).

Union Minister of Water Resources is the Chairman of the Board and Union Minister of Power, Union Minister of State for Water Resources, Chief Ministers and Minister-in-charge of Finance, Irrigation and Power of the concerned two States are its Members.

As per Betwa River Board Act 1976, Chairman, CWC is the Chairman of Executive Committee of Betwa River Board subject to the general superintendence and control of the Board. The management affairs of the Board are vested in the Executive Committee, in accordance with rules and the directions of the Board. The Executive Committee may exercise any power and do any act which may be exercised by the Board. Chairman, Executive Committee has been delegated with emergency powers to take decision on urgent proposals, subject to ratification by the Executive Committee in its next meeting.

The Rajghat Dam with appurtenant structures has been constructed across river Betwa to provide irrigation facility to 1.38 lakh ha in Uttar Pradesh and 1.21 lakh ha in Madhya Pradesh with power generation of 45 MW(15 MW x3) through Rajghat Hydro Electric Project at the toe of dam on left bank. The cost as well as benefits of the project is to be shared equally by both the States. As per the Betwa River Board Act 1976, the entire expenditure on Rajghat Dam, Rajghat Power House and appurtenant works and all other expenditure incurred by the Board is to be equally shared by both Uttar Pradesh and Madhya Pradesh as proposed in the budget of the Board. The project was completed in June 2005 and is in O&M stage since October, 2005.

The status of contribution made by Government of Uttar Pradesh and Madhya Pradesh for expenditure incurred by BetwaRiver Board for the period from 2005-06 to 2018-19 is as under:

(Amount Rs. in crore)

Year	Budget Allocation	Share of M.P Govt.	Share of U.P Govt.	Contribution made by U.P Govt.	Contribution made by U.P Govt.	Revenue received	Yearly Expenditure
2005-06	4.5	2.25	2.25	17.45	-	0.62	9.499
2006-07	9.20	4.60	4.60	-	-	1.00	11.14
2007-08	9.30	4.65	4.65	6.65	11.406	1.2456	10.55
2008-09	13.50	6.75	6.75	6.755	4.50	1.72	14.85
2009-10	19.66	9.83	9.83	10.00	4.50	1.51	17.92

2010-11	20.88	10.44	10.44	4.50	4.50	1.93	16.96
2011-12	26.31	13.155	13.155	10.00	6.50	7.82	20.05
2012-13	30.60	15.30	15.30	15.30	5.00	8.93	20.62
2013-14	30.00	15.00	15.00	15.30	5.00	0.91	22.97
2014-15	26.00	13.00	13.00	13.00	4.00	1.58	24.97
2015-16	32.00	16.00	16.00	13.00	2.00	0.95	22.13
2016-17	34.00	17.00	17.00	13.00	10.00	0.59	23.59
2017-18	46.14	23.07	23.07	13.0	14.93	0.41	28.80
2018-19	41.00	20.50	20.50	13.00	18.00	0.46	32.03

The reservoir (FRL-371.00) filled up to 371.00M during the year 2018-19. The three units of Power House were commissioned during 1999-2000. Power generation was 800.28 lakh units during 2018-19.

Last (15th) meeting of the Betwa River Board was held on 30.04.2015. The 91st meeting of the Executive Committee was held on 16.07.2018.

10.4.3 Ghaggar Standing Committee

The Ghaggar Standing Committee was constituted in February 1990 to examine and coordinate irrigation, flood control, and drainage works in Ghaggar basin and lay down priority for their implementation and accord clearance to individual schemes in Ghaggar basin from inter-state angle. The Members of Committee are from Ministry of Water Resources, Northern Railway, Central Water Commission and Irrigation Departments of the State of Punjab, Haryana and Rajasthan.

27th and 28th meetings of the Ghaggar Standing Committee were held on 03.09.2013and 01.03.2019 respectively under the Chairmanship of Member (RM).The meeting decided that a small Mathematical Model Study regarding mitigation of the flood problem for the entire Ghaggar basinshall be conducted by CWPRS, Pune in consultation with the respective State Governments.

10.4.4 Sahibi Standing Committee

The Sahibi Standing Committee was constituted in 1978 to oversee the implementation of all the elements of the master plan and to ensure that regulation of flows at control points is carried out in best interest of the concerned parties. The Members of the

Committee are from Northern Railway, Irrigation Department of the States of Haryana, Rajasthan and NCT of Delhi. The 15th meeting of the Committee was held on 18.07.1995.

10.4.5 Yamuna Standing Committee

The Yamuna Standing Committee was constituted to study the interest of Delhi, its suburbs and the Northern Railway bridges and other studies on Yamuna at Delhi against undue increase in Maximum Flood Level in Yamuna at Delhi on account of flood control works upstream, to safe guard the interest of Haryana, Uttar Pradesh and Delhi against adverse effect of flood control works in any of these areas and to ensure that adequate water way is provided in any new structure built across the Yamuna river. The Members of the Committee are from GFCC, Northern Railway, Central Water Commission, Ministry of Surface Transport and Irrigation Department of States of Haryana, Uttar Pradesh and NCT of Delhi.

The 89th meeting of the Committee washeld on 15.09.2017 under the Chairmanship of Member (RM), CWC. The minutes of the meeting were finalized and circulated among the Members of the Committee.

10.4.6 Committee on Special Remedial Works for Flood Protection Embankment on rivers Sutlej and Ravi

Committee on Special Remedial Works for flood protection embankment on rivers Sutlej and Ravi was constituted in December 1989 by the Ministry of Water Resources under Chairmanship of Chief Engineer(Flood Management), Central Water Commission to technically examine proposals for counter protective works on the river Sutlej and Ravi submitted by the Government of Punjab after verification of development in the field and to monitor utilization of Central Assistance by Punjab by periodic inspection of ongoing and completed works.

The Members of the Committee are from Ministry of Water Resources, Central Water and Power Research Station, Pune, Central Water Commission, Ministry of Defense and Irrigation Department of the State of Punjab. The Committee was enlarged during 1996 by co-opting Members from Border Security Force, Central Public Works Department and Ministry of Home Affairs at request of Ministry of Home Affairs.

The 32nd and 33rd meetings of the Committee were held at Amritsar on 01.12.2011 and 22.02.2013.

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Chairman, CWC along with Sh. Navin Kumar, Chief Engineer (IMO) & Sh. A. S. Goel, Chief Engineer (YBO) briefing media about 1st CWMA Meeting

MWDT submitting report-cum-decision to the Hon'ble Minister

CHAPTER-XI

ENVIRONMENTAL MANAGEMENTOF WATER RESOURCES PROJECTS

11.1 Environment Management

The Environmental Management Organisation of CWC is involved in monitoring of implementation of environmental safeguards in water resources projects, Studies related to Post Project Environmental Impact assessment (EIA) of water resources projects, and preparation of environment aspects in DPRs of water resources projects..

11.2 National Environmental Monitoring Committee for River Valley Projects (NEMCRVP)

National Environmental Monitoring Committee for River Valley Projects (NEMCRVP) was constituted in February, 1990 to monitor the implementation of environmental safeguards of irrigation, multipurpose and flood control projects. The Committee is entrusted with the work to review the mechanism established by the State Governments and project authorities to monitor the implementation of environmental safeguards and to suggest additional compensatory measures in respect of water resource projects.

11.2.1 Constitution of NEMCRVP

Member (WP&P), CWC, is the Chairman of NEMCRVP. The representatives from Ministries of Agriculture &Farmer's Welfare; Environment, Forests& Climate Change; Water Resources, River Development and Ganga Rejuvenation; Tribal Affairs;NITI Aayog;CEA andCWC are Members of the Committee.Chief Engineer (EMO), CWC is the Vice Chairman and Director (EM), CWC is the Member Secretary of the Committee. Environmental Management Directorate, CWC, functions as the secretariat of NEMCRVP.

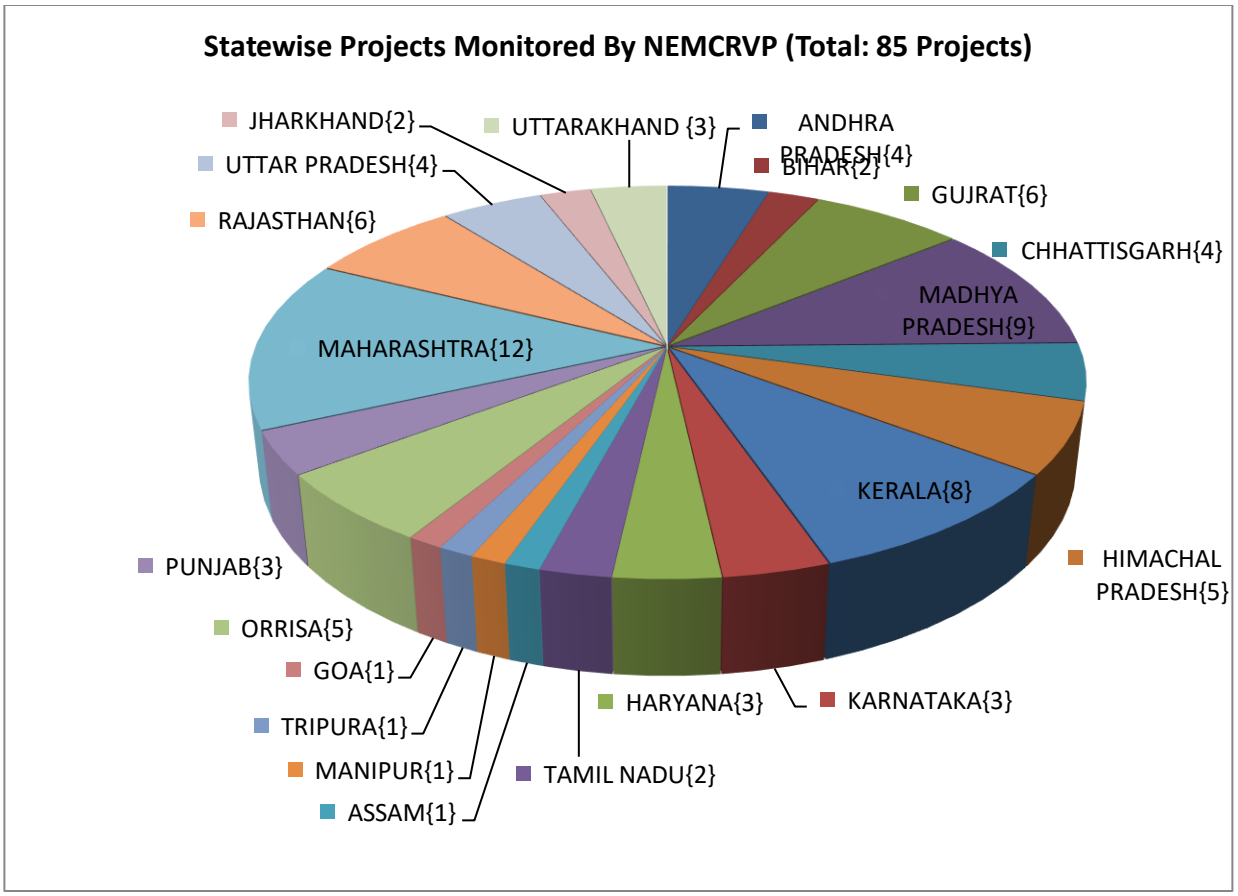

Fig.1 (Statewise Projects Monitored By NEMCRVP)

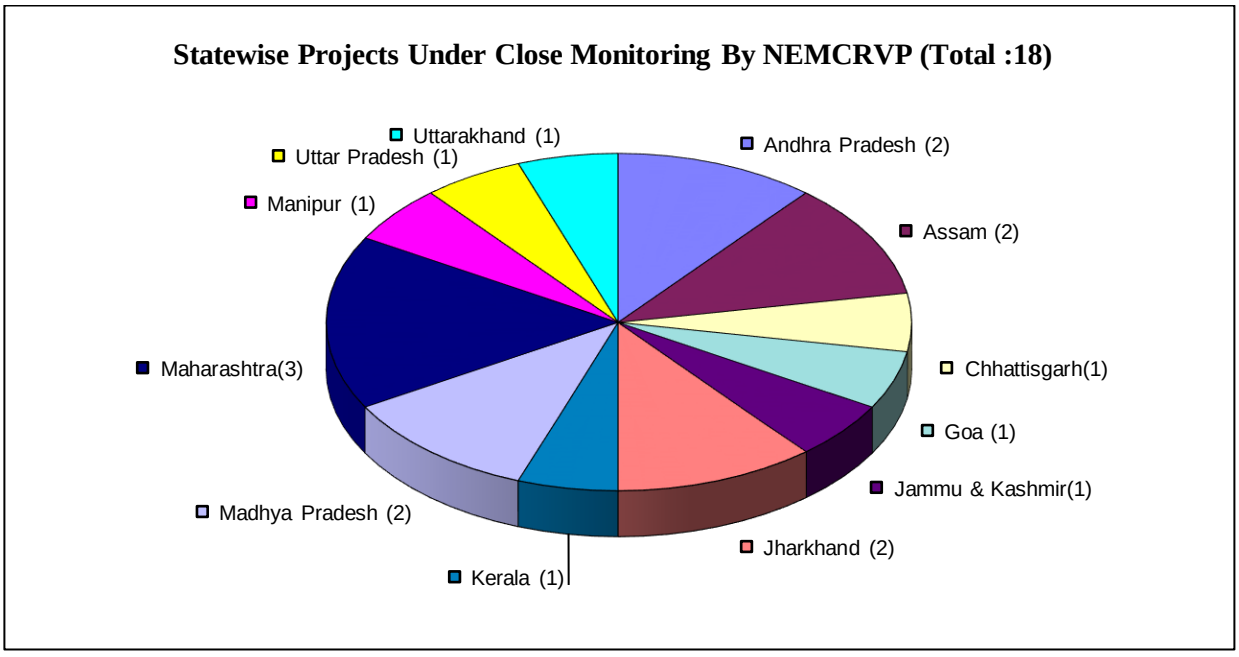

Fig.2 (Statewise Projects Under Close Monitoring By NEMCRVP)

11.2.2 Functions of NEMCRVP

The NEMCRVP visits the projects and holds meetings with the State Governments and Project Authorities for implementation of environmental safeguards as stipulated in environmental and forest clearances.

It encourages the constitution of State Environmental Monitoring Committee (SEMCs) and Project Environmental Management Committee (PEMCs) and monitors the activities of these Committees. As a result of the above, 20 States have already constituted SEMCs under the Chairmanship of Secretary; State Water Resources/ Irrigation Department. PEMCs have been constituted for 68 out of 85 projects selected by NEMCRVP. In addition to this, 48 additional PEMCs have also been constituted for the other projects. PEMCs play a vital role in the implementation of environmental safeguards stipulated for the project. Chief Engineer (EMO)/Director (EM), CWC is the Member of the SEMCs whereas Regional Chief Engineer, CWC is Special Invitee inthese Committees. Director (Appraisal & Monitoring) of the concerned Regional Office of CWC represents CWC in PEMCs.

During 2018-19, the Committee visited Thoubal Multipurpose Project, Manipur during 4th to 7th December, 2018 and 65th Meeting of the Committee was held at Imphal, Manipur under the Chairmanship of Member (WP&P), CWC & Chairman of the Committee. In the meeting, Secretary, WRD, Govt. of Manipur, Principal Chief Conservator of Forests (PCCF), Govt. of Manipur, Additional PCCF, Govt. of Manipur, Joint Secretary (WRD), Govt. of Manipur, Deputy Secretary, Dept. of Revenue, Govt. of Manipur along with Chief Engineer (WRD), Govt. of Manipur and other officers of Water Resources Department, Govt. of Manipur were present. The Monitoring Reports were sent to Secretary, WRD, Government of Manipur for compliance.

11.3Environmental Impact Assessment (EIA)

CWC undertakes Environmental Evaluation Studies of completed Water Resources projects to assess the environmental changes that occurred in post construction phase of the projects. It also include study of impact of the project on Resettlement and Rehabilitation; socio-economic status, agriculture, irrigation and drainage, bio-diversity, land environment, public health, water environment including groundwater, etc.

During the period 2018-19, study of Environmental (including social) impacts of following three water resources projects has been undertaken:-

1. Ukai Project, Gujarat
2. Eastern Koshi Canal Project, Bihar
3. Tawa Project, Madhya Pradesh

Thesestudies have been awarded to the consultants through open tendering. The studies are in progress.

11.6Seminar on Environmental Issues in Water Resources Projects

CWC organized a One Day Seminar on Environmental Issues in Water Resources Projects on 9th October, 2018 at its HQ in New Delhi. The event was inaugurated by Sh. Upendra Prasad Singh, Secretary, MoWR,RD&GR in presence of Sh. S. Masood Husain, Chairman, CWC, Sh. Y.K. Sharma, Member (RM), CWC, Sh. N. K. Mathur, Member (D&R), CWC and Sh. S.K. Haldar, Member (WP&P), CWC. The seminar consisted of two Technical Sessions where nine technical papers were presented by domain experts from various sector. A Panel Discussion was also held on "Environmentally Sustainable Development in India" among professionals from CWC, MoEF&CC, NHPC, NIH and CGWB.

The main aim of the seminar was to have informed discussion regarding environmental issues in water resources development projects. The seminar provided a platform for discussions among experts/stakeholders from organizations, namely,MoEF&CC, CWC, National Water Development Agency, WAPCOS, Narmada Control Authority, Central Inland Fisheries Research Institute, NIH, Tehri Hydropower Development Corporation, Central Ground Water Board, National Hydro Power Corporation, State Government of Gujarat, State Government of Assam and NGOs.

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CHAPTER-XII

EXTERNAL ASSISTANCE

12.1 External Assistance for Development of Water Resources

External assistance flows into the country in various forms; as multilateral or bilateral aid, loan, grants and commodity aid from various foreign countries and other donor agencies. The main source of external assistance in irrigation sector has been the International Bank of Reconstruction and Development (IBRD) commonly known as the World Bank and its soft lending affiliate, the International Development Association (IDA). In addition to the World Bank, other funding agencies such as Japan Bank of International Cooperation (JBIC) and Asian Development Bank (ADB) have also been providing assistance for implementation of irrigation projects. Ministry of Water Resources and its organizations assist the State Governments in tying up the external assistance from different funding agencies to fill up the resources gaps, both in terms of funds and technological update for rapid development of country's water resources.

12.1.1 Role of Central Water Commission

The important activities of Central Water Commission in externally aided projects are:-

(a) Providing assistance to the State Governments for preparation of project proposal for getting external assistance for water sector projects.

(b) Techno-economic examination of the projects posed for external assistance and coordination with State and concerned departments/ministries such as CGWB, MoEF& CC, etc.

12.1.2 Techno- Economic Appraisal &Clearance of Projects

03 Nos.Concept Note and 02 Nos.DPRs of externally aided irrigation project has been appraised in CWC during the period 01st April 2018 to 31st March 2019. The details of these five projects are given in Table 12.1.

Table 12.1

List of Irrigation Projects Appraised in CWC during 2018-19 which are Likely to be Posed for External Assistance

S.No.	Name of Project	State	Funding Agency	Estimated Cost (in crores)	Remarks
A.	Concept Note/ Preliminary Project Report				
1.	Doubling Farmers' income Through Water Conservation, Phase-1	Himachal Pradesh	Externally Assisted	708.97	Recommended To MoWR, RD & GR for consideration of proposal for external funding on 06.07.2018 subject to some conditions to be complied at DPR Stage.
2.	Construction of 2(two) Nos. Rain Water Reservoir on upper catchment of Haora River near Champaknagar and on Champaicherra near Champaibari including rehabilitation of Katakhal drain in Tripura.	Tripura	JICA funding	181.00	Due to insufficient technical information on the proposal, MoWR, RD & GR has been recommended to return the proposal to the Project Authority with the request to resubmit the proposal with requisite details
3.	Land and Water Resources Development and Management Project for Livelihood Improvement in Mizoram.	Mizoram	JICA Funding	1229.90	Due to insufficient technical information on the proposal, MoWR, RD & GR has been recommended to return the proposal to the Project Authority with the requset to resubmit the

					proposal with requisite details
B	Detailed Project Report				
1.	Modernisation of Vijayanagara Channels in Tungabhadra Project under Karnataka Integrated and Sustainable Water Resources Management Investment Program (KISWRMIP), Tranche-2	Karnataka	ADB Funding	456.63 (PL 2017-18)	Considered and approved by Advisory Committee of MoWR, RD & GR during its meeting held on 31.10.2018
2.	Restoration and lining work of Western Main Canal and Ara Main Canal and its System.	Bihar	ADB Funding	3272.49	Revised DPR is yet to be submitted by the Project Authority.

12.2 The World Bank Assistance(EA Dte not maintain this data anymore)

The World Bank continues to be the primary source of external assistance in the water resources sector. The World Bank assistance is in the form of credit or loan. The World Bank financing policies for irrigation projects change from time to time. Initially it financed individual irrigation projects and then changed to financing composite projects in which a group of Major, Medium and Minor irrigation projects were financed under a single credit/loan agreement. It then started financing Water Resources Consolidation Projects in which irrigation sector of the whole State was involved under one credit/loan agreement. Now the policy of World Bank has shifted to finance Water Sector Restructuring Projects in which the emphasis is on irrigation sector reforms of the whole State.

