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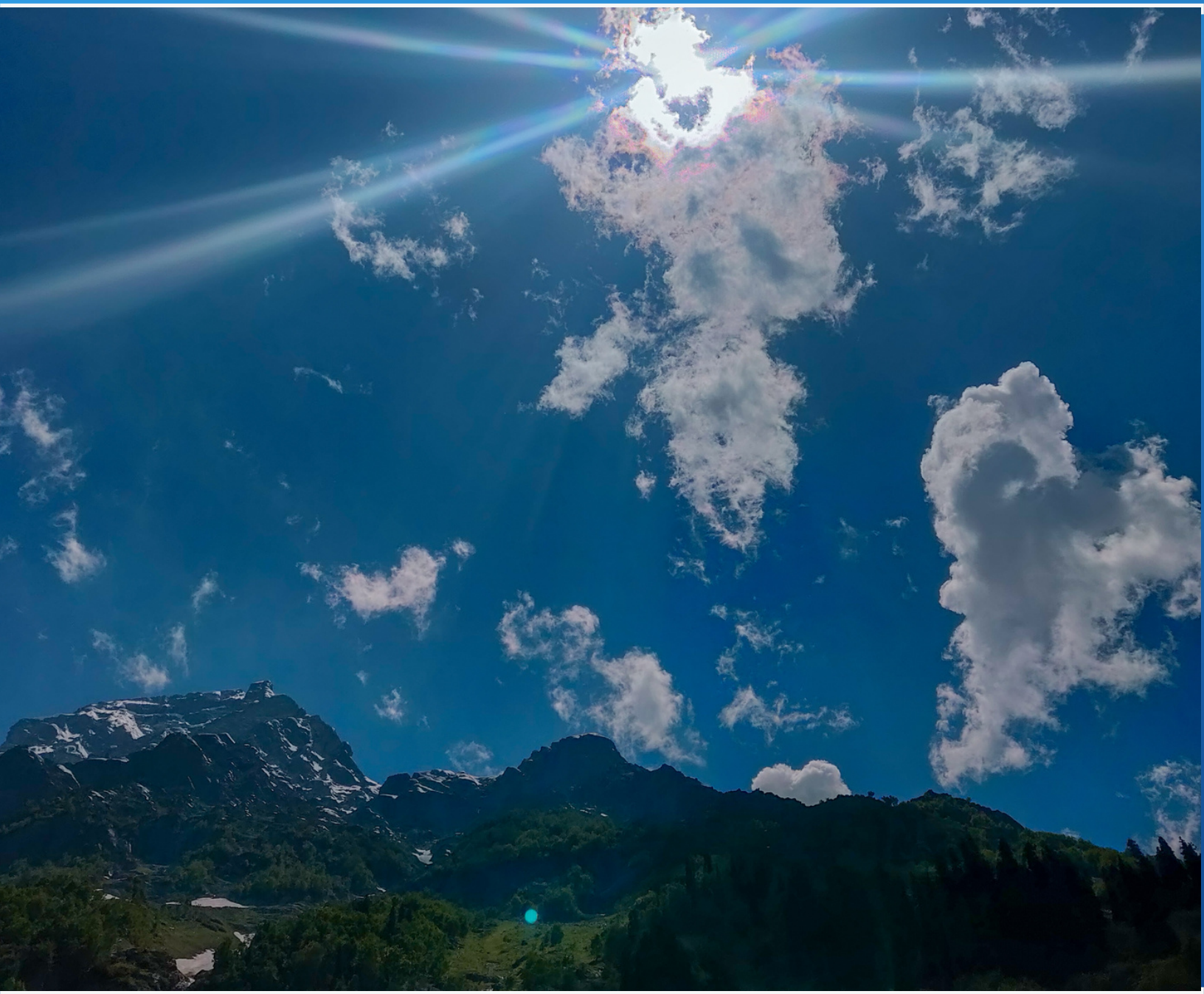

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CONTENTS

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ASSESSMENT OF SEDIMENTATION LOAD FOR DIFFERENT FLOOD CONDITIONS IN LOWER REACHES OF RIVER GANGA AND ITS TRIBUTARIES

N.N.RAI[1], RAJESH KUMAR[2]

ABSTRACT

The phenomenon of sediment transportation, erosion and its deposition is quite complex for a natural river systems especially for a gigantic river like Ganga. Ganga and Brahmaputra are the mighty rivers with very high sediment yield. Natural rivers involuntary tend to attain equilibrium on their own, under the balanced conditions of hydrology, sediment movement and its erosion & disposition. Therefore, the estimation of sediment load and consequently the rate of sedimentation in any of the river reach implicitly has inherent limitations and uncertainties. In order to estimate the sediment load in river Ganga in its lower reaches, the sediment data of river Ganga and its major tributaries viz Ghaghra, Sone, Gandak and Kosi has been analysed. In order to establish a proper relation between discharge and sediment load, concurrent discharge and suspended sediment data of more than 8 to 10 years is essential. In the present paper concurrent suspended sediment and discharge data of more than 10 years, available at different G&D sites of river Ganga and its tributaries has been analysed for fitting the sediment rating curve and to estimate the sediment load for different discharge conditions.

1.0 INTRODUCTION

Sediment yield refers to the amount of sediment exported by a watershed basin over a period of time. The specific sediment yield is the yield per unit of land area. The correlation of sediment yield to erosion is complicated by the problem of determining the sediment delivery ratio. Most sediment is exported from watersheds during relatively short periods of flood discharge, and these events must be accurately monitored to provide information on the long-term yield as well as the timewise variation in load needed to evaluate sediment routing strategies. Knowledge of the spatial variation in yield is required to focus yield reduction efforts on the landscape units that deliver most sediment to the water bodies/rivers. Long-term trends in sediment yield occurring over a period of decades may also influence sediment management strategy. The process of erosion and the delivery of sediment to the exit of a basin is never a spatially uniform process. When virtually any landscape unit is examined, at any scale, there will typically be large variations in the specific sediment yields.

The phenomenon of sediment transportation, erosion and its deposition is quite complex for a natural river systems especially for a gigantic river like Ganga. Ganga and Brahmaputra are the mighty rivers with very high sediment yield. Natural rivers involuntary tend to attain equilibrium on their own, under the balanced conditions of hydrology, sediment movement and its erosion & disposition. Therefore, the estimation of silt load and consequently the rate of sedimentation in any of the river reach implicitly has inherent limitations and uncertainties. In order to estimatethe sediment load in river Ganga in Bihar, the sediment data of river Ganga and its major tributaries

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has been analysed. A drainage area map of River Ganga up to Farakka is provided in Fig.1 depicting the network of various tributaries. The tributaries joining river Ganga from North are Gomti, Ghaghara, Gandak, and Kosi and tributaries joining from the South to river Ganga are Yamuna, Son and Punpun etc.