12.2.1 Water Sector Restructuring Projects

Water Sector Restructuring Project is the latest concept in water resources development and management and are the latest generation irrigation projects being financed by World Bank. Water Sector Restructuring Projects are planned with the objective to take care of water sector reforms, proper implementation of state water policy, creation of apex water institutions and strengthening of multi sector water resources and environment capacity. At present five such projects are being taken up with the assistance of The World Bank in the State of Rajasthan, Madhya Pradesh, Uttar Pradesh, Maharashtra and Andhra Pradesh.

The main objectives of Water Sector Restructuring Project are:-

1. To set up an enabling institutional and policy frame work for water sector reform in the State for integrated water resources management.
2. To strengthen the capacity for strategic planning and sustainable development and management of the surface and ground water resources.
3. To initiate irrigation and drainage sub-sector reforms in the State to increase the productivity of irrigated agriculture through improved surface irrigation system performance and strengthened agriculture support services involving greater participation of users and the private sector in service delivery.

12.2.2 On-going Credits / Loans Agreements

There are four projects under The World Bank funding. The assistance utilized is givenin Table 12.3.

Table 12.3
External Assistance to Projects (World Bank)

Sl. No	Name of Project	Credit No/Loan No.	Agency	Time Slice		Est. Cost(Million)		Assistance (in Millions)	
				Starting month	Closing month	Total as per SAR	Latest	Total	Utilized uptoSept. 17
1.	Andhra Pradesh Water Sector Improvement Project	7897-IN	IBRD (USD)	Aug2010	Jul2018	NA	NA	USD 450.60	USD 329.67

Sl. No	Name of Project	Credit No/Loan No.	Agency	Time Slice		Est. Cost(Million)		Assistance (in Millions)	
				Starting month	Closing month	Total as per SAR	Latest	Total	Utilized uptoSept. 17
2.	Dam rehabilitation and Improvement Project	7943-IN	IBRD (USD)	Dec 2011	Jun 2018	NA	NA	USD 139.65	USD 0.44
	Dam rehabilitation and Improvement Project	4787-IN	IDA (XDR)	Dec 2011	Jun 2018	NA	NA	XDR 93.02	XDR 82.79
3.	West Bengal Accelerated Development of Minor Irrigation	8090-IN	IBRD (USD)	Dec 2011	Dec 2017	NA	NA	USD 30.00	USD 1.22
	West Bengal Accelerated Development of Minor Irrigation	5014-IN	IDA (XDR)	Dec 2011	Dec 2017	NA	NA	XDR 78.20	XDR 50.88
4.	Uttar Pradesh Water Sector Restructuring Project (UPWSRP), Phase-II	5298-IN	IDA (XDR)	Oct 2013	Oct 2020	NA	NA	XDR 239.40	XDR 84.21

12.3 Japan Bank of International Cooperation Assistance

In water resources sector JBIC (JICA) provides financial assistance to major, medium and minor irrigation projects in the form of loans with the objective of increasing production of agriculture by mainly funding construction of civil works in the irrigation system. The main components of these projects are as follows:-

- Construction of civil works
- Training
- Consulting Services
- Agriculture Intensification Programme
- On-farm development.

12.3.1 On-going Agreements

There are two ongoing projects under JICA funding. The assistance utilized is given in Table 12.4.

Table 12.4
External Assistance to Project (JICA)

SI. No.	Name of Project	Loan Agreement No.	Loan Period		Estimated Cost	Total Assistance	Assistance Utilized upto Sep 2017 (in JPY)
			Starting Date	Closing Date	As per Agreement (Rs. in Crore)		
1	AP Irrigation and Livelihood Improvement Project	IDP 181	March 2007	July 2017	1137.77	JPY 15129.95	JPY 15129.95
2.	Rengali Irrigation Project, Ph-2	IDP-244	March 2015	March 2026	3603.67	JPY 32378.00	JPY 1040.78
	Rengali Irrigation Project, Ph-2	IDP-244A	March 2015	March 2026		JPY 1581.00	JPY 197.86
3.	Rajasthan Water Sector Livelihood Improvement Project (I)	IDP-259	March 2017	July 2024	--	JPY 13145.00	0
4	Rajasthan Water Sector Livelihood Improvement Project (I)	IDP-259A	March 2017	July 2024	--	JPY 580.00	0

12.4 Asian Development Bank

Asian Development Bank (ADB) in partnership with its developing member countries and other stakeholders, help create a world in which everyone can share in the benefits of sustained and inclusive growth. Whether it be through investment in infrastructure, health care services, financial and public administration systems, or helping nations prepare for the impact of climate change or better manage their natural resources, ADB is committed to helping developing member countries evolve into thriving, modern economies that are well integrated with each other and the world.

The main devices for assistance are loans, grants, policy dialogue, technical assistance and equity investments.

12.4.1 On-going Agreements

There is five on-going projects under ADB funding. The assistance utilized is given in Table 12.5.

Table 12.5
External Assistance to Project (ADB)

SI. No.	Name of Project	Loan Agreement No.	Loan Period		Estimated Cost	Total Assistance (USD)	Assistance utilized ending Mar 17
			Starting Date	Closing Date	As per agreement (Rs. Millions)		
1.	Sustainable Coastal Protection Management Investment Program-I	2679-IND	August 2011	June 2017	NA	USD 47.37	USD 23.45
2.	Assam Integrated Flood and River Bank Erosion Risk Management Investment Program	2684-IND	May 2011	July 2017	NA	USD 48.50	USD 38.81
3.	Karnataka Integrated and Sustainable Water Resources Management Investment Program-I	3172-IND	May 2015	March 2019	NA	USD 31.00	USD 9.64
4	Orissa Integrated Irrigated Agriculture and water Management Investment Program Tranche-2	3394-IND	June 2016	Sept. 2018	NA	USD 120.00	USD 27.64
5.	Climate Adaptation in Vennar Sub Basin in Cauvery Delta Project	3394-IND	July 2016	June 2021	NA	USD 100.00	USD 13.90

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CHAPTER-XIII

INTERNATIONAL COOPERATION WITH NEIGHBOURING COUNTRIES

13.1 Introduction

The three major river systems of India, namely, Ganga, Brahmaputra and Indus cross international borders. Ministry of Water Resources, River Development and Ganga Rejuvenation is responsible for strengthening international co-operation on matters relating to these rivers by way of discussions with neighbouring countries concerning river waters, water resources development projects and operation of related international treaties.

13.2 Cooperation with Nepal

Most of the rivers, which cause floods in the States of Uttar Pradesh and Bihar originate from Nepal. These rivers are Ghaghra, Sarda, Rapti, Gandak, BurhiGandak, Bagmati, Kamla, Kosi and Mahananda. In order to make flood forecasting and advance warning of floods in the flood plains of the above rivers, a scheme namely, "Flood Forecasting and Warning system on rivers common to India and Nepal" which includes 42 meteorological/ hydro-meteorological sites in Nepal and 18 hydrological sites in India, has been in operation since 1989. The data collected is helpful for formulating the flood forecasts and issue of warnings in the lower catchments.

A Treaty on Integrated Development of Mahakali (Sharda) River including Sharda Barrage, Tanakpur Barrage and Pancheshwar Multipurpose Project, namely “Mahakali Treaty” was signed between Governments of India and Nepal in February 1996, and it came into force in June, 1997. The Treaty is valid for a period of 75 years.

Various Joint Committees have been formed to co-ordinate and deal with different aspects of cooperation on issues related to water resources development and management among the two countries. Details of important Committees are as under:

I. **India – Nepal Joint Committee on Water Resources (JCWR)**: India-Nepal Joint Committee on Water Resources (JCWR) headed by the respective Water

Resources Secretary of the two countries formed in pursuance of the decision taken by the Prime Ministers of Nepal and India during the visit of the Hon'ble Prime Minister of Nepal to India from July 31 – August 06, 2000. The first meeting was held on 1-3 October 2000, at Kathmandu Nepal. The JCWR has met 8 times so far and last meeting was held on 11 January, 2019. JCWR has been functioning with the mandate to act as an umbrella Committee for all Committees and Groups formed for deliberation on water related issues between the two countries.

II. **India-Nepal Joint Standing Technical Committee (JSTC**) : During the 3rd meeting of India-Nepal Joint Committee on Water Resources (JCWR), it was decided to have a 3-tier mechanism to expedite the decision making process and the implementation of decisions under taken at the institutional interactions. Joint Standing Technical Committee was constituted to coordinate all existing Committees and sub Committees under JCWR. Chairman, GFCC, Patna has been nominated as Indian Team Leader and Sr. Jt. Commissioner (Ganga), MoWR as Member Secretary from Indian side. The first meeting of JSTC was held on 8-9 December, 2008 at New Delhi under the Chairmanship of Chairman GFCC. The JSTC has met six times so far and the last meeting was held on 9-10th January, 2019 at New Delhi in which all outstanding technical issues between the two countries were discussed.

III. **India-NepalJoint Committee on Inundation and Flood Management (JCIFM):**In pursuance of the decision taken during the 4th meeting of JCWR held in 2009, **Joint Committee on Inundation and Flood Management (JCIFM)** with Member(C), GFCC, Patna as Team Leader from India side was constituted replacing erstwhile bilateral Committees namely, Standing Committee on Inundation Problem (SCIP), Standing Committee on Flood Forecasting (SCFF), High Level Technical Committee (HLTC), Sub Committee on Embankment Construction (SCEC), Joint Committee on Flood Management (JCFM). JCIFM implements the decisions of JSTC in inundation and flood management issues and address the issues related to flood in this regard.JCIFM has met 13 times and the last meeting was held in 11-17th March,2019 at Kathmandu, Nepal.

IV. **Joint Team of Expert (JTE) –** An understanding was reached between His Majesty's Government of Nepal and Government of India during the visit of theHon'ble Prime Minister of Nepal to India in December 1991 on preparation of Detailed Project Report (DPR) of SaptaKosi High Dam Multipurpose project.

The JTE was constituted, with Member (RM), CWC as Team Leader from the Indian Side, to finalize the modalities of the investigations and the method of assessment of benefits of the proposed project. It was constituted in the year 2000, with the following mandate:

a) Prepare DPR of SaptaKosi High Dam and Sun Kosi Multipurpose Projects

b) Forward the approved DPR to respective Governments for acceptance

The last (15th) meeting of the India-Nepal Joint Team of Experts (JTE) on SaptaKosi high dam Multipurpose Project and Sun Kosi storage-cum-diversion scheme was held in September, 2017 at Kathmandu. Based on the review, JTE recommended extension of tenure of JPO-SKSKI for another 30 months from 1st March 2017.

13.2.1 Status of projects jointly implemented by India and Nepal

I. SaptaKosi High Dam Multipurpose Project & Sun Kosi Storage-cum Diversion Scheme, Indo-Nepal

Field investigation studies and preparation of DPR for SaptaKosi High Dam Multipurpose Project and Sun Kosi Storage-cum-Diversion Scheme have been taken up jointly by Government of India and HMG Nepal. A Joint Project Office (JPO) has been set up in Nepal in August, 2004 for investigation and preparation of DPR within a period of 30 months, which has been subsequently extended uptoAugust, 2019.

Preliminary studies of SaptaKosi High Dam Multipurpose Project envisages construction of a 269 m high dam to divert river waters through a dam toe power house with an installed capacity of 3000 MW (at 50% load factor) and irrigation of 15.22 lakh ha. Gross command area through construction of a barrage, 1 km downstream of the dam. An additional capacity of 300 MW is further contemplated by construction of three canal type power houses along the canal system.

The field investigation for preparation of DPR is still under progress. The project work is hampered maily due to local disturbances.

II. Pancheshwar Multipurpose Project

In pursuance of the Mahakali Treaty signed between Governments of India and Nepal in 1996, India and Nepal jointly undertook investigations & studies and prepared a Detail Project Report (DPR) of Pancheshwar Multipurpose Project. However, some issues between India and Nepal remained unresolved. Later, as per decision taken during the 3rd meeting of JCWR held in 2008, the Pancheshwar Development Authority (PDA), abi-lateral entity between India and Nepal with its office at Mahendranagar, Nepal, was constituted vide MoWR O.MNo.Z-14012/3/2013-Ganga/2302-2314 dated 7th August, 2014 to finalise DPR ofPancheshwar Multipurpose Project and to undertake its execution, operation and maintenance. Six meetings of the Governing Body (GB) of the PDA have been held so far. The last (6^{th}) meeting was held in April, 2018 at Kathmandu, Nepal.

The DPR of Pancheshwar Multipurpose Project was prepared/updated by Pancheshwar Development Authority (PDA) through M/s WAPCOS Ltd. The final draft DPR was forwarded by PDA to the two Governments in December, 2016 for their observations.Asthere were a number of issues which required further working to make the DPR mutually acceptable to the two Governments, the PDA, as per the decision taken by its Governing Body, established a Team of Experts/ Officials (ToE) in 2017, to resolve such issues. Three meetings of the ToE have been held so far. The last (third) meeting of ToE was held in February, 2019 at Kathmandu, wherein substantial progress has been made towards resolving issues. The matter has also been discussed at various other fora during the year 2018-19, including Indo-Nepal Joint Committee on Irrigation and Flood Management (JCIFM) and Joint Committee on Water Resources (JCWR).

13.3 Cooperation with Bhutan

A scheme titled "Comprehensive Scheme for Establishment of Hydro-meteorological and Flood Forecasting Network on rivers common to India and Bhutan" is in operation since 1979. The network consists of 32 hydro-meteorological/ meteorological stations located in Bhutan maintained by Royal Government of Bhutan (RGoB) with funding from India. Central Water Commission utilizes the data received from these stations for formulating the flood forecast.

A Joint Experts Team (JET) consisting of officials from the Governments of India and Royal Government of Bhutan was constituted in 1985 and modified in 1988 and further reconstituted in August, 1992 with Chief Engineer(B&BBO),CWC, as Team Leader from Indian Side. The mandate of JET are as follows :

a) To formulate programme for the Five- Year Plan for continuation of / improvementin the ongoing scheme under operation.
b) To formulate year-to-year programme of work within the overall plan as per (i) above.
c) To review the progress of work vis-à-vis the programme laid down.
d) To recommend the releases to be made to the Royal Govt. of Bhutan on the basis of progress achieved/likely to be achieved after discussion/random general checks.
e) To look into any other specific point related to the scheme which may crop up from time to time.

During 2018-19, the 34th and 35thmeetings of Joint Expert Team (JET) was held during 17th – 18th May, 2018 atAizwal, Mizoram and during 6th – 7th March 2019 at Paro, Bhutan.

A Joint Group of Experts (JGE) on Flood Management headed by Commissioner, Brahmaputra & Barak Basin (B&BB), MoWR, RD & GR has been constituted between India and Bhutan to discuss and assess the probable causes and effects of recurring floods and erosion in the southern foothills of Bhutan and adjoining plains in India and to recommend appropriate and mutually acceptable remedial measures to both Governments. The first meeting of JGE was held in Bhutan from 1st to 5th November, 2004. The JGE had met 8 times and the last meeting was held during1st – 3rd November, 2018 at Guwahati, Assam.

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. During the 2nd meeting of JGE held in February 2008, the reconstitution of Joint Technical Team (JTT) had been agreed with Chief Engineer, CWC, Shillong as its Team Leader (Indian Side). So far, five meetings of the reconstituted Joint Technical Team (JTT) between Government of India and Royal Government of Bhutan (RGoB) have been held. The last meeting was held during 26th - 27 April, 2018, Phuentsholling, Bhutan.

CWC is providing technical assistance for development of hydropower potential in Bhutan. Bhutan Investigation Division (BID), CWC, Phuentsholing is coordinating with RGoB and carrying out necessary field works in this respect.

13.4 Cooperation with China

The Government of India had entered into anMoU with China in the year 2002 for sharing of hydrological information on Yaluzangbu/ Brahmaputra river. In accordance with the provisions contained in the MoU, the Chinese side is providing hydrological information (Water level, discharge and rainfall) in respect of three stations, namely Nugesha, Yangcun and Nuxia located on river Yaluzangbu/Brahmaputra from 1st June to 15th October every year, which is utilized in the formulation of flood forecasts byCentral Water Commission. On expiry of the above MoU in 2007, the revised MoU was signed on 05-06-2008.

During the visit of the Hon'ble President of the People's Republic of China in November 2006, it was agreed to set up an Expert Level Mechanism (ELM) to discuss interaction and co-operation on provision of flood season hydrological data, emergency management and other issues regarding trans-border Rivers as agreed between them. Accordingly, the two sides have set up the Joint Expert Level Mechanism. The Expert Group from Indian side is led by a Joint Secretary level officer. The 12thmeeting of Expert Level Mechanism was held during 20th- 26th, February 2019in Ahmedabad, India.

AnMoU was signed between both the countries on 16th December 2010 as per which Chinese side will provide hydrological information of the LangqenZangbo/Sutlej River in Flood Season to India and the Indian side will provide the Chinese side information regarding data utilization in flood forecasting and mitigation. This MoU expired in 2015 and new MoU was signed on 6th November, 2015. Further, another MoU was signed between both the countries on 20th May, 2013 wherein Chinese side agreed to provide hydrological information of YarlungZangbu/ Brahmaputra River duringflood season to India.

In accordance with the MoU for 'Strengthening Cooperation on Trans-border Rivers' signed on 23rdOctober 2013, the two sides revised the Implementation Plan signed on 30th May, 2013upon the provision of providing hydrological information of

Yaluzangbu / Brahmaputra River. The revised Implementation Plan was signed in Beijing on June 30, 2014 during the Visit of Hon'ble Vice President of India to China. The period for sharing hydrological data between two countries have been changes from 1st June- 15th October to 15th May- 15th October during the 8th meeting of India-China Expert Level Mechanism on trans-border Rivers held at New Delhi from June 24-27, 2014.

13.5 Cooperation with Bangladesh

I. Indo-Bangladesh Joint Rivers Commission (JRC)

In order to ensure the most effective joint effort in maximizing the benefits from common river systems an Indo-Bangladesh Joint Rivers Commission (JRC) is functioning since 1972, which is headed by Water Resource Ministers of both the countries. So far, 37 meetings of JRC have been held and its last meeting was held in March, 2010.The technical level meeting of JRC is held regularly to discuss various related technical matter. Last technical level meeting of the JRC was held on 18 May 2017 at Dhaka.

II. Treaty on Sharing of Ganga/ Ganges Waters at Farakka

As per the provision of the Treaty, signed by the Prime Ministers of India and Bangladesh on 12th December 1996 for the sharing of Ganga/Ganges waters, a Joint Committee has been set up for implementing, joint inspection and monitoring of the sharing arrangements at Farakka in India and at Hardinge Bridge in Bangladesh for the dry season (Jan to May) every year. The validity of Treaty is 30 years. The Treaty is being implemented to the satisfaction of both the countries since 1997.

The Joint Committee has held 3 meetings (69th, 70th& 71st) during 2018-19 in May 2018,September 2018and February 2019.

III. Cooperation in Flood Forecasting

Under bilateral arrangements, India provides the flood data of the sites namely, Pandu, Goalpara&Dubri on river Brahmaputra, Silchar&Badarpurghat on Barak and Domhani&Gazaldoba on river Teesta, Sonamura&Amarpur on Gumti, NH-31 on Jaldhaka (Dharla), Kailashahar on Manu &Ghughumari on Torsa (Dudhkumar),

Khowai Town on Khowai and Dharmnagar on Juri during monsoon to Government of Bangladesh for use of their flood forecasting and warning arrangements. The transmission of flood forecasting information from India during the monsoon which is being supplied free of cost has enabled the Civil and Military authorities in Bangladesh to take precautionary measures and shift the population affected by flood to safer places. Flood data of above sites was communicated to Bangladesh on continuous basis during the Monsoon of the year 2018. The Bangladesh side appreciated the Indian side for providing flood related data and information of various common/border rivers during 15th May to 15th October to the Flood Forecasting and Warning Centre of Bangladesh Water Development Board on a continuous basis which has helped to provide effective forecast thus saving lives and properties.

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The 70th Indo-Bangladesh Joint Committee Meeting was held on 10.09.2018 in Dhaka, Bangladesh for finalization of Annual Report 2018 on sharing of Ganges waters as per the Ganges Water Treaty of 1996.

8th Meeting of Joint Group of Experts (JGE) of Govt. of India and Royal Govt. of Bhutan between 01.11.2018 to 02.11.2018

CHAPTER-XIV

WATER RESOURCES DATA MANAGEMENT

14.1 Development of Water Resources Information System (DWRIS)

Central Water Commission is implementing the Plan Scheme "Development of Water Resources Information System (DWRIS)" with an objective to operate a standardized national water information system in the country with provision for data collection, data processing and storage and online data dissemination. The scheme has following major components:

i. Hydrological Observations Monitoring System
ii. Irrigation Census
iii. Strengthening of Monitoring Unit in CWC
iv. Data Bank and Information System

14.2 India-WRIS

CWC & ISRO has jointly undertaken the work of development of Water Resources Information System (DWRIS) during 11th plan. The first full version of website of INDIA WRIS was launched on 07 Dec, 2010 in New Delhi.Subsequently, four more versions of the website of India-WRIS have been launched. The Ver. 4.1 was launched in July, 2015 and is available in public domain at 1:250000 scale. The URL of the website is www.india-wris.nrsc.gov.in.

The information system contains 105 GIS layers grouped in five heads, namely 1) Watershed Atlas, 2) Administrative Layers, 3) Water Resources Projects, 4) Thematic Layers and 5) Environmental Data. The major GIS layer generated are basin/sub-basin/watershed, river network, canal network, water body, major and medium irrigation project (dam, barrage etc), road network, town and village extent, CWC HO network and CGWB well data. As per provision of Hydro-Meteorological Data Dissemination Policy 2013 (MoWR), all unclassified data of CWC G&D stations has been made available on India-WRIS website.

The centre for maintenance and further development of the India-WRIS portal was functioning at Central Water Commission Headquarter with support from ISRO at New Delhi since February 2015. The support from ISRO for maintenance and further development of the portal ended w.e.f. 31st Dec 2017. Later, the updation of portal has again been restarted by CWC since 1st Feb'18 through hiring of individual consultants. Refinement and updation of rivers, watershed and water bodies are under progress.

The National Water Information Centre has been setup by MoWR, RD&GR for further maintenance and development of India-WRIS. The same is expected to be in function with full manpower by April, 2018.

14.3 Hydrological Observations including Snow Hydrology, Water Quality and Monitoring of Glacial Lakes

14.3.1 Hydrological Observations

India has a total geographical area of 329 Mha having an annual precipitation of 4000 BCM with wide temporal and spatial variation. From river basin point of view,India has been divided into 20 river basins. The collection of hydro-meteorological data for all the river basin in scientific manner is essential for various uses viz. planning and development of water resources projects, studies related to assessment of impacts due to climate change, water availability studies, design flood and sedimentation studies, flood level /inflow forecasting, solving of International & Inter-State issues, river morphology studies, Reservoir siltation studies, development of inland waterways, research related activities etc.

Central Water Commission is operating a network of 878 Hydrological Observation (HO) stations in different river basins of the country to collect (i) water level, (ii) discharge, (iii) water quality, (iv)silt and (v) selected meteorological parameters including snow observations at key stations. In addition to above, it also operates 76 exclusive meteorological observations stations in various basins in the country. The hydrological data collected from sites are scrutinized, validated and published in the form of Water Year Book, Water Quality Year Book and Sediment Year Book, etc. by CWC.

In order to address the data requirement of the country more precisely and in better scientific manner, Central Water Commission has also opened 720 new sites in various parts of the country during XII Plan period. However, measurement of few parameters with reduced frequency is being done at some these sites due to paucity of required manpower.

14.3.2 Monitoring of Glacial Lakes/Water Bodies in Himalayan Region

Glacial lakes are common in the high elevation of Glacierised basin. They are formed when glacial ice or moraines impound water. The impoundment of the lake may be unstable, leading to sudden release of large quantities of stored water. This may leads to flash floods in the downstream reaches of lakes, called as Glacial Lake Outburst Flood (GLOF). GLOFs have immense potential of flooding in downstream areas, causing disaster to human settlements, livestock and property. Incidents of outburst of Glacial Lakes/Water bodies in Himalayan region have been evident during recent past. Therefore, Glacial Lakes and Water Bodies in Himalayan Region need to be closely monitored.

CWC took up the work of monitoring of glacial lakes and water bodies. In order to make inventory and monitoring of glacial lakes and water bodies present in the Himalayan Region, a MoU was signed with NRSC, Hyderabad in 2009. As per inventory created in 2009, there are 2027 nos of glacial lakes and water bodies (GL/WB) with more than 10 Ha water spread area,out of which 477 are more than 50 Ha. Monitoring of these lakes has been taken up. 477 glacial lakes/water bodies with water spread area more than 50 ha have been monitored every year during monsoon season (June–October) of 2011, 2012, 2013, 2014, 2015, 2016, 2017 and 2018. Monitoring reports were prepared and sent to Brahmaputra &BarakWing, Indus Wing and Flood Management Wing of MoWR, RD&GR and concerned State Governments.

As per the Monitoring Report of 2018, cloud free data of 447 GL/WBs was available during the monsoon period of 2018. Amongst these, 32GL/WBs have shown decrease in water spread area, 245 have shown increase, 169 have not shown any significant charge (+/-5%). 4 out of 32 have decreased by more than 20% and 112 out of 245 water bodies have shown increase in area by more than 20%.

Glacial lakes and water bodies need to be assessed for their vulnerability, which depends on their location, size and human habitation & water resources project downstream. CWC has assessed vulnerability of glacial lakes/water bodies with area greater than 50 ha. Glacial lakes/water bodies with water spread area greater than 50 Ha have been prioritized based on vulnerability assessment and stability of lakes for taking up GLOF studies. As per priority, glacial lakes in Sikkim under Teesta River Basin are assessed as most vulnerable and therefore, CWC has carried out GLOF study and prepared advisory sheet. This advisory sheet provides information about the various scenarios of Glacial Lake bursts and the corresponding water level/discharges rise at locations near human settlements and water resources projects

14.4 Coastal Management Information System (CMIS):

Considering the importance of collection of data on coastal processes relevant for evolving plans and coastal protection measures, a new component in the XII-Plan (2012-17) period for creation of "Coastal Management Information System (CMIS)" has been approved by Ministry of Water Resources, Government of India under the Plan Scheme "Development of Water Resources Information System (DWRIS)", which is to be implemented by CWC. In this regard, it is proposed to set up sites along the coast of the maritime states of India for collecting data of relevant coastal processes. The activity of establishing a Coastal Management Information System is a field of activity wherein the experience and expertise is needed. Hence, for implementation and creation of CMIS, it has been decided that CWC would suitably associate with the maritime State/UT Governments and Institutes/Agencies who possess similar expertise and experience.

In view of above, deliberations were held with the maritime State/UT Governments and Expert Institutes/Agencies during the "One day Brainstorming Workshop on Implementation & Creation of CMIS" organized by CWC on 13th May, 2014 at New Delhi. As per suggestion emerged during the workshop, implementation of CMIS has been envisaged through signing of a tripartite Memorandum of Understanding (MoU). In the tripartite MoU, CWC would be the project implementer, the expert agency would be the project executor and the concerned State/ UT Government would be the project facilitator.

With the approval of Ministry, a tripartite MoU has been signed in Oct, 2016 among CWC, IIT Madras and respective States/UTs (Kerala, Tamil Nadu and Puducherry) for

establishment of one coastal data collection site in each participating State/UT over a period of 2 years. The total estimated cost of above work is Rs 896.05 Lakh. The implementation of CMIS in these States is in final stages. The 3rd meeting of Project Monitoring Committee (PMC) was held in July, 2018 at Chettuva, Kerala. 10 days hands-on-training in CMIS for 23 participants was organized at IITM,Chennai in November 2018. The 4th meeting of the PMC was held in March, 2019 at IITM, Chennai. The second National Workshop on Coastal Management Information System (NWCMIS – 2019) was organized at Department of Ocean Engineering, IITM, Chennaiwith the support of CWC on 11thMarch, 2019.

CMIS is also being implemented by National Institute of Oceanography (NIO) Goa for States of Goa and Southern Maharashtra (for three sites) and by CWPRS in States of Gujarat and Maharashtra (for two sites). The Competent Authority in MoWR,RD&GR has approved the Project Proposal of CWPRS, Pune amounting to Rs.695.531 lakh for the implementation of CMIS at 2 sites, 1 in Gujarat and 1 in Northern Maharashtra and a Tripartite Memorandum of Understanding (MoU) among CWC as Project Implementer, CWPRS, Pune as Project Executor and States of Gujarat, and Northern Maharashtra as Project Facilitator has been signed in January 2019.

NIO, Goa had also shown interest for taking up the role of Project Executor for implementation of CMIS at 3 sites, 2 in Goa and 1 in Southern Maharashtra. A Tripartite MoU for the same at an estimated cost of Rs. 1376.60 lakh was signed among CWC as Project Implementer, NIO, Goa as Project Executer and Government of Maharashtra and Government of Goa as Project Facilitator in March 2019.

14.5 Coastal Climate Information System (CCIS):

A Technical Assistance (TA) programme has been signed by Government of India for TA 8652-IND: Climate Resilient Coastal Protection and Management Project (CRCP&MP) to support mainstreaming of climate change consideration into coastal protection and management at the national level and in the two focal States (of Karnataka and Maharashtra) where the Sustainable Coastal Protection and Management Investment Programme (SCP&MIP) is already operational under external assistance from Asian Development Bank(ADB). The implementation of this TA has been financed by a grant amounting to Two Million USD ($) from Global Environment Facility (GEF) & administered by ADB. One of the major objectives of this TA is to develop a comprehensive database related to Oceanographic and meteorological data

for the entire coast of India called Coastal Climate Information System (CCIS) and to upload on India WRIS web portal.

Coastal Climate Information System (CCIS) provides modeled projected scenarios related to storm surge, waves, sea level rise, and precipitation, air, temperature, humidity and wind speed for the coast of India. The interactive maps facilities the visualization of oceanographic and meteorological data for different scenario – present, medium and extreme climate change scenarios and for various probability of occurrence – 10, 50 and 100 years. The CCIS provides first-hand information on the coastal vulnerability to climate change which will be useful for identification of location for investment and a feasibility study of a coastal development project. The CCIS data is generated through modelling exercises by the national knowledge institutions: Storm Surge by Indian Institute of Technology, Delhi; Meteorological data by Indian Institute of Technology, Bombay using the CORDEX data of Indian Institute of Tropical Meteorology, Pune; Wave projections by National Institute of Oceanography, Goa; Sea level projections by CLIMSystems, New Zealand. The data is being generated as part of the GEF-ADB sponsored "Climate-Resilient Coastal Protection and Management Project" and implemented by the Ministry of Water Resources, Ganga Rejuvenation and River Management through ANZDEC, New Zealand.

The project consultant Team has uploaded all the Oceanographic and meteorological data for the entire coast of India on India WRIS web portal under Coastal Climate Tab. The data is categorized in layers viz. Storm surge, Storm surge with Tide, Significant Wave Height and Sea Level Rise for each coastal site. The report on Climate Projection by IITB, Sea level trends and Wave report by NIO Goa, SLR Projections by CLIM systems, Storm surge Projections by IITD are also available on India WRIS portal under Coastal Climate Tab.

14.6 Computerisation Activities in CWC

The IT resources need to be regularly maintained and upgraded in order to match with the technological development in the field of Information Technology. Further, to promote e-governance activities in CWC, several IT applications are being developed/ implemented in coordination with various stakeholders. The Software Management Directorate, CWC is entrusted with the work of management of IT hardware/ software at Head CWC (HQ) and extending IT services to CWC officers. During the period 2017-20, the provision for such activities have been kept underthe component "Data bank

&Information System– Upgradation and Modernization of I.T. in CWC" which is partof the Plan Scheme "Development of Water Resources Information System".

The major activities in this regard during 2018-19were as under:

i) Procurement/ Supply of T&P Items such as Servers, Laptops, Computers, Printers, UPS, Scanners, Networking security appliances etc, as and when required.

ii) Procurement of engineering and general software for use in various directorates as per requirement.

iii) Maintenance of IT Items at CWC (Hq).

iv) Procurement/ Supply of IT consumables items.

v) Management of AMC of IT hardware, software & LAN.

vi) Work related to various e-Governance Activities:

   a. Development of Web Based Application Software for Inventory Management

   b. Development of ePAMS application software

   c. Development of e-Bhagirath software

   d. Implementation of e-HRMS softwareImplementation of e-Office Lite (eFile) software in CWC which is a Mission Mode Project under the National e-Governance Program (NeGP).

   e. Implementation of Smart Performance Appraisal Report Recording Online Window (SPARROW) for APAR and AIPR in CWC.

   f. Design, development and maintenance of new CWC website as per GIGW guidelines.

   g. Coordination and supervision of CWC Work-charged Recruitment System (Online Job Portal Application) for the SWA recruitment process taken up by the various field offices.

   h. Work related to tendering process at TCIL Portal for implementation of e-procurement in all offices of CWC which includes procurement of digital signatures and conducting trainings related to e-publishing and e-procurement.

   i. Development/customization of CWC BPSC web and mobile application for assessing the status of work and performance of employees in Central Water Commission.

vii) Conducting training programmes on various software used in CWC.

viii) Establishment of LAN on various renovated floors of Sewa Bhawan under ongoing renovation and modernization work.

During the year 2018-19,the expenditure amounting to Rs. 301.66 Lakhs has been incurred against budget allocation of Rs 449.93 Lakhs.

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Glacial lakes in Himalayas

CHAPTER-XV

TRAINING

15.1 Training

One of the important functions of Central Water Commission is capacity building of the professionals as well as non-professionals associated with the water resources sector. In order to impart knowledge and develop technical and managerial skills of in-service officers of CWC and other Central/State Government Departments and their Organisations, CWC arranges and co-ordinates training programmes/seminars/ workshops in water related fields. CWC accomplishes this objective through a dedicated unit at HQ and a full-fledged training institute namely, National Water Academy (NWA) at Pune. Officers of CWC are also deputed to various programmes including seminars, conferences, and workshops etc., held both within and outside the country. Further, CWC provides support to other professional organisations and societies and co-sponsors some of the National level seminars, conferences, workshops etc.in water related field. It also arranges Apprenticeship Training for fresh engineering graduates/ diploma holders/vocational certificate holders in collaboration with Board of Apprenticeship Training, Kanpur. A few students of engineering degree courses are given practical training in CWC every year.

15.2 National Water Academy(NWA)

National Water Academy, Pune imparts training on almost all facets of water resources development and management covering the areas of planning, design, evaluation, construction, operation and monitoring of water resources projects and also the application of high-end technology in water sector. Initially, it was set up to provide training to primarily in-service engineers and water professionals of various Central and State agencies. However, subsequently, the programs at NWA were opened to all stakeholders of water sector including those from NGOs, Media, Private Sector Organizations, Academic Institutions, PSUs, Individuals and Foreign Nationals also.

NWA has always striven to cater to every aspect of training in Water Resources Development and Management including upcoming and advanced areas. In the recent past many new areas have been added to the NWAs portfolio like e-SWIS; e-Water;

preparation of PMP Atlas; Monitoring of Irrigation Projects using Bhuvan Software; Modernization and Capacity Enhancement of Hydropower Projects etc.

National Water Academy has also forayed into custom-designed programs meeting specific requirement of client organizations, both at its campus and off-campus at the client locations. NWA has also been recognized as Regional Training Centre (RTC) of the World Meteorological Organisation (WMO), and is conducting Distance Learning Programs on the topics of Hydraulics, Hydrological Sciences and Hydrometeorology in association with WMO for Asian countries.

NWA conducts long term as well as short-term training courses on regular basis and also holds national level seminars and workshops on the emerging technical areas in the field of water resources development and management. In addition, the academy is one of the nodal agencies for conducting training programmes under World Bank aided Hydrology Project. Induction/ orientation training to Assistant Directors recruited through UPSC (CWES-Gr A) and for newly promoted Asstt. Directors, Junior Engineers (JEs) of CWC are also conducted by National Water Academy at Pune.

15.3 Progress of Training Activities

The Training Unit of CWC at Headquarter organises / conducts / coordinates various training courses, workshops and seminar. The list of events organised / conducted / coordinated by Training Unit of CWC during 2017-18 is given at Annexure - 15.1.

Further, since its inception in the year 1988, NWA has conducted a total of 644 training programmes up to March 2019 and trained a total of16216 officers. During the year 2018-19, 32 training programs were conducted at National Water Academy, CWC, Pune.1059 officers have been trained in these programs with 2616.2 man-weeks of training.The list of training courses, workshops and seminar organised / conducted / coordinated by NWA during 2018-19 is given at Annexure - 15.2. The important activities of NWA during the year 2018-19 are as under:

I. International Distance Learning Program in Hydrometry (01.04.2019 to 04.05.2019).

II. Training Program on "IWRM for River Basin Planning and Management, Best Practices and Development and Data Acquisition and Analysis for officers of CGWB" during 16-20 April 2018.

III. Training on "Irrigation Benchmarking under National Hydrology Project" during 23-27 April 2018.

IV. Training on "Flood Disaster Management including Disaster Risk Reduction" (28.05.2018 to 01.06.2018).

V. Training Program on "Survey, Investigation and Preparation of DPR of Water Resources Projects" during 25-28 June 2018.

VI. 30thInduction Training Program for newly recruited Assistant Directors of CWC (02.07.2018 to 25.01.2019).

VII. Training Program on "Water Accounting ++ under National Hydrology Project"during3rdJuly to 31stAugust 2018.

VIII. Knowledge Dissemination Workshop with co-basin States by CWC and IHE Netherlands on Water Accounts of Cauvery Basin using Water Accounting Plus tool (WA+) under National Hydrology Project on 4thSeptember 2018.

IX. Induction Training Program for newly appointed SRAs of CWC (Batch-I from 08.10.2018 to 02.11.2018 and Batch-II from 17.12.2018 to 12.01.2019).

X. Training Program on "Water Information Analytics Generation using Free online tools"during 26-30 November 2018.

XI. Training on "Capacity Development in Groundwater Management on Managed Aquifer Recharge" during 11-15 February 2019.

XII. Training Program on "Design of Piped Irrigation Network and Micro Irrigation"during 11-15 March 2019.

XIII. Training Program on Water Resources Management for NGOs and Media Personnel during 25-26 March 2019.

XIV. Workshop on "River Basin Planning and Management" in technical collaboration with AWP under NHP on 11th March 2019.

15.4Other Important Activities / Achievement of NWA

A. Faculty Development

1) Shri Pradeep Kumar, Director, NWA attended Training Program on Water Accounting Plus at IHE, Delft, The Netherland during 12.03.2018 to 08.06.2018.

B. Mass Awareness Activities.

1) As per directives issued by the Ministry of Water Resources, RD&GR, a one day Training cum Workshop on Water Resources Management under Tribal Sub Plan was conducted at village Chikhali, Pune on 21st December 2018 in which around 150 participants consisting of local authorities, farmers etc. attended the workshop.
2) Training cum Workshop on Scenario of Water Resources Sector of India for school teachers was conducted on 18th July 2018.

C. Awards

1) National Water Academy, CWC, Pune has been conferred with the award for carrying out activities during SwachhataPakhwada 2018 under the Category "Innovative Mechanism for Sustainable Cleanliness" fromHon'ble Ministers of Statefor WR, RD&GR on 10thApril 2018.
2) National Water Academy, CWC, Pune has been conferred with a shield for correspondence in "ख" क्षेत्र. The shield was conferred by Chairman, CWC, New Delhi during the Hindi Pakhwada-2018 at CWC New Delhi

C. Visit of Foreign Delegates

1) An interaction session was held with delegate of US Consultate, Mumbai coprising Dr. Zachary Burt, Columbia University, New York on 10th August 2018 at NWA during which a brief presentation on activities ofNWA was made. The visit was coordinated by Dr. Jayesh C Dadlaney, Office of Public Affairs, US Consulate General, Mumbai to discuss Water Resources Development in India.

D. Distance Learning Program

1) Out of Seven Weeks, 5 Weeks duration "International Distance Learning Program in Hydrology: Advanced Topics in Hydrological, Hydraulic Sciences" was continued during the Financial Year 2018-19. 77 officers including 24 numbers of international participants from Asian Region (RA-II) and 53 Indian participants from various State and Central Organizations underwent this Distance Learning program.

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Release of Training Module for 30th ITP at NWA, Pune

Sh. N K Mathur, Member (D&R), CWC with participants during the training on "Project Hydrology" organized at CWC HQ, New Delhi during 26.11.18 to 30.11.18

1-Chairman, CWC addressing the Valedictory Session of 30th ITP
2-Chairman, CWC awarding 1st prize to Ms.Payal Goyal, AD for 30th ITP
3-Member(D&R) awarding 2nd prize to Sh. Dheeraj Kumar, AD for 30th ITP
4-Member(WP&P) awarding 3rd prize to Sh. Amit Gupta, AD for 30th ITP
5-Three Officers of 30th ITP batch with consolation prizes

CHAPTER-XVI

VIGILANCE

16.1 Disciplinary Cases

The vigilance/ disciplinary cases and complaints received against officers and staffs of CWC were given proper and prompt attention. During the year 2018-19, 9 new complaints/ cases were taken up for investigation.

16.2 Observation of Vigilance Awareness Week

Vigilance Awareness Week was observed in ewe Headquarters and all its field officesfrom 29.10.2018 to 03.11.2018. During the Vigilance Awareness Week, on 02ndNovember, 2018 at ewe (Headquarters), Shri Surinder Kumar Garg, Director(Vigilance), Ministry of Water Resources, RD & GR delivered a lecture on PreventiveVigilance.