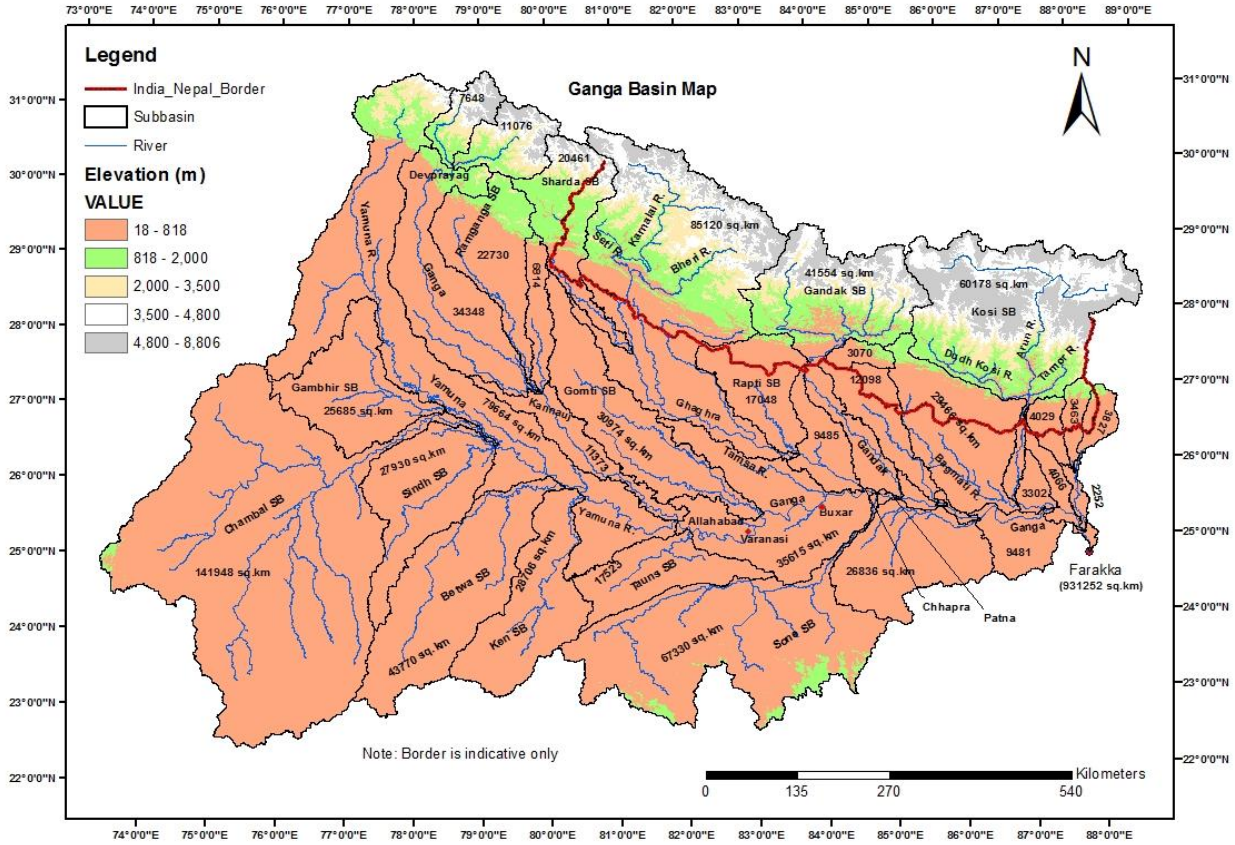

Fig.1: Drainage area map of river Ganga upto Farakka

2.0 SILT LOAD IN RIVER GANGA AS PER CHITTALE COMMITTEE REPORT

In the Chittale Committee report it is mentioned that there have been various estimates of siltation in river Ganga. Subramanian (1986) had estimated the sediment load in river Ganga as 413 million Tonnes/ year. In the same report silt data analysed by GFCC on the basis of observed data from the year 1990 to 2012 is also given, where the silt load is mentioned as follows:

Buxar	Gandhighat	Hathidah	Azamabad	Farakka
81.93×10^6 Tonne	254.8×10^6 Tonne	268×10^6 Tonne	187.9×10^6 Tonne	218.38×10^6 Tonne

It is mentioned in the Subramanian paper, titled "EROSION AND SEDIMENT TRANSPORT IN THE GANGES RIVER BASIN (INDIA)" by NAZAR ABBAS and V. SUBRAMANIAN published in *Journal of Hydrology*, 69 (1984) 173- 182, Elsevier Science Publishers B.V.,

Amsterdam, that during the monsoon of 1981, water samples were collected from various parts of the river basin. At each station, 11 of water samples were collected from either side of the river as far from the bank as possible.

The silt load mentioned in Subramaniun paper may not be considered representative due to following limitations:

- The silt load as given in the above mentioned paper is based on the sample data collected only for one monsoon season of year 1981. Estimation of silt load on the basis of just one monsoon season of data does not appear to be rational.
- The water sample for sediment analysis was collected from either side of the river as far from the bank as possible, which is not a representative sample. To get a representative sample it is necessary to divide a wide river in a number of segments along the river cross section at the sampling site, and data should be collected at each segment and later on mixed together to get the representative sample at that location.
- No data was collected for non-monsoon season

3.0 DATA USED IN THE PRESENT STUDY

Sediment and discharge data of six G&D sites viz. Varanasi, Buxar, Gandhighat, Hathidah, Azmabad and Farakka on the river Ganga, Turtipar G&D site on River Ghaghara and Lalganj G&D site on River Gandakwere made available by Central Water Commission from 1991-92 to till 2014-15. The data of 14 years for the period from 1995-96 to 2009-10 (except the year 2005-06), which has been found to be continuous and overlapping with discharge data has been considered in the study. The sediment data of Koelwar G&D site on River Sone was made available for the period 2006-7 to 2013-14. The concurrent sediment and discharge data of Kosi river at Baltara was available for 6 years for the period 1992-93 to 1997-98. The location of above G&D sites is in Fig.2.

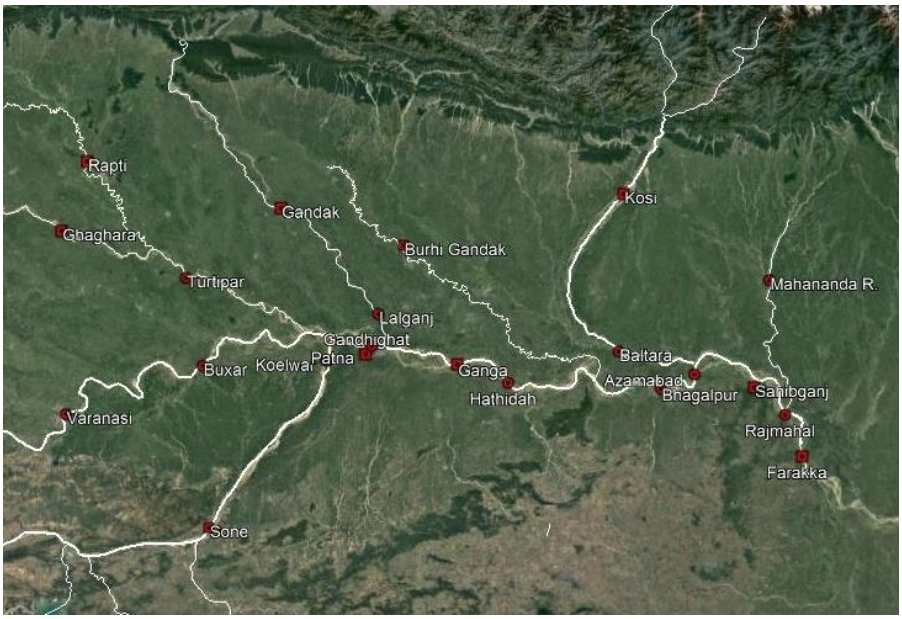

Fig.2: Location of G&D sites of river Ganga and its tributaries used for sediment data analysis

The sediment measurements are, in general, based on bottle samples taken on different segments along the river cross section at the sampling site for measuring the suspended sediment concentrations and does not contain any bed load component. Bed load is generally taken as a fixed percentage to the suspended sediment load. The total sediment load is considered as sum of suspended and bed load components. The catchment area at the above G&D sites as obtained from GIS processing of SRTM DEM is given in Table-1