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CHAPTER-XVII

REPRESENTATION OF CENTRAL WATER COMMISSION IN VARIOUS COMMITTEES

17.1 Committees Represented by CWC Officers

Chairman, Central Water Commission and Members represent CWC in various Technical Committees of various organisations either as the Chairman or as a Member. List of important Committees on which Chairman, CWC and Member, CWC represent are given in Table 17.1

Table 17.1

List of Important Committees Represented by Chairman and Members of CWC

Sl. No.	Name of Committees/Boards/Panel of Experts/Technical Groups etc.	Representation of CWC	
		Officer	Position in Committee
1	Science and Technology Advisory Committee (STAC- MOWR)	Chairman, CWC	Member
2	Standing Advisory Committee(SAC) for R&D Programme	Chairman, CWC	Member
3	Indian National Committee on Surface Water	Chairman, CWC Member (D&R)	Chairman Member
4	National Water Board	Chairman, CWC Member (WP&P)	Member Member-Secretary
5	Water Resources Division Council (WRDC) of BIS	Chairman, CWC	Chairman
6	CEDC(Civil Engineering Divisional Council)	Member (D&R)	Member
7	Governing Council of CWPRS	Chairman, CWC	Member
8	Technical Advisory Committee to the Governing Council for Central Water and Power Research Station, Pune.	Chairman, CWC	Chairman

Sl. No.	Name of Committees/Boards/Panel of Experts/Technical Groups etc.	Representation of CWC	
		Officer	Position in Committee
9	Governing Council for Central Soil & Materials Research Station.	Chairman, CWC Member (D&R)	Member Member
10	Standing Technical Advisory Committee (STAC) to the Governing Council for CSMRS, New Delhi.	Member (D&R)	Chairman
11	National Institute of Hydrology Society (NIH Society)	Chairman, CWC Member(D&R)	Member Member
12	Governing Body of NIH	Chairman, CWC Member(D&R)	Member Alternate Member
13	Technical Advisory Committee of National Institute of Hydrology.	Chairman, CWC Member(D&R)	Chairman Member
14	High Powered Steering Committee for Implementation of National Projects.	Chairman, CWC Member (D&R)	Member Sp. Invitee
15	National Water Development Agency Society.	Chairman, CWC Member(D&R) Member(WP&P)	Member Member Member
16	Governing Body of National Water Development Agency.	Chairman, CWC Member(D&R) Member(WP&P)	Member Member Member
17	Special Committee for Interlinking	Chairman, CWC	Member
18	Taskforce for Interlinking of Rivers	Chairman, CWC	Member
19	Technical Advisory Committee of National Water Development Agency.	Chairman, CWC Member(WP&P) Member(D&R)	Chairman Member Member
20	Advisory Committee for consideration of Techno Economic viability of Major & Medium Irrigation, Flood Control and Multipurpose project proposals.	Chairman, CWC Member(WP&P) Member(D&R) Member(RM)	Member Sp. Invitee Sp. Invitee Sp. Invitee
21	Committee of CEA to accord of techno-economic appraisal of Power Schemes.	Member (D&R)	Permanent Special Invitee

Sl. No.	Name of Committees/Boards/Panel of Experts/Technical Groups etc.	Representation of CWC	
		Officer	Position in Committee
22	Brahmaputra High Powered Review Board	Chairman, CWC Member(RM)	Member Pmt. Invitee
23	Brahmaputra Board	Member(RM)	Member
24	Standing Committee of Brahmaputra Board	Member(RM)	Member
25	Pancheshwar Development Authority (PDA)	Chairman, CWC	Special Invitee
26	Narmada Control Authority (NCA)	Chairman, CWC	Invitee
27	National Level Steering Committee for World Bank assisted National Hydrology Project	Chairman, CWC	Member
28	National Crisis Management Committee (NCMC)	Chairman, CWC	Member
29	Indian Meteorological Department (IMD)	Member (D&R)	Hydrological Advisor
30	Governing Body of National Institute of Rock Mechanics (NIRM)	Member (D&R)	Member
31	Research Advisory Committee (RAC) of National Council for Cement and Building Materials.	Member (D&R)	Member
32	National Committee on Dam Safety(NCDS)	Chairman, CWC Member(D&R)	Chairman Vice Chairman
33	National Committee on Seismic Design Parameters of River Valley Projects (NCSDP)	Member (D&R)	Chairman
34	National Level Steering Committee (NLSC) for Dam Rehabilitation and Improvement Project (DRIP)	Member (D&R)	Member
35	Technical Committee (TC) for Dam Rehabilitation and Improvement Project (DRIP)	Member(D&R)	Chairman
36	Cauvery Technical Committee	Chairman, CWC	Chairman
37	Betwa River Board	Chairman, CWC	Member
38	Executive Committee of Betwa River Board	Chairman, CWC	Chairman
39	Bansagar Control Board	Chairman, CWC	Member
40	Executive Committee of Bansagar Control Board	Chairman, CWC	Chairman

Sl. No.	Name of Committees/Boards/Panel of Experts/Technical Groups etc.	Representation of CWC	
		Officer	Position in Committee
41	Governing Body of NERIWALM	Chairman, CWC	Member
42	Sahibi Standing Committee	Member(RM)	Chairman
43	Ghaggar Standing Committee	Member(RM)	Chairman
44	Yamuna Standing Committee	Member(RM)	Chairman
45	Upper Yamuna River Board	Member(WP&P)	Chairman
46	Upper Yamuna Review Committee	Member(WP&P)	Member Secretary
47	World Meteorological Organization	Member (D&R)	Principal Representative
48	SardarSarovar Construction Advisory Committee	Chairman, CWC	Member
49	India-Nepal Joint Team of Experts (JTE) on SaptaKosi high dam Multipurpose Project and Sun Kosi storage-cum-diversion scheme	Member(RM)	India Team Leader
50	Board of Directors of Tehri Hydro Development Corporation	Member (D&R)	Part Time Director
51	Board meeting of Punatsangchhu-I H.E. Project Authority (PHPA)	Member (D&R)	Permanent Invitee
52	Technical Coordination Committee (TCC) for Punatsangchhu - I H.E Project, Bhutan	Member (D&R)	Co-Chairman
53	Programme Advisory Committee (PAC) for Fly Ash Unit constituted by Department of Science and Technology	Member (D&R)	Member
54	Technical Advisory Committee of the Farakka Barrage Project.	Member (D&R)	Chairman
55	Farakka Barrage Project Advisory Committee (FBP-AC).	Member (D&R)	Chairman
56	Tender Committee of Farakka Barrage Project	Member (D&R)	Chairman
57	Punatsangchhu-II Hydro Electric Project Authority Meetings.	Member (D&R)	Permanent Invitee
58	Technical Co-ordination Committee (TCC) of Punatsangchhu-II Hydro Electric Project	Member (D&R)	Co-Chairman

Sl. No.	Name of Committees/Boards/Panel of Experts/Technical Groups etc.	Representation of CWC	
		Officer	Position in Committee
59	Mangdechhu HE Project Authority Meetings.	Member (D&R)	Permanent Invitee
60	Technical Co-ordination Committee (TCC) Mangdechhu HE Project	Member (D&R)	Co-Chairman
61	Empowered Joint Group meetings (EJG) (for monitoring of implementation of Hydro-power projects in Bhutan).	Member (D&R)	Permanent Invitee
62	Standing Technical Committee (STC) for deciding project parameters of R-O-R Hydro-power scheme which were initially envisaged as storage scheme.	Member (D&R)	Co-Chairman
63	Committee of International Commission on large dams, India (INCOLD)	Member (D&R)	Member
64	National Environmental Monitoring Committee for River Valley Projects (NEMCRVP)	Member (WP&P)	Chairman
65	Programme Advisory Committee, NWA	Chairman, CWC	Chairman

17.2 Activities of Some Important Committees for R&D

17.2.1 Indian National Committee on Surface Water (INCSW)

The Indian National Committee on Surface Water (INC-SW) is an apex body to promote, coordinate and support R&D works related to Surface Water in India. INC-SW is headed by Chairman, CWC with Director WS&RS Directorate, CWC as Member Secretary. There are 12 members representing MoWR/CWC, CSMRS, CWPRS, NIH, DST/DSIR/CSIR, Min.ofAgr., WALMIs, IIT, and NGOs etc. INCSW's main objective is to promote research work in the field of Water Resources Engineering (Surface Water aspect) by providing platform to academicians/experts in the Universities, IITs, recognized R&D laboratories, Water Resources/ Irrigation departments of the Central and State Governments and NGOs under R&D Programme of Ministry of Water Resources (MoWR). The secretariat support to INC-SW is provided by CWC. The work of secretariat is two-fold (a) Regular secretariat work for managing service requests of PIs for R&D schemes and (b) Innovative work to work as Indian office of

ICID and other international bodies.During the year 2018-19 following activities were undertaken:

i. Coordination of Research Schemes related to Surface Water:

At the time of reorganisation, 96 research schemes were handed over to INCSWin 2003.These 96 schemes were reviewed and 7 of them were discontinued. Later, 2 new schemes have been taken up during 2016-19. The status of 91 research schemes coordinated by INCSWis given in Table-17.2. A total amount of Rs 30.86 lakhs has been released to these schemes during year 2018-19.

Table – 17.2

Status of 91 research schemes coordinated by INCSW as on March 2019

Sl. No	Category	Nos. of Scheme
1	Completed	77
2	Near Completion	4
3	Ongoing	10*
4	Total	91

ii. India Spain Water Partnership

A meeting with Spanish delegation led by Dr. Teresa Barres Benlloch, Embassy of Spain was held on 30.05.2018 under the Chairmanship of JS(IC&GW), MoWR,RD&GR in order to discuss the possibility of having bilateral relationship/signing bilateral agreement in the field of water resources between the two countries.

iii. India Morocco Water Partnership

The first Indo-Morocco Joint Working Group meeting was held on 3rd July 2018 in New Delhi under the Chairmanship of JS, MoWR,RD&GR on co-operation in the field of Water Resources wherein CE (EMO), CWC participated as Member, JWG.

iv.India-EU Water Partnership Joint Working Group Meeting

Joint Working Group for India EU Water Partnership was formed in 2016 with Member Secretary, INCSW as the Convener. Various priority areas were identified and an action plan was formulated by MoWR for activities to be undertaken by the Joint Working Group of IEWP. A meeting was held on 26thNovember 2018 under the chairmanship of

Secretary MoWR,RD&GR at New Delhi to review the progress made under IEWP, to discuss the possible adaptation and revision of identified Priority Areas and to provide an update on the business-related component of IEWP.

17.2.2 Technical Advisory Committee of NIH

The research programmes and other technical activities of NIH are monitored and guided by Technical Advisory Committee of NIH headed by Chairman, CWC. Member (D&R) and Chief Engineer, Hydrological Studies Organization are also its Members.71 meetings of TAC of NIH have been held so far. The last meeting was held on 23.4.2018 at New Delhi.

TAC gets feedback from 3 Working Groups on Surface Water, Ground Water and Hydrological Observation and Instrumentation. Chief Engineer, HSO and Chief Engineer, BPMO are Members of the Surface Water Group and Chief Engineer (P&D) is Member of the Hydrological Observations and Instrumentation Group. 46 meeting of Working Group of NIH has been held so far. The last meeting was held during 23rd –24thOctober, 2018 at NIH Roorkee.

17.2.3 Technical Advisory Committee of Farakka Barrage Project

The TAC of Farakka Barrage Project is headed by Member (D&R), CWC, which generally meets once every year and takes decisions about various works to be executed for efficient and safe functioning of the project. Various problems, special studies and related design work were referred to D&R wing from time to time. Member (D&R) held discussions with the Farakka Barrage Project authorities from time to time and Chaired the Technical Advisory Committee meeting of Farakka Barrage Project. 114th meeting of TAC of FBP was held during3rd-4th December 2017 at Farakka, West Bengal.

17.2.4Standing Technical Advisory Committee of CSMRS

The Standing Technical Advisory Committee (STAC) was constituted under the Chairmanship of Member (D&R), CWC for providing an overall perspective and guidance in technical scrutiny of research schemes being undertaken at CSMRS. The STAC is composed of 11 members drawn from various public sector institutions and is

headed by Member (D&R), CWC. 33meetings of STAChas been held so far. The last meeting of STAC was held on 17.8.2018 at New Delhi.

17.3 Association with Bureau of India Standards (BIS)

Central Water Commission being an apex technical body in the water resources sector, has been playing an important role in the formulation of standards in the field of water resources development & management and allied areas through its participation in activities of Water Resources Division (WRD) and Civil Engineering Division (CED) of the BIS. Chairman, Central Water Commission is presently the Chairman of Water Resources Division Council (WRDC).

CWC is represented by its officers of the rank of Chief Engineer and Director in the 16 Sectional Committees of WRDC and 13 Sectional Committees of CEDC. FE&SA and CMDD (NW&S) are the Nodal Directorates in CWC dealing with works of WRDC & CEDC of Bureau of Indian Standards, respectively at CWC.

Since Chairman, CWC is the Chairman of WRDC,the approval of draft codes and amendments to BIS Codes for adoption and printing are processed in CWC and approval of Chairman is communicated to BIS. During the current year,6 draft standards/amendments toBIS codes have been approved by the Chairman for adoption and printing.

17.4 International Commission on Irrigation and Drainage

International Commission on Irrigation and Drainage (ICID)with its headquarters at New Delhi is anInternational non-governmental organization with representation from more than 80 countries. India is one of the founding Members of the ICID. The mission of the ICID is to stimulate and promote the development of arts, science, techniques of engineering, agriculture, economics, ecology and social sciences in managing irrigation, drainage, flood control and river training applications including research and development and capacity building, adopting comprehensive projects and promote state-of-the-art techniques for sustainable agriculture in the world.

The INCSW with its secretariat in CWC is working as National Committee of ICID for India. CWC is associated with various activities of ICID. Officers of CWC have been nominated in various work bodies of ICID for the professional development and

knowledge exchange. The activities / achievement of India under the platform is as under:

i. ICID – Scheme for Recognition of Heritage Irrigation Structures (HIS)

On the basis of nomination submitted by INCSW, two irrigation projects in the State of Telangana, namely, Large Tank (PeddaCheru), Kamareddy Project and SdarmattAnicut Project were selected to be included in the ICID Register of Heritage Irrigation Structures in the 69thIEC meeting held during 12th-17thAugust, 2018 in Saskatoon, Canada. Member Secretary, INCSW as Indian representative received the Awards/Plaques on behalf of the State Government of Telangana. The Awards were handed over to the representative of State Government of Telangana by Chaiman INCSW-CWCon 8th October 2018 at Delhi.

ii. 9thInternational Micro Irrigation Conference, Aurangabad

INCSW successfully organised the 9thInternational Micro Irrigation Conference (IMIC) 2019 at Aurangabad, Maharashtra from 16th-18thJanuary, 2019. The event was attended by a wide range of participants including policy makers, manufacturer of various industries (irrigation, agriculture, construction etc.), Engineering companies, Trade organisations (retail, wholesale, import/export), government departments, trade associations, research institutes, universities, academicians and other public organisations.

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ICOLD delegates at CWC, HQ on 22-10-18


MWDT submitting report-cum-decision to the Hon'ble Minister

CHAPTER –XVIII

PUBLICITY AND PUBLICATION

18.1 Activities of Information System Organisation

The Information System Organisation, CWC brings out various publications on statistics related to water resources development and management and related aspects. The details of publication are as under:

i.Water and Related Statistics

The publication titled "Water and Related Statistics"is brought out by CWC on biennial basis. The important information included in the publication is as under:

- Rainfall in different meteorological sub-divisions of the country.
- Water resources potential in the river basins of India, basin-wise, storages in India.
- Month wise storage position of important reservoirs.
- State-wise ultimate irrigation potential, basin-wise hydrological observation Stations of Central Water commission.
- Resources Utilization including Plan-wise/ State-wise Potential created, Potential Utilised, Achievements of Irrigation Potential of Major & Medium Irrigation Projects. (Surface Water).
- Production Related performances & Economic Efficiency.
- State- wise and Plan-wise Financial Expenditure on Major and Medium irrigation as well as Minor irrigation.
- Status of Coverage of Rural Habitations Under Rural Water Supply
- Details of Projects approved by Empowered Committee for inclusion under Repair Renovation and Restoration (RRR) of Water Bodies during XII Plan
- Funds released to States during XII Plan scheme of Repair Renovation and Restoration (RRR) of Water Bodies

- Flood Forecasting Information & performance of various flood forecasting stations in India

The last publication for the year 2017was brought out in March 2017.

ii. Hand Book on Water and Related Information

The publication titled 'Hand Book on Water and Related Information" is brought out by CWC on annual basis which inter-alia provides the following information:

- Rainfall in different Meteorological Sub-Divisions of the country
- List of new Projects under Appraisal in CWC
- List of Projects accepted by Advisory Committee of MoWR
- List of Irrigation Projects Accepted By Planning Commission
- Number of Major, Medium and ERM Irrigation Projects by State.
- Central Loan Assistance (CLA)/Grant Releases for Major, Medium &ERM Projects under PMKSY-AIBP
- Project-wise Irrigation Potential Created (IPC) underPMKSY-AIBP.
- Details of Declared National Projects
- Details of Ongoing Externally Aided Irrigation Projects
- Central Releases for Command Area Development and Water Management Programmestate-wise.
- Physical Progress of Flood Management Works under Flood Management Programmestate-wise.
- Number of Water Users' Associations (WUAs) Formed and Area covered by State
- State Wise Water Rate for Flow Irrigation and Lift Irrigation

The last publication was brought out in June 2017.

iii. Integrated Hydrological Data Book:

This annual publication provides information of Hydrological Data for non-classified basins collected from the observation sites of CWC. The important information included in the publication is as follows:

- List of all non-classified basins, assessment of water resources and an account of per capita availability of water
- Salient features of each basin like geographical location, topology, topography, major tributaries, soil characteristics, availability of minerals, major industries, urban centers and important irrigation projects
- An account of average annual flow, estimated utilizable flow and total storage capacity in different river basins
- Drainage area, hydrological observation sites, peak water level in different basins as well as maximum and minimum observed water levels and discharge at various sites in a river basin
- Annual dependable flow of water at terminal sites of river basins for the last ten years
- Time series of Sediment load by site in river basin, Tolerance limits of selected water quality parameters for inland surface water on the basis of its use, Critical absolute values of water quality parameters crossing tolerance limits season-wise, Maximum and minimum values of water quality parameters site-wisein a river basin.
- Land use statistics in the form of land utilization pattern of the non-classified river basins, gross and net area irrigated source wise and river basin-wise.
- Basic parameters of Ground water resource availability, utilization and stage of development

The last publication was brought out in December 2018 and is available on the website of CWC.

iv. Financial Aspects of Irrigation Projects in India (Periodicity 5 Year)

This publication is brought out every five year and contains information on Financial Aspects related to irrigation projects at All India, States/UTs & Union Government level. The important information available in the publication is as under:

- Capital Expenditure, Working Expenses and Gross Receipts in respect of:
    - Major & Medium Irrigation Projects
    - Minor Irrigation Projects

- CAD Programme

- State wise status of Accelerated Irrigation Benefits Programme (AIBP) - Central Loan Assistance (CLA)/ Grant Released for Major, Medium and ERM Projects
- Number of Water Users Associations (WUAs) formed and area covered State-wise.
- Plan wise and State wise Cumulative Irrigation Potential Created/Utilized in respect of Major & Medium Irrigation Projects

The source of information for this publication is Financial and Revenue Accounts of the Union and State Governments brought out by the Comptroller & Auditor General of India and the Accountant General of the States respectively.The last publication was brought out in December 2015 and is available on the website of CWC.

v. Comprehensive Flood Management in India (Periodicity five years):

The publication is intended to provide documentation of available data oncomprehensive flood management in India. This is a revised version of erstwhile publication "Financial Aspects of Flood Control, Anti Sea Erosion and Drainage Projects". The publication provides the following information on flood management in India:

- Constitutional Provisions for Flood Management
- Institutional Framework for Flood Management
- Approaches towards Flood Management
- Outcome of Flood Management Measures
- Efforts of Central Government for Flood Management in the Country
- Distribution of revenue expenditure by minor head of account and state
- Distribution of capital expenditure by minor head of account and state
- The Quantum of Damage due to Floods/Heavy Rains

The publication was brought out in September 2018 and is available on the website of CWC.

vi. Pricing of Water in Public System in India (Periodicity 5 years):

This publication provides the following information:

- Water Rates, Revenue and Operational Expenses.
- Financial Performance of Irrigation Projects in India
- State/UT's wise flow and lift Irrigation rates for all crops.
- State/UT's wise water rates (flow & lift) for specific crops viz paddy, wheat, sugarcane, cotton etc.
- Gap in Revenue assessed and Realised for State/UT's

The last publication was brought out in March 2017 and is available on the website of CWC.

18.2 Activities of Publication Division

The Offset Press in the Publication Division of CWC has been closed for all printing operations w.e.f 01/04/2018..

18.3 E-Journal of CWC

Central Water Commission has started publication of E-Journal titled "Journal of Water Resources - Planning, Design & Research" from the year 2017-18. The E-Journal is available on the website of CWC. One volume of the journal for the period of April to July 2018 was published during 2018-19.

18.4 Publication of Journals / bulletins

18.4.1 Bhagirath

Since 1954, CWC has been publishing Bhagirath (English) which one of unique publications related to Water Sector. In addition to above, Bhagirath (Hindi) is also being published since 1974. During 2018-19 following Volumes were published:

1. Bhagirath (English) Journal: 2Issues (Oct-Dec 2017, Jan-Mar 2018)
2. Bhagirath (Hindi) Journal- 2Issues (Jan-Mar 2018, Apr-Jun 2018)

CWC has developed an online system, namely, e-Bhagirath to streamline the process of collection, compilation, editing and verification of various articles under Bhagirath. This system can be used by any user for submission of his article.

http://202.159.215.252:85/

This system also hosts the previous publications of Bhagirath.

18.4.2 Administrative News Bulletin

CWC is publishing Administrative News Bulletin on monthly basis to highlight the activities of CWC. 12 issues of CWC Administrative News Bulletin were brought out during the period of April, 2018 to March, 2019.

18.4.3 Jalansh - The Monthly Newsletter of CWC

Central Water Commission initiated publication of monthly newsletter titled "Jalansh" in August, 2018. The main purpose of this newsletter is to apprise the stakeholder organizations and public at large about the activities of Central Water Commission and other pertinent information related to water sector. Limited copies of the Newsletter is printed and distributed to limited audience. The softcopy is hosted on CWC website and also sent by email to a large no. of recipientsfor wider dissemination. During 2018-19, total of eight monthly newsletters (from August-18 to March-2019) were published.

18.5 Compilation of News articles related to Water and allied sector

CWC is compiling the news articles related to water and allied sector published in various Newspaper on daily basis and post the same on CWC website for wide dissemination. Such compilation can be used by officers of Central and State organisations as well as general public for keeping them updated on latest happening in the sector.

18.6 Engineering Museum

CWC is maintaining an Engineering Museum at KalindiBhawan, New Delhi. The Museum has various photographs, charts, working models related to the development of the water resources sector. This museum is visited by various officers, school

children etc. to get a feel of the water sector. During the year 2018-19, CWC also organized 9 numbers of School Visit for creating awareness amongst school children on water resources management and conservation of resources.

18.7Presence on Social Media Platforms

Social Media Platform now-a-days is an important means to communicate with common people, disseminate information and create awareness. In order to fully harness the facility, CWC has opened accounts on various Social Media Platforms such as Facebook, Twitter, Instagram and YouTube for dissemination of information to public at large. The URL for these accounts is as under.

https://twitter.com/CWCOfficial_GoI

https://www.facebook.com/CWCOfficial.GoI

https://www.instagram.com/cwcofficial.goi

https://www.youtube.com/c/CWCOfficialGoI

18.8 Mass Awareness Activities:

The mass awareness activities undertaken by CWC during the period from 1st April, 2018 to 31st March, 2019 are as under:

- A one day Workshop on "Reassessment of Water Potential of India using Space Inputs" was organized by CWC on 6th April, 2018 at New Delhi.
- A one day Workshop on "Flood Preparedness" was organized by CWC on 28th May, 2018 at New Delhi.
- Central Water Commission (CWC) organized a seminar on "Environment Issues in Water Resources Projects" on 9th October, 2018 at New Delhi.
- The first Technical Seminar in Hindi "JalSanrakshan – HamariZimmedari" was organized by Central Water Commission on 7th February, 2019 at Hyderabad.
- One day National Workshop on "Web-based Project Appraisal Management System (e-PAMS) was organized by CWC on 25thFeburary, 2019 at New Delhi. Officials from various State Governments participated in the workshop. The e-PAMS was formally launched during the workshop.

- The "International Dam Safety Conference-2019" was organized by the Central Water Commission (CWC)in collaboration with Odisha Water Resources Department and the World Bankat Bhubaneswar during 13th – 14th February, 2019.
- A lecture on "Women Empowerment in Male Dominated Society" by ShriAlokRawat, Former Secretary (WR, RD&GR) was organized on the occasion of International Womens Day-2019 on 7th March, 2019 at New Delhi.
- A National Workshop on "Climate Change Adaption Guidelines for Coastal Protection and Management in India" was organized by Asian Development Bank in association with Central Water Commission on 26th March, 2019 at New Delhi.
- CWC has been participating in various exhibitions, fairs, etc. and setting up stall demonstrating different exhibitory materials viz. posters, working models etc.. The details of participation during the year are as under:
    - Central Water Commission on behalf of Ministry of Water Resources, RD & GR participated in Vibrant North East-2019 at Guwahati from 3rd May, 2018 to 5th May, 2018. The main focus for the Expo was on Industrial & Economic Development.
    - Central Water Commission on behalf of Ministry of Water Resources, RD & GR participated in Water India Expo-2018 at PragatiMaidan, New Delhi from 23rd May, 2018 to 25th May, 2018 on the theme of Ground Water Management Water Harvesting and Water Conservation, NamamiGange, Dam rehabilitation, Irrigation, Water Scarcity, Sanitation and waste water Management, Water supply and distribution and purification technologies, Swatch Bharat, Make in India, digital India Skill India, stand up India etc.
    - Central Water Commission on behalf of Ministry of Water Resources, RD & GR participated in National Conference cum Exhibition & awards on Science & Innovation in Water Management held at Hotel Le-Meridien, New Delhi on 28th June, 2018.
    - Central Water Commission on behalf of Ministry of Water Resources, RD & GR participated in Vision Maharashtra 2018 Awareness on Water Resources and River Development at Auto Cluster Expo Center, Pimpri, Pune, Maharashtra from 3rd August, 2018 to 5th August, 2018.
    - Central Water Commission on behalf of Ministry of Water Resources, RD & GR participated in 2nd Wellness India-2018 Expo and Krishi India Expo 2018 from 20th August to 22nd August, 2018 at PragatiMaidan, New Delhi.
    - Central Water Commission participated in 10thEdition of AGRI TECH INDIA-2018 at Bangalore from 31stSeptember to 2ndOctober, 2018. The main aim of the Expo is to share their experience, knowledge & technologies in the field of

Agriculture and Agriculture related technologies to all state holders including farmers etc.

- Central Water Commission on behalf of Ministry of Water Resources, RD & GR participated in Shining Maharashtra 2018 at Solapur, Maharashtra from 26thSeptember to 28thSeptember, 2018. CWC stall gotthe "Best Stall for Awareness" award during the event.
- Central Water Commission on behalf of Ministry of Water Resources, RD & GR participated in IISF-2018 in Mega Science, Tech. & Industry Expo at Lucknow, Gomti Nagar, Railway Ground from 5thOctober, 2018 to 8thOctober, 2018.
- Central Water Commission on behalf of Ministry of Water Resources, RD & GR participated in Ujwal Himachal Pradesh, HPCA Stadium Dharmshala, and HimachalPradesh from 14thDecember, 2018 to 16thDecember, 2018. CWC stall got the "Best Display Award" during the event.
- Central Water Commission on behalf of Ministry of Water Resources, RD & GR participated in 9thVibrant Gujarat Global Trade Show 2019 at Gandhinagar, Gujarat from 18thJanuary, 2019 to 22ndJanuary, 2019. The Theme of the expo was on "Innovation, Sustainability and Human Development".
- Central Water Commission participated in 29thInternational Exhibition & Conference -WaterEX World Expo 2019 at Bombay Exhibition Centre, Mumbai from 20thFebruary, 2019 to 23rdFebruary, 2019.
- Central Water Commission participated in UJJWAL UTTARAKHAND 2019 at Gadarpur, Udhamsingh Nagar, Uttarakhand from 2ndMarch, 2019 to 4thMarch, 2019. CWC stall got the "Best Display Information"award during the event.
- Central Water Commission participated in Women Empowerment 2019 at Gaiety Heritage Cultural Complex at Shimla, Himachal Pradesh from 12thMarch, 2019 to 14thMarch, 2019. The main focus of the expo is on distributing knowledge among the people regarding various opportunities and innovations in different fields of Agriculture. The CWC stall got the "Best Stall in Public Awareness" award during the event.

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The 69th Meeting of the IEC (International Executive Council) and Council Meetings of Work Bodies for ICID was held in Saskatoon, Canada. Sh. K. Vohra, Commissioner (SPR), MoWR, RD&GR, Sh. Anuj Kanwal, Member-Secretary (INCSW), and Sh. S.L. Meena, Director (Finance), CWC participated in the event.

During the event, indian delegation also promoted 9th International Micro-Irrigation Conference to be organised by CWC-INCSW at Aurangabad in 2019

Release of Publication during Inaugural Function of IDSC on 13.2.19 at Bhubaneswar, Odisha

Chairman, CWC addressing Dams India 2018 Conference at New Delhi

4th International Yoga Day Celebration at M&ERO, CWC, Bhubaneswar

Monthly Swachhta Abhiyan at Public Garden by PPA and KGBO, CWC on 27.7.2018

श्री मोती लाल, संयुक्त सचिव, के.ज.आ., श्री एन के माथुर, सदस्य (अभिकल्प एवं अनुसंधान), के.ज.आ., श्री एस मसूद हुसैन, अध्यक्ष, के.ज.आ., श्री आर.के. जैन, अध्यक्ष, गोदावरी नदी प्रबंधन बोर्ड, श्री आर.के. गुप्ता ,सदस्य सचिव, पोलावरम परियोजना प्राधिकरण एवं श्री डी. रंगारेड्डी , मुख्य अभियंता , कृष्णा और गोदावरी नदी बेसिन संगठन , के.ज.आ. 7.2.19 को हैदराबाद में हिन्दी में "जल संरक्षण हमारी ज़िम्मेदारी" विषय पर आयोजित प्रथम तकनीकी संगोष्ठी के दौरान स्मारिका का विमोचन करते हुये

Sh. U P Singh, Secretary, MoWR, RD&GR took a meeting to review the progress of IEWP on 26th November 2018 wherein nodal officers from the Indian side and EU were present.

Annexure – 5.1

List of Consultancy Projects in D&R Wing during the Year 2018-19

Sl. No.	Name of Project
Construction Stage Projects	
Andaman & Nicobar Islands	
1	KhudirampurNallah Water Supply Scheme
Andhra Pradesh	
2	Indira Sagar (Polavaram) Project
Chhatisgarh	
3	ArpaBhaisajhar Barrage Project (Arpa river)
Gujarat	
4	Garudeshwar Weir Project
Himachal Pradesh	
5	Phina Sigh Medium Irrigation Project
Jharkhand	
6	Kharkai Barrage under Subarnarekha M.P. Project
7	Icha Dam Under Subarnarekha M.P.Project
Madhya Pradesh	
8	Bargi Diversion Project
9	Pench Diversion Project
10	Halon Irrigation Project
Manipur	
11	Dholaithabi barrage Project
Meghalaya	
12	New Umtru H.E. Project
13	GanolH.E.Project
Odisha	
14	Anandpur Barrage Project
15	Chheligada Irrigation Project
16	Raising of height of Embankment of Tata Steel Project at Kalinganagar

Sl. No.	Name of Project
Rajasthan	
17	Parwan Project
18	BattisaNalah Minor Irrigation Project
Uttar Pradesh	
19	ArjunSahayakPariyojna
20	Kanhar Irrigation Project
Uttarakhand	
21	Tehri&Koteshwar H. E. Project
22	LakhwarMulti-Purpose Project
23	Vishnu gad Pipalkoti HEP
24	Dhukwan SHP
Bhutan	
25	Punatsangchu Stage-I H.E. Project
26	Punatsangchu Stage-II H.E. Project
Nepal	
27	Arun-3 HEP
DPR Stage Projects	
Assam	
1	RukmaniSonai Irrigation Project
2	Sonai Irrigation Project
Chattisgarh	
3	HasdeoBango (Minimata) Right Bank Canal Diversion Project
Jammu & Kashmir	
4	Ujh Multipurpose Project (DPR)
Jharkhand	
5	Twenty nine medium and minor projects for taking up preparation of DPR.
Maharashtra	
6	Intra State Link Projects.i.Daman Ganga (Val/Vagh)-Vaitarna-Godavari (Kadva-Dev) link.ii.Daman Ganga (Ekdare)-Godavari link
Orissa	

Sl. No.	Name of Project
7	Vetting of Designs & Drawings of proposed Weirs/Barrages on National Waterways-5.
Sikkim	
8	Kalezkhola H.E. Project
West Bengal	
9	Design of pass/fish ladder in proposed navigation lock at Farakka
Nepal	
10	SaptaKosiMulti-Purpose Project
11	SunkosiMulti-Purpose Project
12	Pancheshwar Multipurpose Project
Sp. Problem Projects	
Bihar	
1	Durgawati Reservoir Project
Chattisgarh	
2	Sikasar Project
Himachal Pradesh	
3	Rampur H.E.Project
Madhya Pradesh	
4	Indira Sagar Project - Re-designed of Energy Dissipation Arrangement
Maharashtra	
5	Temghar Project
Odisha	
6	Kanupur Irrigation Project
7	SubarnrekhaIrrigation Project
Punjab	
8	RanjitSagar Dam (Stability Analysis)
Rajasthan	
9	Rehabilitation of Garada Dam
Sikkim	
10	Teesta (Stage-IV) H.E.Project
Tripura	

Sl. No.	Name of Project
11	NoaCherra Barrage
West Bengal	
12	Dauk Barrage Project
13	Mahananda Barrage Project
14	Farakka Barrage Project
15	National Waterways-1, Bank Protection works in Farakka Feeder Canal
Bhutan	
16	TalaH.E.Project
17	ChukhaH.E.Project

Annexure-7.1

List of the Irrigation / Multipurpose Projects Accepted by the Advisory Committee of MoWR,RD&GR during 2018-19

Sl. No.	Project Name	State	Major/ Medium	Est. Cost (Rs. in Crore)	Irrigation Benefits (in Ha)
1	Revised Cost Estimate of Upper Pravara (Nilwande-II) Project	Maharashtra	RCE, Major irrigation	2232.62 Cr (PL 2016-17)	CCA -86100 AI- 68878
2	Kaleshwaram project	Telangana	new, Major irrigation	80190.46 Cr (PL 2015-16)	CCA-738851 AI--961497
3	Revised Cost Estimate (RCE) of Jigaon Irrigation Project	Maharashtra	RCE, Major Irrigation	7764.39 Cr (PL 2016-17)	CCA- 84240 AI-101088
4	Lower Tapi Project	Maharashtra	Major Irrigation	2751.05 Cr (PL 2016-17)	CCA- 25657 AI-32328
5	JiheKathapur Lift Irrigation Project	Maharashtra	Major Irrigation	1061.34 Cr (PL 2016-17)	CCA-35540 AI- 27500
6	Revised Cost Estimate (RCE) of ShahpurKandi Dam Project	Punjab	RCE, Multipurpose, National Project	2715.7 Cr (PL Feb, 2018)	CCA-37173 AI-37173
7	Modernization of Vijayanagara Channels in Tungabhadra Project under Karnataka Integrated and Sustainable Water Resources Management Investment Program (KISWRMIP), Tranche-II	Karnataka	ERM , Major Irrigation, Externally Assisted	456.63 Cr (PL 2017-18)	CCA- 11154 AI-16243
8	Revised Cost Estimate (RCE) of Tral Lift Irrigation Project	Jammu & Kashmir	RCE, Medium Irrigation	170.50 Cr (PL 2016)	CCA- 3415 AI-5122
9	Revised Cost Estimate (RCE) of Ghungshi Barrage Irrigation Project	Maharashtra	RCE, Medium Irrigation	498.46 Cr (PL 2016-17)	CCA- 6343 AI-6660
10	Ujh Multipurpose Project	Jammu & Kashmir	Major, Multipurpose, National Project	Rs. 5850 Cr (PL July 2017)	CCA- 16743 Ha AI - 31380 Ha.

Sl. No.	Project Name	State	Major/ Medium	Est. Cost (Rs. in Crore)	Irrigation Benefits (in Ha)
11	Revised Cost Estimate of Polavaram Irrigation Project	Andhra Pradesh	Major Irrigation, National Project.	Rs. 55548.87 Cr (PL 2017-18)	CCA- 02.91 Lakh h AI- 04.36 Lakh ha Power 960 MW
12	Revised Cost Estimate of Lakhwar Multipurpose Project	Uttarakhand	Multipurpose, National Project.	Rs. 5747.17 Cr (PL- July 2018)	CCA and AI- 33780 ha power- 300 MW
13	Revised Cost Estimate of Jamrani Dam Multipurpose Project	Uttarakhand	Major Multipurpose Irrigation	Rs. 2584.10 Cr (PL- May, 2018)	CCA- 150027 ha; AI- 295382 ha; Power- 14 MW

Annexure - 7.2

List of the Flood Control Schemes Accepted by the Advisory Committee of MoWR,RD&GR during 2018-19

Sl. No.	Project Name	State	Est. Cost (Rs. in Crore)	Flood Protection
1	Mahananda Flood management Scheme Phase-II	Bihar	791.066 Cr (2016 PL)	Area 114000 Ha; population 46.18 Lakh
2	Flood protection/channelisation of Seer Khad from barchhawar to Jahu Bridge in Tehsil Sarkaghat	Himachal Pradesh	157.66 Cr (Feb 2018 PL)	Area protected 115 Ha; population benefitted 10000
3	Flood protection works in Yanam.	Puducherry	137.28 crore	protected area 3000 ha and benefitted population 56000
4	Phase-I works of Ghatal Master Plan in PaschimMedinipur and PurbaMedinipur districts	West Bengal	1238.95 Cr (2107 PL)	Protected area 65700 Ha and population benefitted 8.74 lakh
5	Anti-erosion work in between km 28.00 to 35.00 km of P.P. Embankment and at Chandrapur Retire Line	Bihar	49.15 Cr (PL 2017)	Area Protected 792000 Ha & population benefitted 149198
6	Raising and strengthening JaauaDilliDiwanganjMahananda left embankment from km. 13.25 to km 34.07 with turning platform at the interval of 3 km with service road on the top	Bihar	81.77 Cr (PL 2017)	Area Protected 40180 Ha & population benefitted 200000
7	Raising and strengthening of Nagarpara embankment between 0.00 km to 13.110 km and after raising and strengthening construction of service road on above length of the embankment	Bihar	46.59 Cr (PL 2017)	Area Protected 4500 Ha & population benefitted 200000

Sl. No.	Project Name	State	Est. Cost (Rs. in Crore)	Flood Protection
8	Flood protection work of SML, ESML, Raising, Strengthening of Panchi Right embankment, Dagmara- Rajpur Embankment and km 15.00 to km 18.213 of WKE (Below Bharada)	Bihar	44.14 Cr (PL 2107)	Area Protected 10500 Ha & population benefitted 500000
9	Construction of Basantpur-Khajuri marginal Embankment on right bank of river Ghaghara in BarabankiDist	Uttar Pradesh	68.6159 Cr (PL-2018)	Benefitted area-5184 ha Benefitted population-15106
10	Revised project estimate for the construction of KhajuhaJhunjhuniyaAndharpurwa marginal bund on left bank of Rapti river in ShrawastiDist	Uttar Pradesh	46.3726 Cr (PL-2016)	Benefitted area-15412 ha Benefitted population-98350
11	Revised project estimate for the construction of ParsaDehariyaTilakpur marginal bund on left bank of Rapti river in ShrawastiDist	Uttar Pradesh	Rs. 37.8629 crore (PL- 2016)	Benefitted area-14868.76 ha Benefitted population-83900

Annexure - 7.3

The list of H.E Project accepted by TECduring 2018-19

Sl No.	Project Name	State	Capacity (MW)
1.	Sawalkot	Jammu & Kashmir	1856
2.	Luhri Stage-I	Himachal Pradesh	210
3.	Attunli	Arunachal Pradesh	680
Total			2746

Annexure - 7.4

Present Status of Projects declared as National Projects

Sl. No.	Name of the Project	1) Irrigation (Ha) 2) Power (MW) 3)Storage (MAF)	Year-wise Central Assistance released under Scheme of National Project (inCroresRs.)	Status
1.	Gosikhurd, Maharashtra	1) 2.50 lakh 2) 3 MW 3) 0.93 MAF	2008-09= 450.00 2009-10= 720.00 2010-11= 1412.94 2012-13= 405.00 2017-18= 166.59 2018-19=195.81 Total= 3350.34	Project is under execution.
2.	Shahpurkandi, Punjab	1) 0.37 lakh 2) 168 MW 3) 0.012MAF	2009-10= 10.80 2010-11=15.236 Total= 26.036	Project is under execution. Central Assistance of Rs. 29.85 Cr. also provided under AIBP prior to declaration of National Project.
3.	Teesta Barrage, West Bengal	1) 9.23 lakh 2) 1000 MW 3) Barrage	2010-11= 81.00 2011-12= 97.20 Total= 178.20	Project is at standstill since 2014-15 due to land acquisition issues.
4.	Renukaji, HP	1) Drinking water 2) 40 MW 3) 0.404 MAF	-	Revised cost finalised as 6946.99 Cr. at price level October, 2018. One–time special grant of Rs 446.96 Cr was provided as per order of Hon'ble Supreme Court.
5.	LakhwarVyasi, Uttarakhand	1) 0.34 lakh 2) 420 MW 3) 0.325 MAF	-	RCE of the project amounting to Rs. 5747.17 at PL 07/2018 was accepted during 141st Advisory Committee meeting held on 11.02.2019. National Green Tribunal on 10.01.2019 directed Expert Appraisal Committee (EAC) of MoEF& CC to appraise the project afresh in terms of EIA notification 2006.