Table-1: Catchment area at G&D site

S.No.	Name of G&D site	River	Catchment Area (sq.km)
1	Varanasi	Ganga	465215
2	Buxar	Ganga	521324
3	Gandhighat	Ganga	725248
4	Hathidah	Ganga	781378
5	Azmabad	Ganga	820708
6	Farraka	Ganga	931000
7	Turtipar	Ghaghara	113088
8	Lalganj	Gandak	42520
9	Koelwar	Sone	67330
10	Baltara	Kosi	89600

3.1 Methodology

The rate of erosion depends upon various factors which include rainfall-runoff erosion factor, soil erodibility factor, slope-length factor, slope steepness factor, cover management factor, land slides etc. In the plains of Ganga a significant contribution of sediment is from sheet flow also. Generally & predominantly used method for sediment rate estimation is using the observed sediment data. A sediment rating curve can be generated from observed sediment and discharge data. To account for the bed load, the observed suspended sediment load is generally increased by a certain percentage. To estimate the volume of sediment from a particular weight of sediment requires an estimate of the density of the deposited sediment. This density depends upon the nature of the sediment. If the fine deposited sediment dries as a result of the operation of the reservoir then the density tends to be greater than sediment that is permanently under water. Fine sediment that is deposited in a channel compacts through time so that the deposited density gradually increases. Generally for the sediments found in Gangetic plains, sediment density of 1200 Kg/m^3 appears to be appropriate and the same has been used in the present analysis.

3.2 Analysis & Results

Using the discharge and sediment data the computed average annual suspended sediment load, bed load, total sediment load and sediment yield are presented in Table-2. Bed load has been assumed as 15% of the suspended sediment load. Suspended sediment load has been added to bed load to get the total sediment load. Total sediment volume has been divided with catchment area to get sediment yield.

The average monthly sediment load is presented in Table-3. Further, the concurrent flow data and suspended sediment data has been utilized to analyze the suspended sediment concentration in terms of parts per million (PPM) or (mg/l) of flowing water and the same is provided in Table-

4. Average monthly suspended sediment load as percentage of average annual sediment load is given in Table-5. From the analysis it has been found that the sediment yield of northern tributaries viz Ghaghra and Gandak is more than 0.85 mm/km^2/yr, which is very high. This shows that the northern tributaries of river Ganga are contributing the maximum sediment in main stem of river Ganga in Bihar.

Table-2: Average annual suspended, bed and total sediment load and sediment yield

G&D Site	River	Average annual suspended sediment load	Average annual bed load @15% of suspended sediment load	Average annual total sediment load	Sediment yield
		(Million Tonnes)	(Million Tonnes)	(Million Tonnes)	mm/km^2/yr
Varanasi	Ganga	136.53	20.48	157.00	0.28
Buxar	Ganga	83.27	12.49	95.76	0.15
Turtipar	Ghaghra	101.52	15.23	116.75	0.86
Gandhighat	Ganga	225.44	33.82	259.25	0.30
Lalganj	Gandak	37.72	5.66	43.37	0.85
Hathidah	Ganga	238.01	35.70	273.72	0.29
Azamabad	Ganga	181.29	27.19	208.48	0.21
Farakka	Ganga	218.25	32.74	250.99	0.22
Koelwar	Sone	3.36	0.50	3.86	0.05
Baltara	Kosi	46.36	6.95	53.31	0.50

Table-3: Average monthly suspended sediment load in Million Tonnes for the 10 sites

Place	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Varanasi	0.339	11.934	55.154	56.044	10.252	1.503	0.844	0.308	0.066	0.037	0.026	0.018
Buxar	0.460	6.253	28.417	39.558	7.006	0.901	0.369	0.159	0.068	0.042	0.024	0.012
Turtipar	1.354	17.216	36.431	30.047	11.709	2.818	1.200	0.241	0.102	0.094	0.108	0.198
Lalganj	1.742	6.961	14.934	9.729	2.431	0.681	0.378	0.180	0.117	0.092	0.162	0.311
Gandhighat	2.162	28.786	99.739	94.960	17.712	2.467	0.719	0.368	0.267	0.212	0.218	0.257
Hathidah	1.716	28.617	88.862	89.013	24.113	2.681	0.861	0.563	0.441	0.377	0.381	0.397
Azamabad	2.943	25.913	60.969	60.012	18.952	5.217	2.540	1.444	0.944	0.776	0.723	0.867
Farakka	1.151	19.549	59.238	80.471	43.208	10.497	2.572	0.749	0.393	0.185	0.112	0.128
Koelwar	0.076	0.347	1.561	0.862	0.150	0.075	0.100	0.044	0.030	0.034	0.044	0.038
Baltara	5.453	9.342	13.862	9.019	3.500	1.386	1.016	0.689	0.375	0.355	0.378	0.983

Table-4: Average monthly suspended sediment load as percentage of average annual load

Place	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Varanasi	0.25	8.74	40.40	41.05	7.51	1.10	0.62	0.23	0.05	0.03	0.02	0.01
Buxar	0.55	7.51	34.13	47.51	8.41	1.08	0.44	0.19	0.08	0.05	0.03	0.01
Turtipar	1.33	16.96	35.89	29.60	11.53	2.78	1.18	0.24	0.10	0.09	0.11	0.20
Lalganj	4.62	18.46	39.59	25.79	6.45	1.81	1.00	0.48	0.31	0.24	0.43	0.82
Gandhighat	0.87	11.61	40.24	38.31	7.15	1.00	0.29	0.15	0.11	0.09	0.09	0.10
Hathidah	0.72	12.02	37.33	37.40	10.13	1.13	0.36	0.24	0.19	0.16	0.16	0.17
Azamabad	1.62	14.29	33.63	33.10	10.45	2.88	1.40	0.80	0.52	0.43	0.40	0.48
Farakka	0.53	8.96	27.14	36.87	19.80	4.81	1.18	0.34	0.18	0.08	0.05	0.06
Koelwar	2.26	10.32	46.44	25.65	4.46	2.23	2.98	1.31	0.89	1.01	1.31	1.13
Baltara	11.76	20.15	29.90	19.46	7.55	2.99	2.19	1.49	0.81	0.76	0.82	2.12

Table-5: Average monthly suspended sediment concentration in PPM

Place	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Varanasi	240	1254	2158	2252	1220	471	368	187	57	35	28	25
Buxar	281	527	853	1199	594	231	126	77	44	29	21	13
Turtipar	430	1456	1836	1717	1227	699	493	197	111	123	130	120
Lalganj	639	810	1015	945	605	350	290	209	204	177	193	260
Gandhighat	239	850	1383	1419	814	326	133	91	81	71	71	69
Hathidah	219	715	1109	1134	786	231	119	107	106	102	104	93
Azamabad	319	541	682	679	510	380	313	289	263	243	247	240
Farakka	85	353	649	881	913	546	221	97	67	36	23	21
Koelwar	252	398	693	483	260	180	190	183	127	120	138	136
Baltara	1830	577	405	269	280	280	338	445	346	390	428	798

4.0 SEDIMENT RATING CURVE

There are several causative factors for sediment yield and from Instantaneous sediment load corresponding to a particular discharge it may not possible to conclude about the actual sediment load. In order to establish a proper relation between discharge and sediment load, concurrent discharge and suspended sediment data of more than 8 to 10 years is essential. For the present case concurrent suspended sediment and discharge data of 14 years, available at the 9 G&D sites of river Ganga and its tributaries has been used for fitting the rating curve and to estimate the sediment load for different discharge conditions. The suspended sediment rating curves are given in Fig.3 to 12.