Sl. No.	Name of the Project	1) Irrigation (Ha) 2) Power (MW) 3)Storage (MAF)	Year-wise Central Assistance released under Scheme of National Project (inCroresRs.)	Status
6.	Kishau, HP/ Uttarakhand	1) 0.97 Lakh 2) 600 MW 3) 1.04 MAF	-	Revised DPR under preparation by Project Authority.
7.	Ken Betwa, Madhya Pradesh	1) 6.35 lakh 2) 78 MW 3) 2.18 MAF	-	DPR of Ph-II is under appraisal in CWC. As per the decision taken in the review meeting convened by Hon'ble Union Minister (WR, RD & GR) on 25th September, 2017 a draft comprehensive report on Ken Betwa Link Project prepared by NWDA was forwarded to State Govt. of MP / UP and CWC. Final report is yet to be received.
8.	Bursar, J&K	1) 1 lakh (indirect) 2) 1230 MW 3) 1 MAF	-	Under appraisal in CWC/CEA.
9.	Gyspa Project, HP	1) 0.50 lakh ha 2) 300 MW 3) 0.74 MAF	-	DPR under preparation by Govt. of Himachal Pradesh.
10.	2nd Ravi Vyas Link, Punjab	Harness water flowing across border of about .58 MAF in non-monsoon period	-	Under PFR stage
11.	Ujh Multipurpose Project, J&K	1) 0.32 lakh 2) 212 MW 3) 0.82 MAF	-	#
	# Accepted by Advisory Committee in 139th meeting held on 07.01.2019 for Rs. 5850.00 Cr. at PL 07/2017. At present projected consumptive requirement of water in J&K is about 250 MCM (including evaporation losses). Meetings were held by Secretary (WR, RD & GR) on 15th Feb, 2019 and 11th June, 2019 to review the possible ways for utilization of entire storage from the proposed Ujh Multipurpose project in the downstream areas of the project in Ravi/Beas basin. Govt. of J&K is to frame a detailed proposal, for inclusion of additional CCA and consumptive requirement of water bringing out its cost as well as the benefits.			

Sl. No.	Name of the Project	1) Irrigation (Ha) 2) Power (MW) 3)Storage (MAF)	Year-wise Central Assistance released under Scheme of National Project (inCroresRs.)	Status
12.	Kulsi Dam Project, Assam	1) 22,000 ha. 2) 55 MW 3) 0.28 MAF	-	Under appraisal in CWC / CEA. The State is to decide ownership, funding of their part and enter into Memorandum of Agreement (MoA) with the State of Meghalaya.
13.	Noa-Dihing Dam Project, Arunachal Pradesh	1) 3605 ha. 2) 71 MW 3) 0.26 MAF	-	Under appraisal in CWC / CEA. The State is to decide funding of their part.
14.	Upper Siang, Arunachal Pradesh	1) Indirect 2) 9750 MW 3) 1.44 MAF 4) Flood moderation	-	DPR under preparation
15.	SaryuNaharPariyojana, Uttar Pradesh	1) 14.04(NP comp. 4.73) 2) - 3) Barrage	2012-13= 67.98 2013-14= 380.75 2014-15= 210.855 2015-16= 500.00 2016-17= 62.00 2017-18=0.00 2018-19=305.00 Total = 1526.58	Project is under execution.
16.	IndirasagarPolavaram, Andhra Pradesh	1) 4.68 lakh ha 2) 960 MW 3) 23.44 TMC of water to Vizag city for drinking and Industrial Purpose and Diversion of 84.70 TMC to Krishna.	2014-15= 250.00 2015-16= 600.00 2016-17= 2514.70 2017-18= 2000.00 2018-19=1400.00 Total = 6764.16	Project is under execution. Central Assistance of Rs. 562.47Cr also provided under AIBP prior to declaration of National Project.

Annexure - 8.1

State-Wise and Project-Wise List of Projects under General Monitoring - Target & Achievements of Monitoring Visits during 2018-19

Sl. No	State/Project Name	Major/ Medium/ ERM	Date of Visit	Status of Report
ANDHRA PRADESH/ TELANGANA				
1	1-Peddagedda Reservoir Project-AP	Medium	--	--
2	2-Godavari Lift Irrigation Scheme-TS	Major	-	--
3	3- KLRS Pulichintala Project &Krishna Delta Modernization Scheme including Pulichintala Dam Project (New)-AP	Major	--	--
4	4-Pulivendula Branch Canal-AP	Major	--	--
5	5-Tungabhadra high level canal stage -II-AP	Major	--	--
	TOTAL- 05			
BIHAR				
6	1-North Koel Reservoir-IS	Major	-	-
7	2-Bateswar Asthan Ganga Pump Canal Phase-I -IS	Major	--	--
	TOTAL- 02			
GUJARAT				
8	1-Und-II	Medium	--	--
	Total-01			
HIMACHAL PRADESH				
9	1-Phina Singh Irrigation Project	Medium	-	-
10	2-Nadaun Area Medium Irrigation Project	Medium	-	-
	TOTAL-02			
JHARKHAND				
11	1-Ajoy BarrageProject	Major	--	--

Sl. No	State/Project Name	Major/ Medium/ ERM	Date of Visit	Status of Report
12	2-Dhansinghtoli Res. Project	Medium	--	--
13	3-Katri Res.Project	Medium	--	--
14	4-Nakti Res. Project	Medium	--	--
15	5-PunasiRes.Project	Medium	--	--
16	6-Kans Reservoir	Medium	--	--
	TOTAL-06			
KARANATAKA				
17	1-Hirehalla	Medium	--	--
18	2-Amarja	Medium	--	--
19	3-Bennathora	Major	--	--
20	4-Lower Mullamari	Medium	--	--
21	5-Sri Rameshwara Lift Irrigation	Major	--	--
	TOTAL-05			
KERALA				
22	1-Idamalayar Irri. Project	Major	-	-
	TOTAL-01			
MAHARASHTRA				
23	1-Wakod Irrigation Project	Medium	--	--
24	2-Kirmiri Darur Lift Irrigation Scheme	Medium	--	--
25	3-Sonapur Tomta Lift Irrigation Scheme	Medium	--	--
26	4-Chilhewadi Irrigation Project	Medium	--	--
27	5-Haranghat Lift Irrigation Scheme	Medium	--	--
28	6-Kamani Tanda Medium Irrigation Project	Medium	--	--
29	7-Ghungshi Barrage Medium Irigation Project	Medium	--	--

Sl. No	State/Project Name	Major/ Medium/ ERM	Date of Visit	Status of Report
30	8-Shelgaon Barrage project	Medium	23.10.2018 08.03.2019	--
31	9-Urmodi Irrigation Project	Major	--	--
32	10-Tembhu Lift Irrigation Project	Major	--	--
33	11-Bodwad ParisarSinchanYojna	Major	23.10.2018	-
34	12-Maharashtra Water sector Improvement Project (MWSIP) (World Bank Aided)-ERM	Major	--	--
35	13- Purna Barrage (NerDhamana) Irrigation Project.	Medium	--	--
36	14-Upper Pravara	Major	15.03.2019	-
	TOTAL-14			
MEGHALAYA				
37	1-Rongoi Valley	Medium	--	--
	Total-01			
NAGALAND				
38	1-D'zuza irrigation scheme	Medium	--	--
	TOTAL_01			
RAJASTHAN				
39	1-Takli Irrigation Cum Drinking Water Project	Medium	--	--
40	2-Gagrin Irrigation Project	Medium	--	--
41	3-Piplad Irrigation Project	Medium	--	--
42	4-Lhasi Irrigation Project	Medium	--	--
	TOTAL-04			
UTTAT PRADESH				
43	1-Bhupali Pump Canal	Major	--	--
44	2-Kanhar Irrigation Project	Major	--	--

Sl. No	State/Project Name	Major/ Medium/ ERM	Date of Visit	Status of Report
45	3-Restoring capacity of Western Gandak Canal system – ERM	Major	--	--
	TOTAL-03			
WEST BENGAL				
46	1-Beko Irrigation scheme	Major	--	--
47	2-Khairabera Irrigation Scheme	Major	--	--
	Total-02			
	Monitoring Target	**47**	4	

Annexure - 8.2

State-Wise and Project-Wise List of Projects under AIBP - Target & Achievements of Monitoring Visits during 2018-19

Sl. No	State/Project Name	Major/ Medium/ ERM	Date of Visit	Status of Report
	ANDHRA PRADESH			
1	Yerrakalva Res.	Med.	04.07.2018	Issued
2	Tadipudi LIS	Maj.	05.07.2018	Issued
3	Pushkara LIS	Maj.	(i) 11.05.2018 (ii) 22.11.2018	Issued
4	Gundlakdamma	Maj.	(i) 09.07.2018 (ii) 22.11.2018	Issued
5	Thotapally Barrage	Maj.	22.08.2018	Issued
6	TarakaramathirthaSagaram	Med.	23.08.2018	Issued
7	Musurumilli	Med.	10.05.2018	Issued
8	Indira Sagar (Polavaram)	Maj.		--
	Maddigedda Res. Project			Issued
	TOTAL=08			
	ASSAM			
9	Dhansiri	Maj.	(i) 20.08.2018 (ii) 27.03.2019	Issued
10	Champamati	Maj.	(i) 08.06.2018 (ii) 28.02.2019	Issued
11	Borolia	Med.	(i) 10.08.2018 (ii) 03.03.2019	Issued
12	BurhiDihing lift	Med.	--	--
	Mod. Of Jamuna-ERM		--	--
	TOTAL=04			
	BIHAR			
13	Western Kosi	Maj.	--	--
14	Durgawati	Maj.	(i) 19.11.2018 (ii) 20.11.2018	Issued
	Bansagar		--	--

Sl. No	State/Project Name	Major/ Medium/ ERM	Date of Visit	Status of Report
15	Batane	Med.	--	--
16	Punpun	Maj.	21.11.2018	Issued
	Eastern Kosi Canal System-ERM		--	--
	TOTAL=04			
	CHHATISGARH			
17	Kelo Project	Maj.	23-24.06.2018	Issued
18	Kharung	ERM	29.05.2018	Issued
19	Sutiapat	Med.	--	--
20	Maniyari Tank (ERM)	Maj	29.05.2018	Issued
	TOTAL=04			
	GOA			
21	Tillari	Maj.	05-06.9.2018	Issued
	TOTAL=01			
	GUJARAT			
22	SardarSarovar	Maj.	25-28.09.2018 12.03.2019	Issued
	TOTAL=01			
	HIMACHAL PRADESH			
23	ShahneharIrr. Project	Maj.	--	--
24	Sidhata	Med.	--	--
25	BalhVally (Left Bank)	Med.	--	--
	TOTAL=03			
	JAMMU & KASHMIR			
26	Mod. of Ranbir Canal*	ERM	--	--
27	Mod. of New Pratap Canal*	ERM	--	--
28	Rajpora Lift	Med.	26.05.2018	Issued
29	Tral Lift	Med.	26.04.2018	Issued
30	Mod. Of Dadi Canal	ERM	--	--
31	Mod. Kandi Canal	Med	--	--

Sl. No	State/Project Name	Major/ Medium/ ERM	Date of Visit	Status of Report
32	PrakachikKhows Canal	Med.	09.08.2018	Issued
33	Mod. Of Ahji Canal	ERM	--	--
34	Restoration & Mod. Of Main Ravi Canal	ERM	17.05.2018 26.03.2019	Issued
	TOTAL=09			
	JHARKHAND			
35	Gumani	Med.	--	--
36	Sonua	Med.	--	--
37	Surangi	Med.	--	--
38	Upper Sankh	Med.	--	--
39	Panchkhero	Med.	--	--
40	Subernarekha Multipurpose	Maj	03-04.01.2019	Issued
	TOTAL=06			
	KARNATAKA			
41	Upper Krishna St.I	Maj.	--	--
42	Malaprabha	Maj.	--	--
43	Karanja	Maj.	12-13.07.2018	Issued
44	Upper Krishna St.II	Maj.	--	--
45	Varahi	Maj.	--	--
46	Dudhganga	Maj.	--	--
47	Mod. Canal System of Bhadra Reservoir Canal System (ERM)	ERM	--	--
48	Hipparagi LIS	Maj.	--	--
49	Restoration Bhimasamundra Tank	ERM	--	--
50	Bhima LIS	Maj.	10-11.07.2018	Issued
51	GuddadaMalapura Lift	Med	--	--
52	Upper Tunga Irrigation Project	Major		
53	Sri Rameswar Irrigation	Major	27-28.06.2018	Issued
54	NLBC System Project(New ERM)	ERM	25-26.06.2018	Issued
	TOTAL=14			

Sl. No	State/Project Name	Major/ Medium/ ERM	Date of Visit	Status of Report
	KERALA			
55	Muvattupuzha	Maj.	12.10.2018	Issued
56	Karapuzha	Med.	28.06.2018	Issued
57	Kanhirapuzha	ERM	--	--
58	Chitturpuzha	ERM	--	--
	TOTAL=04			
	MADHYA PRADESH			
59	Indira Sagar Unit II (Ph I &II)	Maj.		
	Indira Sagar Canal Ph. III			
	Indira Sagar Unit IV		27-28.12.2018	Issued
	Indira Sagar Unit V			
	Bansagar Unit-II		22.05.2018	Issued
60	Sindh Phase II	Maj.	06.07.2018	Issued
61	Mahi	Maj.	19.06.2018	Issued
62	Bariarpur LBC	Maj.	--	--
63	Bawanthadi	Maj.	--	--
64	Mahan	Maj.	23.05.2018	Issued
65	OmkareshwarPh - I	Maj.	--	--
	Omkareshwar, Ph.-II		14.11.2018	Issued
	Omkareshwar, Ph.-III		15.11.2018	Issued
	Omkareshwar, Ph.-IV		15.11.2018	Issued
66	Bargi Diversion Ph - I	Maj.	22.05.2018	Issued
	Bargi Diversion Ph -I I		23.05.2018	Issued
	Bargi Diversion Ph -I II		24.05.2018	Issued
	Bargi Diversion Ph-IV		24.05.2018	Issued
67	PenchDiv-I	Maj.	17.07.2018	Issued
68	Upper Beda	Maj.	--	--
69	Punasa lift	Maj.	--	--
70	Lower Goi	Maj.	--	--
71	Jobat	Med	--	--
72	Sagar(Sagad)	Med.	16.05.2018	Issued
73	Singhpur	Med.	14-15.05.2018	Issued
74	Sanjay Sagar (Bah)	Med.	16.05.2018	Issued
75	Mahuar	Med.	14-15.05.2018	Issued

Sl. No	State/Project Name	Major/ Medium/ ERM	Date of Visit	Status of Report
	TOTAL=17			
	MAHARASHTRA			
76	Gosikhurd [NP]	Maj.	27.04.2018, 2-4.05.2018	Issued
77	Waghur	Maj.	(i) 01.06.2018 (ii) 7-8.03.2019	Issued
78	Upper Manar	Med.	--	--
79	Upper Pen Ganga	Maj.	(i) 28.06.2018 (ii) 05.06.03.2019	Issued
	Bawanthadi [IS]		14.03.2019	(i) Issued
80	Lower Dudhna	Maj.	07.03.2019	Issued
	Tillari		14.03.2019	Issued
81	Warna	Maj.	--	--
82	Punad	Maj.	-	--
83	Lower Wardha	Maj.	(i) 22-23.05.2018 (ii) 15.03.2019	Issued
84	Khadakpurna	Maj.	26.06.2018	Issued
85	Dongargaon	Med.	-	-
86	Gul	Med.	--	--
87	Bembla	Maj.	(i) 29.06.2018 (ii) 11.03.2019	Issued
88	Uttermand	Med.	--	--
89	Sangola Branch Canal	Maj.	(i) 13.07.2018 (ii) 13.03.2019	Issued
90	Tarali	Maj.	10-11.1.2019	Issued
91	DhomBalakwadi	Maj.	08-09.01.2019	Issued
92	Morna (Gureghar)	Med.	20.04.2018	Issued
93	Arjuna	Med.	08.02.2019	Issued
94	Lower Pedhi	Maj.	20.06.2018	(i) Issued
95	Upper Kundalika	Med	08.03.2019	Issued
96	Wang Project	Med	20.04.2018	Issued
97	Lower Panzara	Med	(i) 02.06.2018 (ii) 6.03.2019	Issued
98	Aruna	Med	31.05.2018	Issued

Sl. No	State/Project Name	Major/ Medium/ ERM	Date of Visit	Status of Report
99	Krishna Koyana Lift	Maj.	14-15.07.2018	Issued
100	Naradave (Mahammadwadi)	Med	(i) 30.05.2018 (ii) 16.03.2019	Issued
101	Gadnadi	Med	09.02.2019	Issued
102	Kudali	Med	19.04.2018	Issued
	NandurMadhmeshwarPh-II		(i) 30-31.05.2018 (ii) 25-26.03.2019	Issued
	TOTAL=27			
	MANIPUR			
103	Khuga	Maj.	--	--
104	Thoubal	Maj.	(i) 20-22.11.2018 (ii) 14.03.2019	Issued
105	Dolaithabi Barrage	Med.	(i) 20-22.11.2018 (ii) 13-14.03.2019	Issued
	TOTAL=03			
	ORISSA			
106	Upper Indravati(KBK)	Maj.	(i) 22.11.2018 (ii) 21.01.2019	Issued
107	Subernarekha	Maj.	31.10.2018	Issued
108	Rengali	Maj.	-	
109	Anandpur Barr./ Integrated Anandpur Barr.	ERM	(i) 03.08.2018 (ii) 27.02.2019	Issued
110	Lower Indra(KBK)	Maj.	(i) 30.06.2018 (ii) 28.03.2019	Issued
111	Lower Suktel(KBK)	Maj.	--	--
112	Telengiri(KBK)	Maj.	27.03.2019	Issued

Sl. No	State/Project Name	Major/ Medium/ ERM	Date of Visit	Status of Report
113	RET Irrigation(KBK)	Med.	21.11.2018	Issued
114	Kanupur	Maj.	(i) 19.01.2019 (ii) 28.02.2019	Issued
115	Chheligada Dam	Med.	--	--
116	Rukura-Tribal	Med	14.01.2019	Issued
	TOTAL=11			
	PUNJAB			
117	ShahpurKandi dam (N.P)	Maj.	--	--
118	Kandi Canal Extension (Ph.II)	ERM	--	--
119	Rehabilitation of Ist Patiala Feeder and Kotla Branch Project	ERM	--	--
120	Relining of Rajasthan Feeder Cannal&Sirhind Feeder	ERM	--	--
	TOTAL=04			
	RAJASTHAN			
121	IGNP Stage-II	Maj.	--	--
122	Narmada Canal	Maj.	9-11.07.2018	Issued
123	Mod. of Gang Canal	ERM	--	--
	TOTAL=03			
	TELANGANA			
124	Indiramma FFC of SRSP	ERM	(i) 28-29.09.2018 (ii) 23.02.2019	Issued
125	SRSP St.II	ERM	(i) 12.06.2018 (ii) 15.11.2018	Issued
126	Ralivagu	Med.	(i) 17.04.2018 (ii) 17.12.2018	Issued

Sl. No	State/Project Name	Major/ Medium/ ERM	Date of Visit	Status of Report
127	Gollavagu	Med.	(i) 17.04.2018 (ii) 17.12.2018	Issued
128	Mathadivagu	Med.	(i) 01.08.2018 (ii) 22.01.2019	Issued
129	Peddavagu at Jagannathpur	Med.	(i) 18.04.2018 (ii) 18.12.2018	Issued
130	J. ChokkaRao LIS	Maj	(i) 21-22.05.2018 (ii) 29.01.2019	Issued
131	Neelwai (Peddavagu)	Med.	(i) 18.04.2018 (ii) 17.12.2018	Issued
132	Sri KomaramBheem	Med.	(i) 19.04.2018 (ii) 18.12.2018	Issued
133	Palemvagu	Med.	(i) 08.06.2018 (ii) 30.01.2019	Issued
134	Rajiv Bhima LIS	Maj	(i) 19.06.2018 (ii) 09.01.2019	Issued
	TOTAL=11			
	TRIPURA			
135	Manu	Med.	--	--
136	Gumti	Med.	--	--
137	Khowai	Med.	--	--
	TOTAL=03			
	UTTAR PRADESH			
138	SaryuNahar NP	Maj	(i) 10-12.07.2018 (ii) 05-07.02.2019	Issued