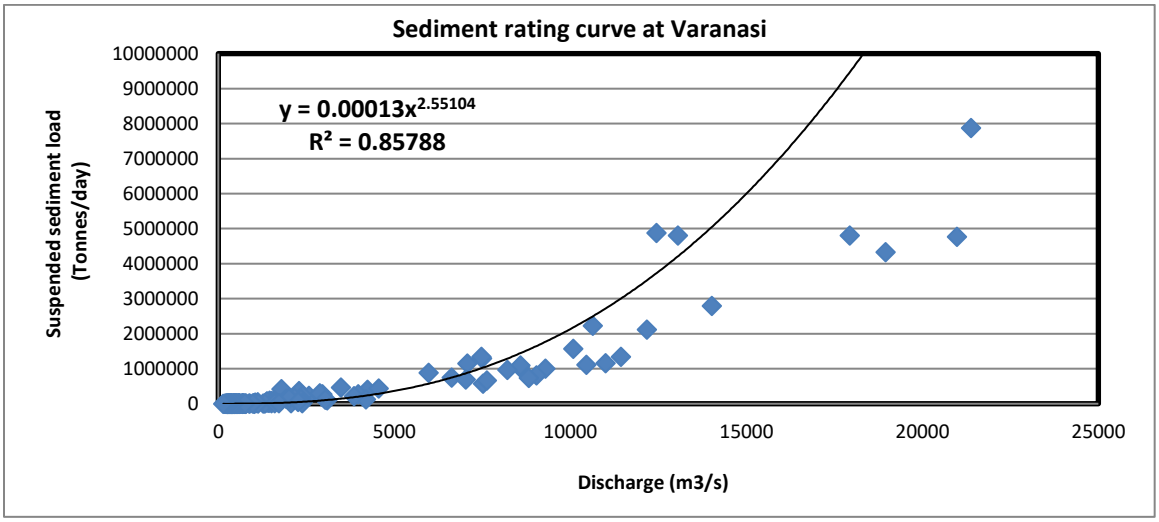

Fig.3: Sediment rating curve at Varanasi

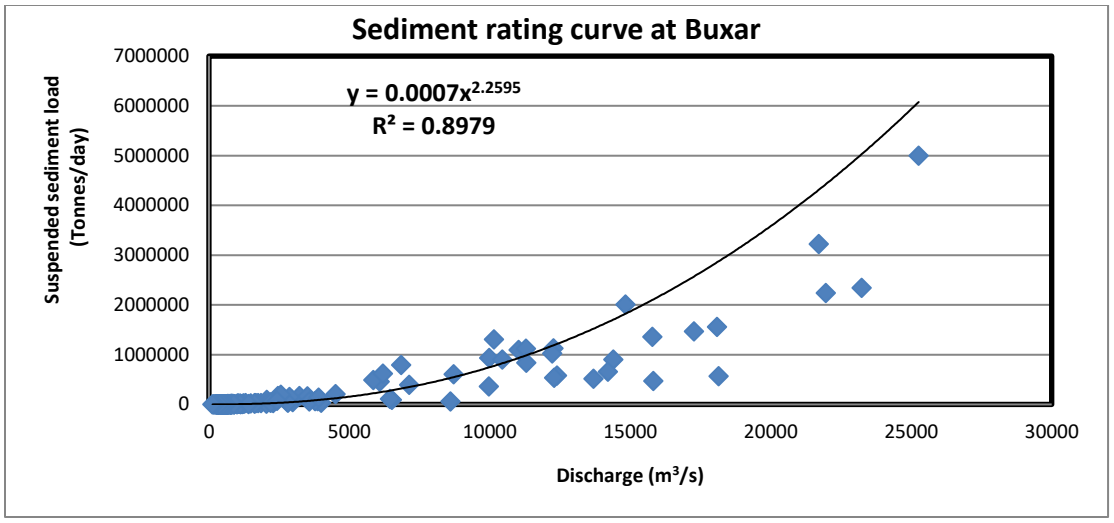

Fig.4: Sediment rating curve at Buxar

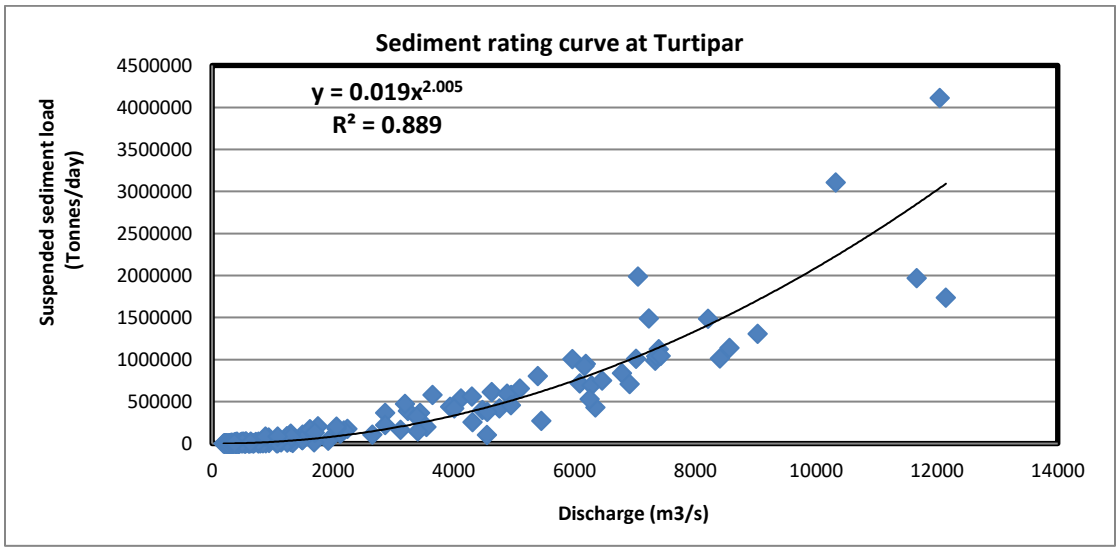

Fig.5: Sediment rating curve of river Ghaghara at Turtipar

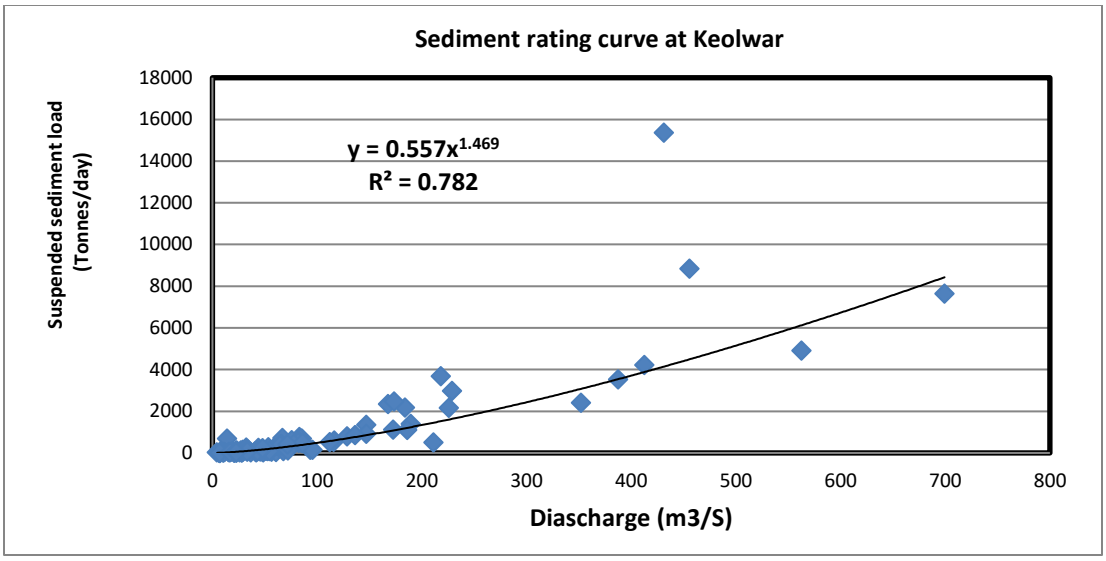

Fig.6: Sediment rating curve of river Sone at Keolwar

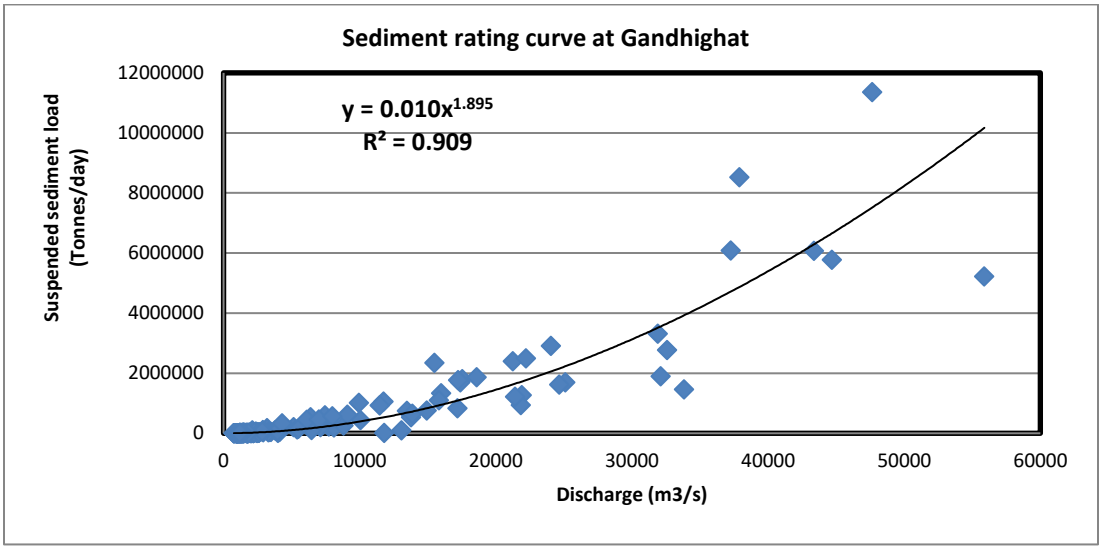

Fig.7: Sediment rating curve of river Ganga at Gandhighat

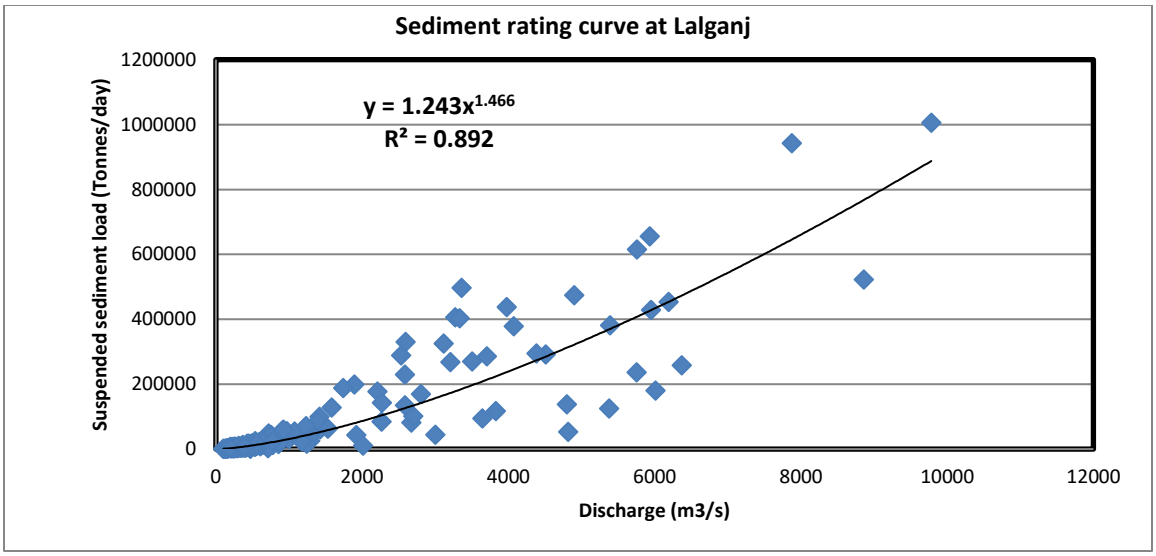

Fig.8: Sediment rating curve of river Gandak at Lalganj

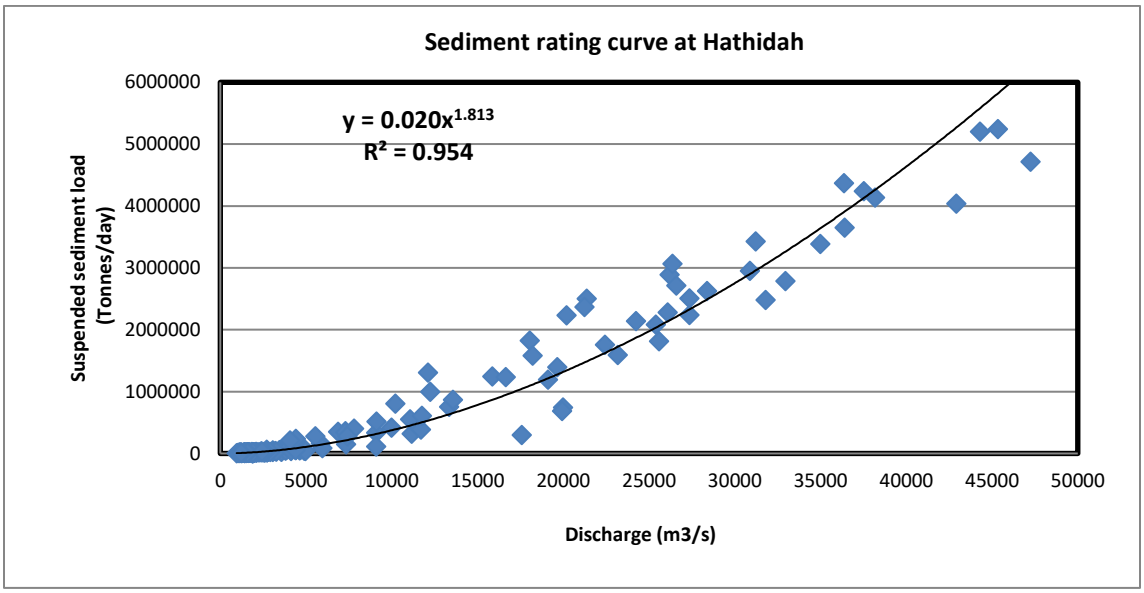

Fig.9: Sediment rating curve of river Ganga at Hathidah

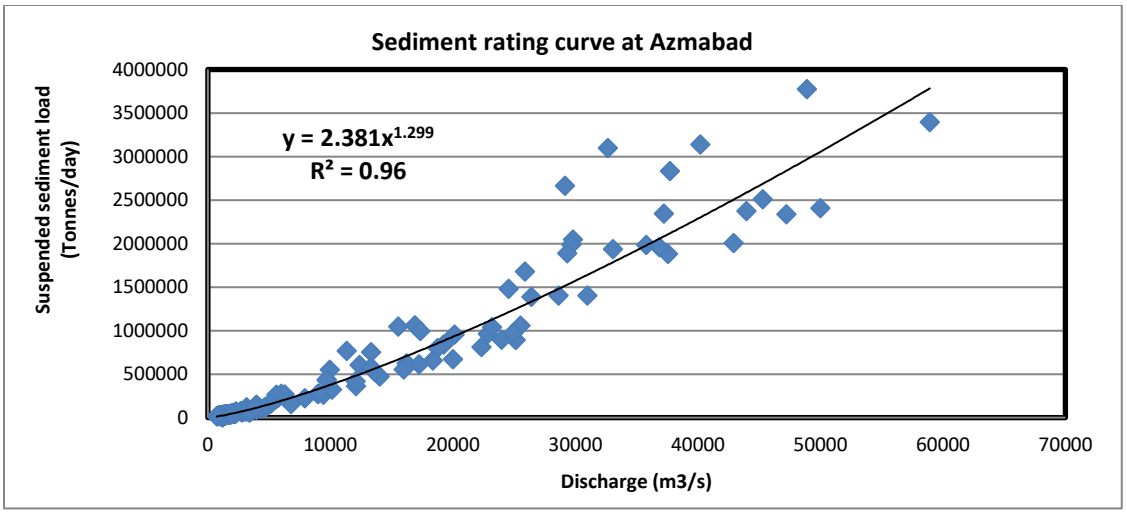

Fig.10: Sediment rating curve of river Ganga at Azamabad

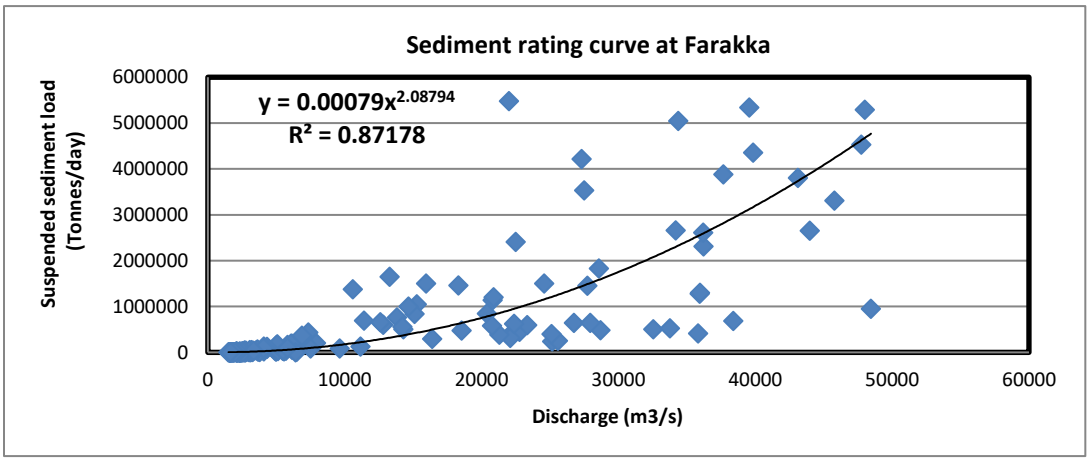

Fig.11: Sediment rating curve of river Ganga at Farakka

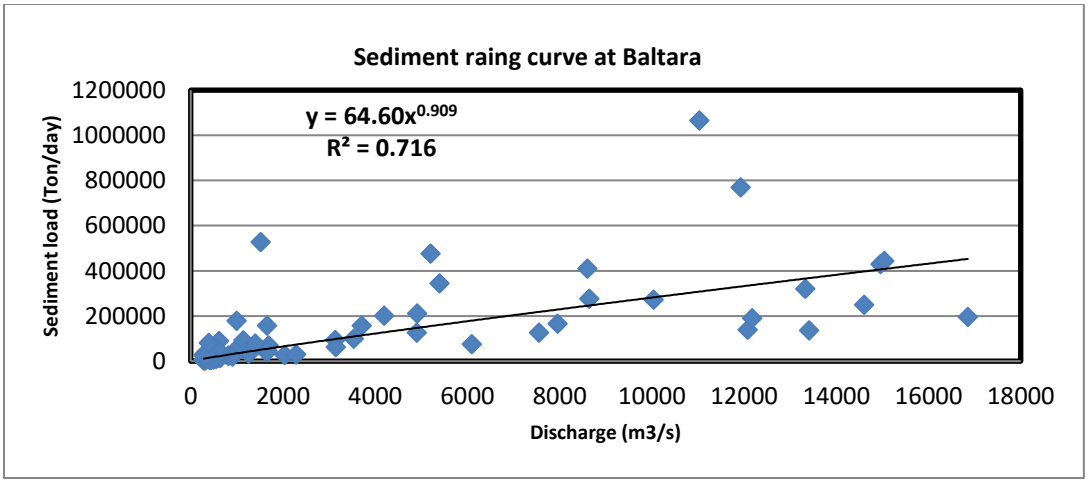

Fig.12: Sediment rating curve of river Kosi at Baltara

5.0 CONCLUSION

From the sediment rating curves, the discharge vs sediment relationship for suspended sediment is given in Table-3.6, where x is discharge in (m^3/s) and y is the suspended sediment load in (Tonnes/day). The same may be utilized to estimate the sediment load for any return period discharge/flood.