Sl. No	State/Project Name	Major/ Medium/ ERM	Date of Visit	Status of Report
139	Bansagar Canal	Maj.	(i) 07-09.05.2018 (ii) 24-27.05.2018	Issued
140	Mod. of Lachhura Dam	ERM	--	--
141	Improving Irr. Intensity of Hardoi Branch System	ERM	--	--
142	Madhya Ganga Canal Ph-II	Maj.	--	--
143	Kachnoda Dam	Maj.	--	--
144	ArjunShyak	Maj.	(i) 22-24.10.2018 (ii) 27-28.02.2019	Issued
145	Restoring Cap of SardaSahayak [NP]	ERM	--	--
	TOTAL=08			
	WEST BENGAL			
146	Teesta Barrage [N.P]	Maj.	--	--
147	Tatko	Med.	--	--
148	Patloi	Med.	--	--
149	Subernrekha Barrage ++	Maj.	--	--
	TOTAL=04			
	Grand Total	**149**	**129**	**122**

Annexure - 8.3

State-Wise and Project-Wise List of Inter-State Projects to be Monitored by CWC (HQ) during 2018-19

S. No.	Name of Project	Major/ Medium/ ERM	States
1.			
2.	Subernarekha multipurpose Irrigation project	Major	JHARKHAND (ORISSA,W.B)
3.	Western Kosi Canal	Major	BIHAR (JHARKHAND)
4.	Batane Irrigation Project	Medium	BIHAR (JHARKHAND)
	Total - 3		
5.	Bansagar Canal (UP)	Major	UTTAR PRADESH (M.P)
	Total - 1		
6.	Indira sagarPolavaram	Major	ANDHRA PRADESH (ORISSA)
7.	Dudhganga project	Major	KARNATAKA (MAHARASTRA)
8.	Subernarekha irrigation project	Major	ORISSA (JHARKHAND)
	Total - 3		
9.	Rajasthan Feeder Canal	Major	RAJASTHAN (PUNJAB)
10.	SardarSarovar (Narmada)	Major	GUJARAT (RAJASTHAN)
11.	Narmada Project	Major	RAJASTHAN (GUJARAT)
	Total - 3		
12.	Bawanthadi (IS)	Major	MAHARASHTRA (M.P)
13.	Tillari #	Major	GOA (MAHARASHTRA)
14.	Bansagar Canal (MP)	Major	M.P (UTTAR PRADESH)
	Total - 3		
15.	**Grand Total - 13**		

Annexure - 8.4

State-wise Summary of Monitoring Visits to projects under AIBP - Targets and Achievements during 2018-19

Sl. No.	Name of the State	Target	Achievement	Status Reports prepared
1	ANDHRA PRADESH	8	9	9
2	ASSAM	4	6	3
3	BIHAR	4	2	2
4	CHATTISGARH	4	3	3
5	GOA	1	1	1
6	GUJARAT	1	2	2
7	HIMACHAL PRADESH	3		
8	JAMMU & KASHMIR	9	5	5
9	JHARKHAND	6	1	1
10	KARNATAKA	14	4	4
11	KERALA	4	2	2
12	MADHYA PRADESH	17	17	17
13	MAHARASHTRA	27	32	30
14	MANIPUR	3	4	2
15	ODISHA	11	12	12
16	PUNJAB	4		
17	RAJASTHAN	3	1	1
18	TELANGANA	11	22	22
19	TRIPURA	3	0	0
20	UTTAR PRADESH	8	6	6
21	WEST BENGAL	4	0	0
	TOTAL	**149**	**129**	**122**

Annexure - 8.5

Details of Completed Projects under AIBP

S. No.	State/Project Name	Year of Inclusion in AIBP	Year of Completion
	ANDHRA PRADESH		
1	Cheyyeru(Annamaya)	1996-97	2003-04
2	Somasila	1998-99	2006-07
3	Madduvalasa	1998-99	2005-06
4	Maddigedda	2001-02	2006-07
5	Vamsdhara St-II Ph I	2003-04	2008-09
6	Veligallu	2006-07	2008-09
7	Swarnamukhi	2005-06	2008-09
	ASSAM		
8	Pahumara	1996-97	2008-09
9	Hawaipur lift	1996-97	2006-07
10	Rupahi Lift	1996-97	2001-02
11	Boradikarai	1997-98	2004-05
12	Intg. Irr. Scheme in Kallong Basin	1997-98	2006-07
13	Kallonga @	1996-97	2006-07
14	Mod. ofJamunaIrr.	2001-02	2008-09
	BIHAR		
15	Upper Kiul	1996-97	2006-07
16	Orni Reservoir	1997-98	2006-07
17	Bilasi Reservoir	1997-98	2000-01
18	Sone Modernisation	1998-99	2008-09
19	Restoration of Kosi Barrage and its appurtenants for sustaining created irrigation Potential	2008-09	2010-11
	CHHATISGARH		
20	HasdeoBango	1997-98	2006-07

S. No.	State/Project Name	Year of Inclusion in AIBP	Year of Completion
21	Shivnath Diversion	1997-98	2002-03
22	Jonk Diversion	1999-2000	2006-07
23	Kosarteda	2002-03	2013-14
24	Mahanadi Res. Pr.	2005-06	2010-11
25	Barnai	2002-03	2006-07
26	Minimata (HasdeoBango Ph. IV)	2007-08	2010-11
	GOA		
27	Salauli	1997-98	2006-07
	GUJARAT		
28	Jhuj	1996-97	1999-2000
29	Sipu	1996-97	1999-2000
30	Mukteshwar	1996-97	2006-07
31	Harnav - II	1996-97	1997-98
32	Umaria	1996-97	1996-97
33	Damanganga	1997-98	1999-2000
34	Karjan	1997-98	1999-2000
35	Sukhi	1997-98	1999-2000
36	Deo	1997-98	1997-98
37	Watrak	1997-98	1999-2000
38	Aji-IV	2000-01	2009-10
39	Ozat-II	2000-01	2009-10
40	Brahmini-II	2000-01	2008-09
41	Bhadar-II	2002-03	2010-11
	HARYANA		
42	Gurgaon Canal	1996-97	2003-04
43	WRCP	1996-97	2006-07

S. No.	State/Project Name	Year of Inclusion in AIBP	Year of Completion
	HIMACHAL PRADESH		
44	Changer Lift Irr. Project	2000-01	2012-13
	JAMMU & KASHMIR		
45	Marwal Lift*	1996-97	2006-07
46	Lethpora Lift*	1996-97	2006-07
47	Koil Lift*	1996-97	2006-07
48	Mod. of Kathua Canal	1999-2000	2006-07
49	IgopheyIrr. Pr.	2000-01	2006-07
50	Rafiabad High Lift Irr.	2001-02	2010-11
51	Mod. of Zaingir Canal	2001-02	2006-07
52	Mod. Of Martand Canal	2006-07	2010-11
53	Mod. Of MavKhul	2006-07	2010-11
54	Mod. of Babul Canal	2007-08	2011-12
	JHARKHAND		
55	Latratu	1997-98	2002-03
56	Kansjore	1997-98	2010-11
57	Tapkara Reservoir	1997-98	2002-03
	KARNATAKA		
58	Hirehalla	1996-97	2006-07
59	GhataprabhaSt.III	1997-98	2010-11
60	GandoriNala	2001-02	2009-10
61	Maskinallah	2002-03	2003-04
62	Votehole	2007-08	2008-09
	KERALA		
63	Kallada	1996-97	2004-05
	MADHYA PRADESH		

S. No.	State/Project Name	Year of Inclusion in AIBP	Year of Completion
64	Bansagar Unit-I	1996-97	2010-11
65	Upper Wainganga	1996-97	2002-03
	Rajghat Dam	1998-99	2004-05
66	Sindh Phase I	1999-2000	2006-07
67	Urmil RBC	2000-01	2002-03
68	Banjar	2000-01	2002-03
	MAHARASHTRA		
69	Surya	1996-97	2006-07
70	Bhima	1997-98	2006-07
71	Upper Tapi	1997-98	2004-05
72	Upper Wardha	1997-98	2008-09
73	Wan	1998-99	2005-06
74	Jayakwadi Stage-II	2000-01	2004-05
75	Vishnupuri	2000-01	2005-06
76	Bahula	2000-01	2006-07
77	Krishna	2002-03	2008-09
78	Kukadi	2002-03	2008-09
79	Hetwane	2002-03	2008-09
80	Chaskaman	2002-03	2008-09
81	Wan - II	2006-07	2008-09
82	PothraNalla	2006-07	2008-09
83	Utawali	2006-07	2008-09
84	Purna	2006-07	2008-09
85	NandurMadhmeshwar	2006-07	2008-09
86	Kar	2006-07	2008-09
87	LalNalla	2006-07	2008-09

S. No.	State/Project Name	Year of Inclusion in AIBP	Year of Completion
88	Arunavati	2006-07	2008-09
89	Tajnapur LIS	2006-07	2008-09
90	Khadakwasla	2002-03	2004-05
91	Kadvi	2002-03	2004-05
92	Kasarsai	2002-03	2004-05
93	Jawalgaon	2002-03	2004-05
94	Kumbhi	2002-03	2006-07
95	Kasari	2002-03	2004-05
96	Patgoan	2004-05	2006-07
97	Madan Tank	2005-06	2008-09
98	ShivnaTakli	2005-06	2008-09
99	Amravati	2005-06	2007-08
100	Chandarbhaga	2007-08	2009-10
101	Sapan	2007-08	2009-10
102	Pentakli	2007-08	2009-10
103	Prakasha Barrage	2007-08	2008-09
104	Sulwade Barrage	2007-08	2008-09
105	Sarangkheda	2007-08	2008-09
	ORISSA		
106	Upper Kolab(KBK)	1997-98	2004-05
107	Titlagarh St-II(KBK)	1998-99	2004-05
108	Potteru(KBK)	2001-02	2004-05
109	Naraj Barrage	2001-02	2005-06
110	Improvement to Sason Canal System	2002-03	2004-05
111	Salandi Left Main Canal-Ambahata	2002-03	2005-06
112	Improvement to Salki Irrigation	2003-04	2004-05

S. No.	State/Project Name	Year of Inclusion in AIBP	Year of Completion
	PUNJAB		
113	RanjitSagar Dam	1996-97	2000-01
114	Remodelling of UBDC	2000-01	2006-07
115	Irr. to H.P. below Talwara (ShahneharIrr. Project)	2000-01	2005-06
	RAJASTHAN		
116	Jaisamand (Modernisation)	1996-97	2000-01
117	Chhapi	1996-97	2004-05
118	Panchana	1997-98	2004-05
119	Bisalpur	1998-99	2006-07
120	Gambhiri (Modernisation)	1998-99	2000-01
121	Chauli	1998-99	2006-07
122	Mahi Bajaj Sagar	1999-2000	2006-07
123	WRCP	1996-97	2006-07
	TELANGANA		
124	SriramsagarSt.I	1996-97	2005-06
125	PriyadarshiniJurala	1997-98	2006-07
126	Nagarjunsagar	1998-99	2005-06
127	Gundalavagu	2001-02	2006-07
128	Alisagar LIS	2006-07	2008-09
129	Guthpa LIS	2006-07	2008-09
	UTTAR PRADESH		
130	Upper Ganga including Madhya Ganga Canal	1996-97	2003-04
131	SardaSahayak	1996-97	2000-01
132	Providing Kharif Channel in H.K. Doab	1996-97	2004-05
133	Rajghat Dam	1996-97	1996-97
134	GuntaNala Dam	1996-97	1999-2000

S. No.	State/Project Name	Year of Inclusion in AIBP	Year of Completion
135	Gyanpur Pump Canal	1999-2000	2001-02
136	Eastern Ganga Canal	1999-2000	2010-11
137	Rajghat Canal	2000-01	2008-09
138	Mod. Agra Canal	2002-03	2008-09
139	Jarauli Pump Canal	2003-04	2006-07
	UTTRAKHAND		
140	Tehri	1999-2000	2006-07
	WEST BENGAL		
141	Kangsabati	1997-98	2001-02
142	Mod. Barrage and Irrigation System of DVC	1997-98	2006-07
143	Hanumata	2000-01	2008-09

Annexure - 8.6

Details of Projects Reported to be Completedunder PMKSY-AIBP as on 31.3.2019

S. No.	State/Project Name	Year of Inclusion in AIBP	Year of Completion
	ANDHRA PRADESH		
1	Maddigedda	2001-02	2017-18
	CHHATISGARH		
2	Maniyari Tank (ERM)	2011-12	2017-18
3	Kharung(ERM)	2010-11	
	JAMMU & KASHMIR		
4	Rajpora Lift	2000-01	2018-19
	KARNATAKA		
5	Sri Rameswar Irrigation	2014-15	2017-18
6	Bhima LIS	2009-10	2018-19
	MADHYA PRADESH		
7	Sagar(Sagad)	2011-12	2017-18
8	Singhpur	2011-12	2017-18
9	Mahuar	2013-14	2017-18
10	Sindh Phase II	1998-99	2018-19
11	Bariarpur LBC	2000-2001	2018-19
12	Bansagar Unit-II	2003-04	2018-19
13	Sanjay Sagar (Bah)	2011-12	2018-19
14	Indira Sagar Unit II (Ph I & II)	1996-97	2018-19
15	Indira Sagar Unit V	2014-15	2018-19
16	Omkareshwar, Ph.-IV	2014-15	2018-19
17	Bargi Diversion Ph - I	2001-02	2018-19
	MAHARASHTRA		
18	Bawanthadi [IS]	2004-05	2017-18

19	Lower Panzara	2009-10	2017-18
20	Dongargaon	2005-06	2017-18
21	Warna	2005-06	2017-18
22	NandurMadhmeshwar	2006-07	2018-19
23	Upper Kundalika	2008-09	2018-19
	ORISSA		
24	Upper Indravati(KBK)	1996-97	2017-18
25	Rukura-Tribal	2009-10	2017-18
26	RET Irrigation(KBK)	2003-04	2018-19
	PUNJAB		
27	Kandi Canal Extension (Ph.II)	2002-03	2017-18
28	Rehabilitation of Ist Patiala Feeder and Kotla Branch Project	2007-08	2017-18
	RAJASTHAN		
29	Narmada Canal	1998-99	2018-19
30	Mod. of Gang Canal	**2000-2001**	2018-19
	TELANGANA		
31	Gollavagu	2006-07	2017-18
32	Ralivagu	2006-07	2017-18
33	Mathadivagu	2006-07	2017-18
	UTTAR PRADESH		
34	Bansagar Canal	**1997-98**	2018-19

Annexure - 8.7

List of Completed Projects Selected for Impact Assessment Study by Academy of Management Studies

Sl. No	Project Name	State
1	Hawaipur Lift Irrigation Scheme	Assam
2	Jhuj	Gujarat
3	Shah Nehar Irrigation Project	Himachal Pradesh
4	Muskinala	Karnataka
5	Sindh Phase-I	Madhya Pradesh
6	Purna	Maharashtra
7	Upper Kolab Project	Odisha
8	Mahi Bajaj Sagar	Rajasthan
9	PriyadarshaniJurala	Telangana
10	HindonKrishi Doab Project	Uttar Pradesh

Annexure - 15.1

Training Activities Organised / Coordinated by Training Directorate during 2018-19

Training / Workshops within Country

Sl. No.	Topics of Program	Date	Venue	No. of Participants
A. In House Program at CWC (H/Q), New Delhi				
1.	Workshop on "Pre Retirement Counseling (PRC)"	16 May,2018	New Delhi	87 Officials of CWC
2.	Hindi Workshop	25 June, 2018	New Delhi	44 Participants
3.	"Basic Computer Training-MS Office, Excel &Power Point etc. including Advanced tools in MS Office &Excel.	4–5, July, 2018	New Delhi	19 CWC Officers
4.	Training program on "Implementation of e-Procurement" conducted through TCIL for CWC Officers.	19-20, July, 2018	New Delhi	10 CWC Officers
5.	Training program on "Implementation of e-Procurement" conducted through TCIL for CWC Officers.	9-10 August, 2018	New Delhi	10 CWC Officers
6.	Training program on "Application Software ARC-GIS"	27-29 August, 2018	CWC(HQ) New Delhi	10 officers of CWC
7.	Training Programme on "Implementation of e-procurement in CWC conducted by TCIL"	6-7 September, 2018	New Delhi	10 officers of CWC
8.	Training Programme on "Application Software Auto CAD"	17-18 September, 2018	New Delhi	10 officers of CWC
9.	Hindi Work Shop	20 September, 2018	New Delhi	60 Participants
10.	Training Programme on "Study of glacial Lake outburst of glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basin"	24-28 September, 2018	New Delhi	15 officers of CWC
11.	Training programme on "MIKE-21"	3-4 Oct, 2018	New Delhi	10 officers of CWC
12.	Seminar on "Environmental Issues in Water Resources Project"	9th Oct, 2018	New Delhi	62 officers of CWC
13.	"Training Course on "WRIS & Remote Sensing related issues"	23-24 Oct,2018	New Delhi	10 Officers
14.	Training Course on "Network Security Active Directory LDAP"	15 November, 2018	New Delhi	9 officers

Sl. No.	Topics of Program	Date	Venue	No. of Participants
15.	Training Program on "Project Hydrology- Hydrological Aspect in Planning & Preparation of DPR" including a day of field visit to Agra.	26 Nov-01 Dec, 2018	New Delhi	13 CWC Officers & 14 State Officers
16.	Training Program on "Satellite Image Analysis using Googles Earth Engine"	04-05 Dec, 2018	New Delhi	19 Participants
17.	Hindi Programme	05 Dec, 2018	New Delhi	51 Participants
18.	Training Program on "Telemetry Automatic Data Collection & Transmission System.	12-14 Dec, 2018	New Delhi	28 Participants
19.	Training Programme on "Dam Safety, Portfolio Management and Risk Assessment" organized by CWC, through M/s Entura Hydro Tasmania, Australia	21 Jan- 1 Feb, 2019	IIT Madras, Chennai,	7 CWC Officers
20.	Technical Seminar on "Water Conservation Our Responsibility"	7, February, 2019	Hyderabad	21 CWC Officers
21.	Level-III training program for Hydromel Cadre Staff	18-22 February,2019	New Delhi	15 Participants
22.	Training Programme on "Dam Safety, Portfolio Management and Risk Assessment" organized by CWC, through M/s Entura Hydro Tasmania, Australia	19 February - 02 March, 2019	IIT Roorkee	6 CWC Officers
23.	National Workshop on "web-enables PAMS"	25th Feb, 2019	CWC(HQ) New Delhi	73 CWC Officers
24.	Training programme for" Hydro-met Cadre Staff, Level-II"CWC	25 Feb to 01 March, 2019	CWC(HQ) New Delhi	24 Officers
25.	Training Program on "Use of Statistic in Hydrology"	5-7 March, 2019	CWC(HQ) New Delhi)	19 CWC 13 State
26.	Level-I training program for Hydromel Cadre Staff	11-15 March,2019 February,2019	New Delhi	14 Participants
27.	Hindi Workshop	13 March, 2019	New Delhi	57 participants
Programme Organized by Other Organization				
44	Training on "Creation of DEM" organized by Survey of India, Dehradun	1-3 May, 2018	Dehradun	3 officers of CWC
45	Participation in Field training for Exposure in construction activates at Kaleshwaram Project, Telangana	Batch-I 24-25 May, 2018	Kaleshwaram (Telangana)	12 CWC Officer

Sl. No.	Topics of Program	Date	Venue	No. of Participants
46	Participation in Field training for Exposure in construction activates at Kaleshwaram Project, Telangana	Batch-II 05-06 June, 2018	Kaleshwaram (Telangana)	12 CWC Officer
47	Participation in Field training for Exposure in construction activates at Kaleshwaram Project, Telangana	Batch-III, 19-20 June, 2018	Kaleshwaram (Telangana)	12 CWC Officer
48	Participation in Training Program on "Water Quality Monitoring, Instrumentation, Analysis and Interpretation organised by CPCB under NHP	25-27 June,2018	IIPA,New Delhi	2 CWC Officer
49	Participation in Training Program on "Reservoir Simulation using NIH ReSyP" organised by NIH & BITS Plani under NHP	25-29 June,2018	BITS Plani,Campus Hyderabad	3 CWC Officer
50	Participation in Training Course on "MIKE HYDRO RIVER" Organized by DHI (India) Water and Environment Pvt. Ltd., New Delhi.	11-13 July,2018	New Delhi	6 officers of CWC
51	Participation in Training Program on "Geo –Spatial Database Administration " Survey of India under NHP	11-17 July,2018	Hyderabad	4 CWC Officers
52	Participation in Training Program on "RS&GIS Application to Water Resources" organized by RSC under NHP	30 July-10 August,2018	Hyderabad	4 officers of CWC
53	Training program on "Laboratory Quality Management System and Internal Audit as per ISO/IEC-17025 and NABL requirement" organized by Standardization Testing and Quality Directorate Under Ministry of Electronics and Information Technology, Goyt. of India	7-10 August,2018	New Delhi	10 officers of CWC
54	Training Program on "Refresher course for Divisional Accountant and PFMS application for CPWD" organized by INGAF under Ministry of Finance Govt. of India, Chennai	13-14 August,2018	Chennai	1 CWC Officer