Table-6: Suspended sediment vs discharge relationship

G&D Site	River	Suspended sediment vs discharge	R^2
Varanasi	Ganga	$y = 0.00013x^{2.55104}$	0.858
Buxar	Ganga	$y = 0.0007x^{2.2595}$	0.898
Turtipar	Ghaghra	$y = 0.019x^{2.005}$	0.889
Gandhighat	Ganga	$y = 0.010x^{1.895}$	0.909
Lalganj	Gandak	$y = 1.243x^{1.466}$	0.892
Hathidah	Ganga	$y = 0.020x^{1.813}$	0.954
Azamabad	Ganga	$y = 2.381x^{1.299}$	0.960
Farakka	Ganga	$y = 0.00079x^{2.08794}$	0.872
Koelwar	Sone	$y = 0.557x^{1.469}$	0.782
Baltara	Kosi	$y = 64.60x^{0.909}$	0.716

From the sediment - discharge rating equations, average annual sediment load and average monthly sediment load following conclusions may be drawn:

- The average annual sediment load in main stem of river Ganga in Bihar is of the order of 200 to 280 Million Tonnes. The same at Farakka barrage is about 250 Million Tonnes.
- The sediment load is exponentially increasing with discharge.
- From the monthly sediment distribution it may be established that the sediment inflow during the 4 monsoon months July, August, September and Octobers is about 90 to 95% of the annual sediment load.
- Huge contribution of sediment load in main stem of river Ganga is from its northern tributaries viz Ghaghara and Gandak with their sediment yield more than 0.8 mm/km^2/year. The suspended sediment load of Kosi river at Baltara is of the order of 45 to 50 million Tonnes per year. The sediment yield of Kosi is also quite high (about 0.5 mm/km^2/year) The high concentration of sediment in northern tributaries, a very flat slope of the order of 1:10,0000 of the tributaries and 1:20,000 of the main stem of river Ganga in Bihar could be attributed to significant sediment deposition at their confluences with river Ganga and further downstream.

- Sediment contribution from Sone in main stem of river Ganga seems to be insignificant.

6.0 LIMITATIONS

The total sediment load assessment is on the basis of observed suspended sediment load and assumed bed load @15% of the suspended sediment load. Hence, assumption of bed load is a limitation. During the extreme flood conditions may not be possible to collect the water samples from each segment for suspended sediment analysis, which one of the limitations.

ACKNOWLEGDEMENT

The assessment of sediment load was possible due to availability of concurrent sediment and discharge data of river Ganga and its tributaries form Central Water Commission.

Disclaimer: *The views expressed in the paper are purely personal and not necessarily the views of the organisation.*

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A COMPARATIVE MODELING STUDY OF GLACIAL LAKE AND ASSOCIATED GLACIAL LAKE OUTBURST FLOODS AT DUGAR HYDRO-ELECTRIC PROJECT IN CHENAB RIVER BASIN

ANKIT KUMAR[1], SAMIR KUMAR SHUKLA[2], YOGESH KUMAR GUPTA[3]

ABSTRACT

Glacial lakes are common in the upper reaches of glacierised basin such as basins in Himalayan regions. They are formed by storage of melting water from snow and glacier ice. Most of these glacial lakes are dammed by unstable lateral or end moraines. These lakes normally drain their water through seepage. But as the global warming has increased the pace of melting of snow and glaciers, some glacial lakes are getting bigger in size and accumulating more water with time. Such bigger glacial lakes holding large quantity of water, if breached, discharges huge amount of stored water instantly causing flash floods, known as Glacial Lake Outburst Floods (GLOFs). It could create havoc in downstream areas. Hence GLOF must be taken into account while planning, designing and constructing any infrastructure in downstream. Specifically, water resource projects shall be of prime concern for experts involved in water sector as they are situated on the stream path and could breach leading to further catastrophe and financial loss. In the present study, glacial lakes, that may pose a threat for under planned Dugar Hydro-Electric Project (HEP) in Chenab basin, have been identified. By criticality analysis, three glacial lakes have been selected as potentially dangerous based on their water surface extent and distance from project site. The water surface area of one glacial lake was found to be increased by 81% from 2014 to 2020 using remote sensing analysis. The increase in lake size also led to increase in GLOF by 50% at project site. The motive of this study is to assess the increase in GLOF due to increase in lake area. This study tries to impart a sense of understanding to the water resource community regarding the expansion in both glacial lakes and resulted GLOF and try to present a road map for various future researches.

Keywords: *Glacier retreat, Glacial lake expansion, Glacial lake outburst flood (GLOF), Hydrodynamic channel routing, MIKE-11, Dam break*

1. Introduction

A number of water resource projects have been constructed in Indian River basins of Himalayan region and many are in different stages of planning and construction. The catchment of most projects in Himalayan region includes snow cover and glaciers. Due to the climate change induced global warming; the temperature in the Himalayas during the past few decades has shown constant increment resulting in recession of glaciers. (1, 2, 3, 4, 5, 6, 7) As a result of this climate change induced global warming; glacial lakes are increasing significantly both in terms

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can be erosion lakes, cirque lakes, moraine dammed lakes, etc. (2, 11) However moraine dammed glacial lakes are considered as potentially dangerous lakes due to its unstable and unconsolidated nature. The moraine dams are naturally formed dams with ice and highly porous soil material inside the dam body. Due to receding of glaciers at a rapid rate, size of glacial lakes is also increasing concomitantly. The moraines that are damming such glacial lakes may breach in future either due to overtopping or piping, releasing a sudden discharge. The sudden discharging caused due to breaching of such glacial moraine lakes releases enormous volume of water and debris in devastating manner is known as Glacial Lake Outburst Floods (GLOFs) (12). These GLOF events endanger the safety of hydroelectric projects being planned in downstream. Hence, it has become utmost important for water resources planners to account for the GLOF along with the design flood for deciding the spillway capacity of projects located in similar hydro-meteorological regions. Typically during a GLOF, about 15-50 million cubic meter of water along with debris may be discharged causing widespread damage in downstream, in some cases for hundreds of kilometres. One significant GLOF event per decade was recorded to have taken place in Himalayan region during 1950s and by 1990s, it had increased to one event per three years (13). Hence, it has also become necessary to monitor the potentially dangerous glacial lakes at regular interval to map the expansion in size of such lakes upstream of the existing projects and also formation of new lakes in upper mountainous region.

In this study, the simulation model of glacial lake, about 205 km upstream of Dugar HEP in Chenab river basin, has been developed for satellite imagery of both 2014 and 2020 to assess the increment in breach discharge of identified glacial lake just downstream of lake. Consequently, the peak discharge has been routed up to Dugar HEP site. The outcome for the both conditions has been compared to get a holistic view of risk associated and way forward.

2. CASE STUDY

2.1 Description of Study Area

The study area of the present study is the catchment area of Dugar Hydro-Electric Project (HEP) in the Chenab Basin. The Dugar HEP is proposed on the Chenab River in Himachal Pradesh, India. The capacity for Dugar HEP is 449 MW. The diversion site for the project is proposed at Latitude 33°07’05”N and Longitude 76°21’20.7”E. The catchment area at proposed diversion site is 7823 km^2. The Chenab River is a major tributary of the Indus Basin. The Chandra and Bhaga Rivers join together to form Chenab river.

2.2 Inventory of Glacial Lakes

The identification of glacial lakes in high mountainous regions of a basin is a tedious task. However many remote sensing methods have been developed in the recent past, that can be used effectively to prepare an inventory of glacial lakes in remote areas like upper reaches of Himalaya. To identify the glacial lakes using remote sensing, satellite images should be free of clouds with minimal ice cover. The preparation of glacial lake inventory includes: a) Identification of glacial lakes using multispectral imagery by differentiating water and other

types of surface, b) Digitisation of lake boundaries using ERDAS tools, c) Assigning of a number for digitized polygon boundaries, d) Calculation of surface area of glacial lakes

2.3 Criticality Analysis

After preparation of inventory of glacial lakes, the potentially dangerous glacial lakes have been identified from the inventory based on the water spread area and various other features related to the glacial lakes. Three glacial lakes having water spread area more than 50 hectare, 01_52H_002, 01_52H_004 and 01_52H_005 (naming as per CWC guidelines), have been selected as potentially dangerous as shown in Figure 1.

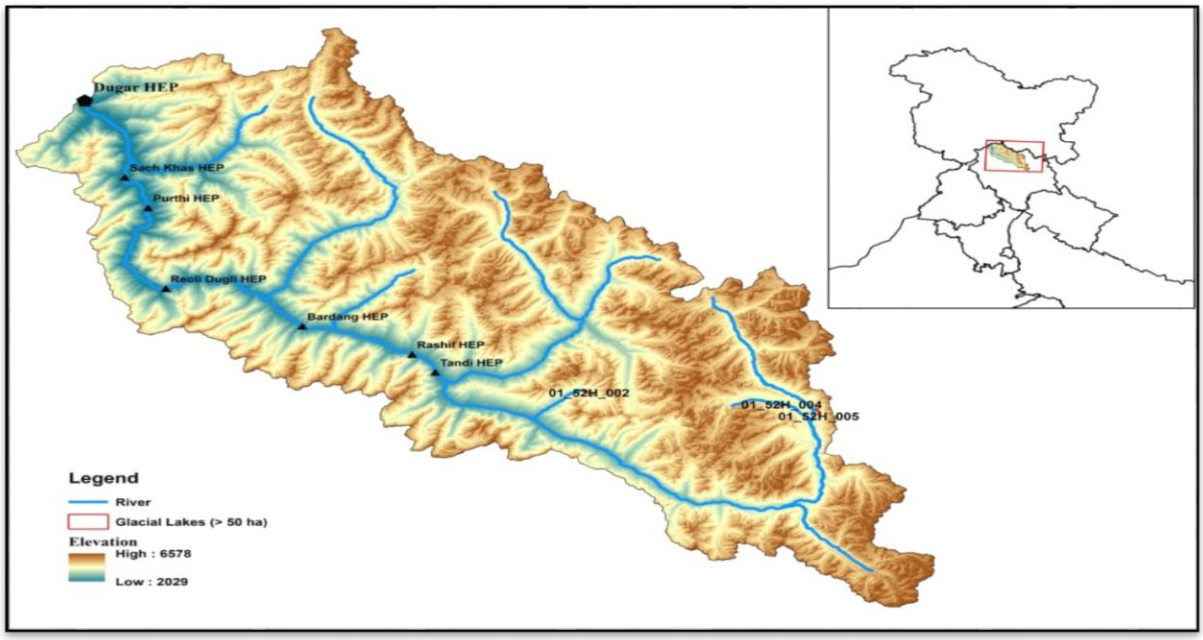

Figure 1: Catchment area map of Chenab basin up to Dugar HEP showing potential dangerous glacial lakes and other major planned HEP on Chenab River.