Sl. No.	Topics of Program	Date	Venue	No. of Participants
55	Participation in Training Course on "Durability of Concrete using different Cementitious Materials & Quality Measure for Hydraulic Structures"	30-31 August, 2018	CSMRS, New Delhi	10 officers of CWC
56	Participation in Training Program on "Design and Construction of Hydropower Project" organized by NHPC Ltd. Faridabad	10-12 September, 2018	Faridabad	5 CWC Officer
57	Participation in Training Course on "Laboratory of Rock & Geotechnical Instrumentation in Hydro-electric project" organized by CSMRS , New Delhi	26-27 September, 2018	CSMRS, New Delhi	1 CWC Officer
58	Participation in training of trainers programme on "Strengthening Competencies of Indian Training Provider" organised by IEWP with collaboration with Gesellschaft for International Zusallenarbeit (GIZ)	13-17 Nov,2018	Shillong	2 CWC Officers
59	Participation Training Course on "IWRM, Water Security and Climate Change for Developing Economies" organised by NIH, Roorkee	15-16 Nov,2018	Roorkee	2 CWC Officers
60	Participation in "Hands on training in CMIS Data Collection " Organised by IIT, Madras,Chennai	19-29 Nov,2018	IIT ,Madras ,Chennai	19 CWC Officer
61	Participation in 5th Operational Training on "CPGRAMS" organized by Dept. of Administrative Reforms and Public Grievances(DARPG),at Sardar Patel Bhawan, SansadMarg, New Delhi	29 Nov, 2018	New Delhi	2 CWC Officers
62	Participation in training programme on "Dam Safety, Portfolio Management and Risk Assessment" organized by CWC at Indian Institute of Science, C.V. Raman, Road, Bengaluru.	03-14 December, 2018	Bengaluru	7 CWC Officers

Sl. No.	Topics of Program	Date	Venue	No. of Participants
63	Participation in a Training Course on "Concrete Construction Materials & Quality Control for Hydraulic Structures" organized by CSMRS, New Delhi	17-18 January, 2019	New Delhi	4 CWC Officer
64	Participation in two days training course on "Geotechnical Investigation for Embankment" organized by CSMRS	7 -8 February, 2019	CSMRS, New Delhi	3 CWC Officer
65	Participation in Training Programme on "Water Quality Assessment & Management" organized by NIH, Roorkee.	11-15 March, 2019	NIH, Roorkee	5 CWC officers

In-House Training Program in Field Office

S. No.	Name of Training	Period	Venue	Participants
1.	Training Programme on "Methodology of Hydrology observation related equipments&WQ sample collection/testing etc" for newly recruited SWA	14-15 June, 2018	Gandhi Nagar	51 newly recruited SWAs under HOC, CWC, Gandhinagar
2.	Training Program on "Use of e-Governance Modules in Office Management [e Office,eHRMS,Bhavishya&PFMS]	9-12 July,2018	Coimbatore	25 Officials of CSRO
3.	Training Programme on MS Word, MS Excel, PowerPoint etc including advance tools in MS Office & Excel	17-20 September, 2018	Coimbatore	21 Participants of CSRO, CWC
4.	Workshop on "Health of Ramganga and Gomti River Issues & Way forward"	28 September,2018	UGBO,Lucknow	125 officers of State & CWC Officers
5.	Training Program on "Hydrological Observations, Water Quality, Telemetry	8-12 October,2018	Coimbatore	25 Officials of CWC

	system & E-SWIS" under CSRO,CWC Coimbatore.			
6.	Training Program on Application of Total station & RTKGPS for H.O work & Topography Survey " under MTBO,CWC Gandhinagar	29 Oct,2018to 01 Nov,2018	**Gandhinagar**	24 Officers
7.	Training Program on "Hydrological Observations, Water Quality, Telemetry system & E-SWIS" under MTBO,CWC Gandhinagar	12-16 November,2018	**Gandhinagar**	25 Officers
8.	Training Program on "Hydrological Observations, Water Quality, Telemetry system & E-SWIS" under B&BBO Shillong	12-16 Nov,2018	**Guwahati**	24 participants
9.	Special Course on " Geo-Desy" Conducted by ISM,Hyderabad	12-16 Nov,2018	**Hyderabad**	22 Officers of CWC
10.	Workshop on Implementation of Official Language (HINDI) for the officials of C & SRO, CWC, Coimbatore.	30 Nov-01 Dec, 2018	**Chennai**	25 Participants
11.	Training Program on "Application of Total Station & RTKGPS for HO work & Topographic Survey for the Officials of B & BBO, CWC, Shillong	03-06 Dec, 2018	**Guwahati**	27 Participants
12.	Training Program on "Application of Total Station & RTKGPS for HO Work & Topographic Survey for the officials of UGBO, CWC, Lucknow.	06-07 Dec, 2018	**Lucknow**	12 Participants
13.	Training Program on "Hydrological Observation Water Quality Telemetry & e SWISS" for the Officials of Monitoring (South) Organization, Bangaluru.	10-14 Dec, 2018	**Bangaluru**	23 Participants

14.	Workshop on "Improving Water Use Efficiency in Irrigation Sector in UP" at UGBO, CWC, Lucknow.	14 Dec, 2018	**Lucknow**	100 Participants CWC & State
15.	Training Program on "Application of Total Station & RTKGPS for HO Work & Topographic Survey for the officials of UGBO, CWC, Lucknow.	6-7 January,2019	Lucknow	12Participants
16	Training Programme on "Hydrological Observation, Water Quality, Telemetry System &eSWIS"	07-11 January, 2019	Hyderabad	25 Officers of KGBO, Hyderabad
17	Training Programmeon e Office /eHRMS/Bhavishya/PFMS/Financial Management "for the officials of UGBO, CWC, Lucknow.	8-9 January,2019	Lucknow	15 Participants
18	Workshop on Implementation of Official Language (HINDI) for the officials of CSRO, CWC, Coimbatore.	8-9 January,2019	Coimbatore	20Participants
19.	Training program on "Standard Module for Ministerial Cadre of subordinate services" for the official of KGBO	21-25, January, 2019	Hyderabad	35 Participants
20.	Training program on "Basic computer training including MS Office, Excel and PowerPoint with advance tools" for the official of KGBO	25 January, 2019	Pune	20 Participants
21	Training program on "Use of E-Governance Modules in Office Management (e-Office/e-HRMS/Bhavishya/PFMS) for the officials of CSRO.	28 January,2019 to 31st January,2019	Kochi	25 Officials of CSRO
22	Training program on "Application of Total Station & RTKGPS for H.O. work & Topographic Survey" for the officials of CSRO	18-20 February, 2019	Coimbatore	25 Participants

23	Training program on "Basic computer training including MS Office, Excel and PowerPoint with advance tools" for the official of H.G.Division, CWC, Dehradun [UGBO]	7-8 March, 2019	Dehradun	11 officials
24	Training program on "Basic computer training including MS Office, Excel and PowerPoint with advance tools" for the official of MGD-III,Varanasi [UGBO}	7-8 March, 2019	Varanasi	12 Officials
25	Training program on"Preparation and Appraisal of DPR for Coastal Protection & Flood Protection Works under Flood Management Program [FMP} under CSRO.	8-9 March,2019	Kochi	5 CWC& 22 state officers
26	Refresher Course on "Flood Forecasting Activity" under Godavari Circle(KGBO)	11-12 March, 2019	Hyderabad	30 Participants
27	Training Programme on "Delineation of Watershed by Arc GIS for HO states under Godavari Circle (KGBO)	13-15 March,2019	Hyderabad	30 Participants
28	Training Program on "Application of Total Station & RTKGPS for HO Work & Topographic Survey for the officials of CSRO, CWC, and Coimbatore.	18-20 March,2019	Coimbatore	25 participants
29	Training Program on "Hydrological Observation Water Quality Telemetry & e SWISS" for the Officials ofLGBO,CWC,Patna	26-28 March,2019	Patna	25 participants

Training / Workshops /Seminar

S. No.	Name of Training	Period	Venue	Participants
1.	Participation in World Bank Group Workshop "Enabling the Business of Agriculture 2017 Report organized by The World Bank.	5/04/2018	New Delhi	1 officer of CWC
2.	Participation in Workshop for "Deliberation on Interim Report of Expert committee for proper management of North-Eastern Region's Water Resources" organized by MoWR, RD &GR	23rd April, 2018	Guwahati	3 officers of CWC
3.	Participation in National Workshop on "Early Warning and Flood Resilience with Focus on Regional Cooperation and Institutional coordination" organized by Christian Aid(CA), IWMI, Practical Action Consulting Pvt. Ltd., Special Centre for University, Oxfam India and the Lutheran World Relief.	27th April, 2018	JNU, New Delhi	2 officers of CWC
4.	Conference on "Non-Revenue Water" organized by India Infrastructure Publishing Pvt. Ltd. New Delhi	14-15 May, 2018	Shangri-La's Eros Hotel, New Delhi	3 officers of CWC
5.	National Workshop on "E-Flows under IEWP priority area-2" jointly organized by CWC & GIZ India Ltd. New Delhi.	21-22 May, 2018	New Delhi	8 Officers of CWC.
6.	Conference on "India's Modern Infrastructure Set in Concrete" organized by Tunneling Association of India jointly with association of CBIP.	24 May ,2018	Mumbai	2 officers of CWC
7.	Conference on" Sustainable Concrete Technology for Tunnel & Bridges" organized by Tunneling Association of India jointly with association of CBIP.	25 May ,2018	Mumbai	2 officers of CWC
8.	Two days Workshop on "National Building Code of India- 2016" Organized by Bureau of Indian	7-8 June, 2018	Shimla	2 officers of CWC

	Standards (BIS), New Delhi.			
9.	Participation in Seminar on "Slope Stabilization Challenges in Infrastructure Projects" Organized by CBIP, New Delhi.	21-22 June, 2018	New Delhi	6 officers of CWC
10.	Participation in Workshop on "Flood Forecasting–data requirement and reliability in flood modeling,with specific reference to Brahmaputra" Organized by AWRMIS, Guwahati under NHP .	21-22 June,2018	Guwahati	1 officer of CWC
11.	Participation in National Workshop on "Application of Spatial Data Infrastructure for Irrigation Management" organized by Water Technology Centre, IARI under NHP.	25-27 July,2018	New Delhi	7 officers of CWC
12.	Participation in Seminar "River Action Plan, Flood Management and Basin Development" Organized by Consulting Engineer Association of India(CEAI)	27-28 July,2018	Shangri La's Eros Hotel, New Delhi	10 officers of CWC
13.	Participation in "Chhattisgarh State Water Conclave 2018" organized by Advance Water Digest Pvt. Ltd., New Delhi	1 August, 2018	Raipur	2 officers of CWC
14.	Participation in 2nd World Water Summit – 2018 organized by Energy and Environmental Foundation with support of the MoWR, RD & GR and NitiAyog.	21-23 August, 2018	New Delhi	2 officers of CWC
15.	Participation in "Telangana State Water Conclave- 2018" organized by MoWR, Govt. of Telangana, CGWB, NSF, Wash Institute and WD News	07th September, 2018	Hyderabad	5 officers of CWC
16.	Two days workshop on "National Building Code of India 2016 & Revised Seismic Codes" organized by BIS Jointly with the Institute of Engineer (India), Maharashtra State Centre, and IIT Bombay, Mumbai.	4-5 Oct, 2018	IIT Bombay, Mumbai	2 officers of CWC
17.	National Workshop on "Tunnel Engineering" organized by CSIR-		IIT, Roorkee	6 officers of CWC

	CIMFR Research Centre, Roorkee.	10-12 Oct, 2018		
18.	Participation in the Conference "Storage Dams for Water Security & Sustainable Development" organised by INCOLD & CBIP	24-25 Oct,2018	New Delhi	10 CWC Officers
19.	Participation in Seminar "GEO Synthetics for Erosion control and Coastal Protection" Organized by CBIP, New Delhi	25-26 Oct,2018	New Delhi	3 CWC Officers
20.	Participation in Workshop on "Water Resources Planning & Management" organised by South Asian Water Initiative " (SAWI) of the world Bank & NHP, GOI	29-31 Oct, 2018	Hotel Radisson, Guwahati	6 CWC Officers
21.	Participation in "Urban Café' Policy Dialogue on "River for Habitat" organised by MMCG.	31 Oct,2018	New Delhi	4 CWC Officers
22.	Participation in "Seismological aspects related to Design & Safety Evaluation of Concrete Gravity Dams " organized by CPMU of DRIP	29Oct-3 Nov,2018	Roorkee	6 CWC Officers
23.	Participation in 4th Edition of India Industry water Conclave on Sustainable Water Management & 6th edition of FICCI water awards organised by FICCI, New Delhi	1-2 Nov,2018	New Delhi	4 CWC Officers
24.	Participation in Short Course on " Earthquake and Dam Safety (Seismic aspect of Dam Design and Dam Safety)" organised by INCOLD,CBIP,DRIP and World Bank under the ageis of ICOLD	12-13 Nov,2018	CBIP, New Delhi	9 CWC Officers
25.	Participation in "XII World Aqua Foundation-International Conference & Exhibition, 2018" organization by	22-23 November, 2018	India Hebitate Centre, New Delhi	3 officers of CWC

	Aqua Foundation			
26.	Participation in "Indian Rivers Week, 2018" organized by Consortium of NGO's (INTACH, SANDRA, WWF India, Toxics Link, PEACE Institute and Peoples Science Institute), WWF India Secretariat at Lodhi Road, New Delhi	24-26 Nov, 2018	New Delhi	3 CWC Officers
27.	Participation in "One day Workshop for Focused Attention on vulnerable and over-exploited areas in Jhansi" organized by National Water Mission (MoWR, RD&GR) at Maharani LaxmiBai Paramedical College, Jhansi.	30 Nov, 2018	Jhansi	1 officer of CWC
28.	Participation and Presentation in" Advanced Materials for Sustainable Growth of Champion Manufacturing Industries" organized by The Confederation of Indian Industry (CII) in partnership with BIS at India Habitat Centre, Lodhi Road, New Delhi	04 Dec, 2018	New Delhi	4 CWC Officers
29.	Participation in "India Water Impact Summit 2018" organized by National Mission for Clean Ganga(NMCG) and Centre for Ganga River Basin Management and Studies (Ganga) at VigyanBhawan, New Delhi	05-07 Dec. 2018	New Delhi	4 CWC Officers
30.	Participation in workshop on "Water Information System" organized by Australian Water Partnership (AWP) under National Hydrology Project, Govt of India at Hotel Imperial, New Delhi	18-19 Dec,2018	New Delhi	6 CWC Officers
31.	Participation in International Conference on "HYDRO-2018" organized by NIT. Patna	19-21 December, 2018	NIT, Patna	2 Officers of CWC
32.	Participation in 4th National Summit on Sustainable Water & Sanitation organized by M/S Nispana Innovative Plat Forms Pvt. Ltd.,	10-11 January, 2019	Bangaluru	3 Officers of CWC

	Bangaluru			
33.	Participation in "9th International Micro Irrigation Conference (9IMIC)" organized by Indian National Committee on Surface Water (INCSW), Aurangabad, Maharashtra	16-18 January, 2019	Aurangabad	48 Officers of CWC
34.	Participation in workshop on "Morphological Study of Krishna and Tungabhadra Basins Using Remote Technique" organized by Department of Civil Engineering, IIT, Madras and CWC, New Delhi	18-19 January, 2019	Vijayawada	14 Officers of CWC
35.	Participation in Bilateral workshop on "Building an Operational Composite Drought Index for India" organized by Water Technology Centre, ICAR-IARi	22-23 January, 2019	Pusa, New Delhi	2 officer of CWC
36.	Participation in "4th World Congress on Disaster Management" organized by Government of Maharashtra, Disaster Management Initiatives and Convergence Society (DMICS), IIT-TISS	29 January-1 February, 2019	Mumbai	3 Participants
37.	Participation in a National workshop on "Flood Management Under Changing Climate" Organized by IWRS and DWRDM	1 February, 2019	IIT Roorkee	2 officer of CWC
38.	Participation in seminar on "Developing a Roadmap for Conservation of Wetlands in Ganga Basin" organized by National Mission for Clean Ganga (NMCG) and WWF-India.	4 February,2019	India Habitat Centre, New Delhi	3 officers of CWC
39.	Participation and presentation in	13-14	Bhubaneswar	70

	"International Dam Safety Conference-2019" organized by Central Water Commission in collaboration with Odisha Water Resources Department and the World Bank	February, 2019		participants
40.	Participation in International Conference on "River Health" Assessment to Restoration (RHAR-2019) organized by Department of Civil Engineering, IIT (BHU)	14-16 February, 2019	Varanasi	5 officers of CWC
41.	Participation in Water Ex World Conference-2019 Organised by JasuBhai Media Pvt. Ltd. Mumbai	21 February,2019	Mumbai	6 Officers of CWC
42.	Participation in Workshop on "PMKSY-HKKP-GW Irrigation-A Centrally sponsored scheme Organized by CGWB, New Delhi.	28 February,2019	CSMRS Auditorium, New Delhi	3 officers of CWC
43.	Participation In 2nd National Workshop On "Coastal Management Information System (NWCMIS) Organized By IIT Madras (IITM) Chennai.	11 March, 2019	IITM-Chennai	16 CWC officers
44.	Participation in "International Conference on India Smart Utility Week (ISUW-2019)" organized by India Smart Grid Forum.	14 March, 2019	Manekshaw Centre, New Delhi	4 CWC officers
45.	Participation in International Conference on Smart Cities: opportunities & Challenges" organized by JamiaMilliaIslamia, Central University, New Delhi.	14-16 March, 2019	J.M.I University New Delhi	4 officers of CWC
46.	Participation in 2nd International Workshop on Disaster Resilient Infrastructure(IWDRI) organized by NDMA in collaboration with UN Officers for Disaster Risk Management (UN ISDR).	19-20 March, 2019	NDMA Bhawan, New Delhi	4 officers of CWC
47.	Participation in "Water Symposium - 2019" organized by Water Innovation Centre : Technology Research & Education [WICTRE]	26 March, 2019	IIT,Bombay, Mumbai	3 Officers of CWC

Annexure - 15.2

Details of Training Programs undertaken by National Water Academy, Pune during 2018-19

Sr. No.	Name of Training Program	From	No of participants	Man weeks
1	International Distance Learning Program in Hydrology : Advanced Topics in Hydrological, Hydraulic Sciences (Continued Program)	01-04-2018	77	385
2	IWRM for River Basin Planning & Management, Best Practices & Development and Data Acquisition and Analysis for CGWB Officers	16-04-2018	12	12
3	Irrigation Benchmarking (NHP)	23-04-2018	34	34
4	Induction Training Program for JEs-Batch 1	01-05-2018	38	114
5	Flood Hydrology measurement to Modelling (NHP)	07-05-2018	12	12
6	Hindi Workshop	21-05-2018	17	3.4
7	Flood Disaster Management including Disaster Risk Reduction	28-05-2018	21	21
8	Climate Change Impact; mitigation measures; modeling tools GCM; RCM	11-06-2018	20	20
9	Survey, Investigation and Preparation of Detailed Project Reports for Water Resources Projects	25-06-2018	35	28
10	Coastal Erosion and protection	16-07-2018	31	31
11	Training-cum-Workshop on Scenario of Water Resources Sector of India	18-07-2018	42	8.4
12	Integrated Water Resources Management under NHP	30-07-2018	33	33
13	The World Bank Procurement Procedures under NHP	23-07-2018	41	41
14	30th Induction Training Program including Bharat Darshan Component (30 weeks)	02-07-2018	37	1110

15	Water Accounting ++ (under NHP)	03-07-2018	12	96
16	Overview of Water Resources Sector of India	27-08-2018	20	20
17	Knowledge Dissemination Workshop with co-basin states by CWC and IHE Netherlands on Water Accounts of Cauvery Basin using Water Accounting Plus tool (WA+) (Under NHP)	04-09-2018	25	5
18	Induction Training Program for Newly Appointed SRAs (Batch 1)	08-10-2018	25	100
19	Water Information Analytics Generation using Free Online Tools	26-11-2018	38	38
20	Management Development Program for Non-Technical officers	03-12-2018	16	16
21	Induction Training Program for Newly Appointed SRAs (Batch II)	17-12-2018	28	112
22	Training-cum-Workshop under Ministry of Tribal Affairs	21-12-2018	150	30
23	Digital Surface Modelling and Watershed Analysis using RS	31-12-2018	26	52
24	Use of Advanced Software in design of water resources structures	14-01-2019	48	48
25	Induction Training Program for Junior Engineer- Batch II	28-01-2019	45	90
26	Training on Capacity Development in Groundwater Management on Managed Aquifer Recharge	11-02-2019	29	29
27	Orientation Program for AD-II	18-02-2019	33	66
28	Application of Hydrometeorology using -eSwis (NHP)	05-03-2019	17	17
29	Design of Piped Irrigation Network and Micro Irrigation	11-03-2019	21	21
30	Training Program on Water Resources Management for NGO and Media personnel	25-03-2019	21	8.4
31	Workshop on "River Basin Planning and Management" in technical collaboration with AWP Under NHP	11-03-2019	35	7

32	Two days meet on regarding Generic State WRIS (Maharashtra & Gujarat) under NHP	14-03-2019	20	8
Total			1059	2616.2

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