After closely following satellite imagery of 2014 and 2020, it was observed that all of the three glacial lakes have shown an expansion in water spread area. The basic features of these glacial lakes have been given in Table 1. The detailed criticality analysis has been carried out to map out the most critical glacial lake in catchment area of the project and moraine dammed lake 01_52H_004 has found to be most vulnerable. The areal expansion of glacial lake 01_52H_004 has been shown in Figure 2 and Figure 3.

Table 1: Physical parameters of identified glacial lakes

Lake ID as per CWC Inventory	*Longitude*	*Latitude*	*Elevation (m)*	*Area in ha (2014)*	*Area in ha (2020)*	*Distance from Dugar HEP (km)*	*Type*
01_52H_002	77°13'06"	33°31'29"	4068	65	105	142	Moraine
01_52H_004	77°32'58"	32°29'55"	4150	88	160	205	Moraine
01_52H_005	77°36'58"	32°28'56"	4275	48	51	202	Cirque

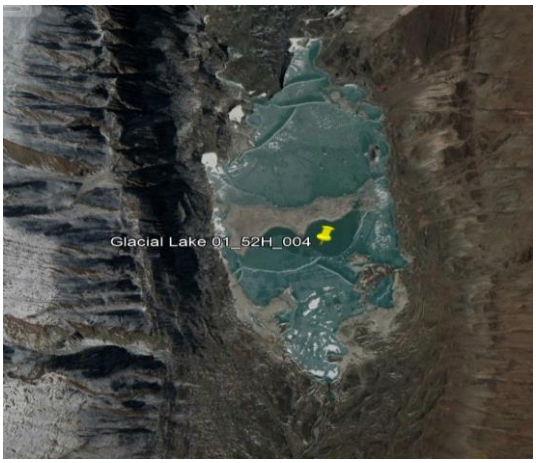

Figure 2: Google Earth Image of Glacial Lake 01_52H_004 (2014)

Figure 3: Google Earth Image of Glacial Lake 01_52H_004 (2020)

3. MATHEMATICAL MODEL FOR GLOF STUDY

3.1 GLOF- A Dam Break Modelling

GLOF modeling may be treated as a type of dam break unsteady flow modeling. The possible failure mechanism associated with moraine dammed lakes are almost the same as of an earthen dam with difference being only in the time of full breach development. Since the moraine dams are highly porous in nature and have low inherent strength, their breach development time will be small in comparison to a well compacted earthen dam leading near abrupt failure. Further there are two basic parts of a GLOF modeling: i) Estimation of outburst flood hydrograph just downstream of glacial lake and ii) Hydrodynamic channel routing of outburst flood to get the GLOF output at a project site through proper attenuation and translation mechanism. For the present study, the MIKE-11 model developed by Danish Hydraulic Institute, Denmark has been used. A typical flow chart of GLOF study has been illustrated in Figure 4.

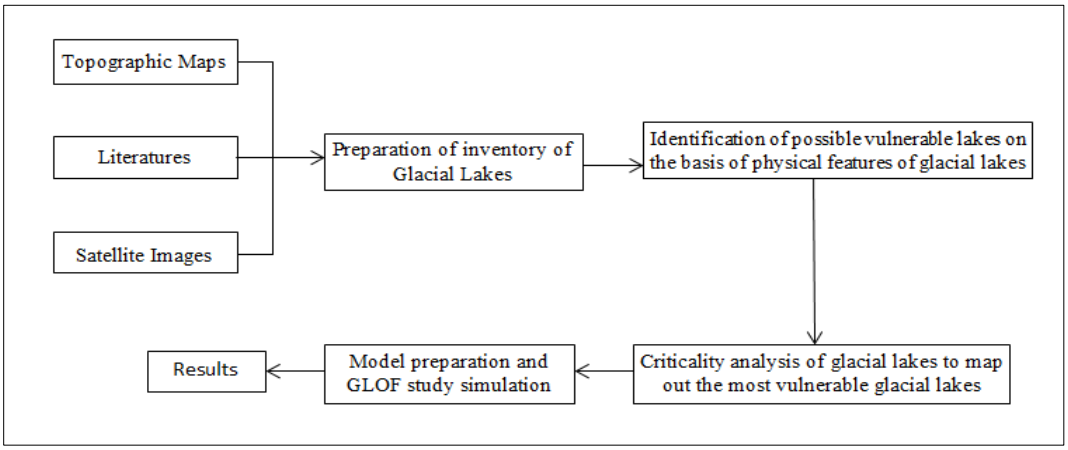

Figure 4: Flow Diagram for GLOF Study

3.2 Input Data and Breach Parameters

The depth of the glacial lake and volume of water stored in its reservoir are two primary parameters to estimate GLOF. Different researchers have given different sets of empirical relations to calculate depth and volume. International Centre for Integrated Mountain Development (ICIMOD) guidelines and Christian Huggel's equations are widely used. ICIMOD guidelines provide different average depth for different type of glacial lakes in Bhutan and Nepal (Cirque Lake- 10 m, Lateral Moraine Lake- 20 m, Moraine Lake- 30 m, Blocking Lake and Glacial Erosion Lake- 40 m). The Christian Huggel's equations are developed for moraine glacial lakes in Swiss Alps region, but are being used satisfactorily for glacial lakes of Himalayan regions as well.

$$Depth\ (D) = 0.140A^{0.42}$$
$$Volume\ (V) = 0.140A^{1.42}$$

After criticality analysis, the moraine dammed glacial lake 01_52H_004 (as per CWC Inventory) with estimated volume of 17.6 MCM, located about 205 km upstream of Dugar HE Project diversion site has been adopted to estimate the GLOF. The stream cross sections at an interval of 2 to 5 km, extracted from SRTM DEM, have been utilised to carry out the channel routing in MIKE-11. The Froelich's equations (2007) have been used to determine breach parameters. The glacial lake has been represented by an elevation-area relationship.

4. RESULTS AND DISCUSSION

Satellite images reveal that glacial lake 01_52H_004 has undergone significant areal expansion. In 2014, its surface area was 88 ha (0.088 km2). By the September 2020, the lake area has increased to 160 ha (0.160 km^2), showing an increase of approximate 81% relative to 2014. The increase in volume of glacial lake due to increase in water surface area has a direct relation with the resulting GLOF. The consequential increment in outburst flood not only affects the spillway capacity of Dugar HEP, but also various other projects being planned on Chenab River.

Based on the data from satellite imagery of 2014, GLOF peak is found to be 3008 cumec at its origin i.e. just downstream and gets attenuated to 761 cumec at Dugar HEP site for glacial lake 01_52H_004. But based on data of 2020, GLOF peak at its origin increases to 3305 cumec and gets attenuated to 1145 cumec at project site i.e. an increase of about 50% at project site as compared to 2014. The GLOF hydrograph at its origin and at Dugar HEP site for 2014 and 2020 is given in Figure 5 and Figure 6 respectively.

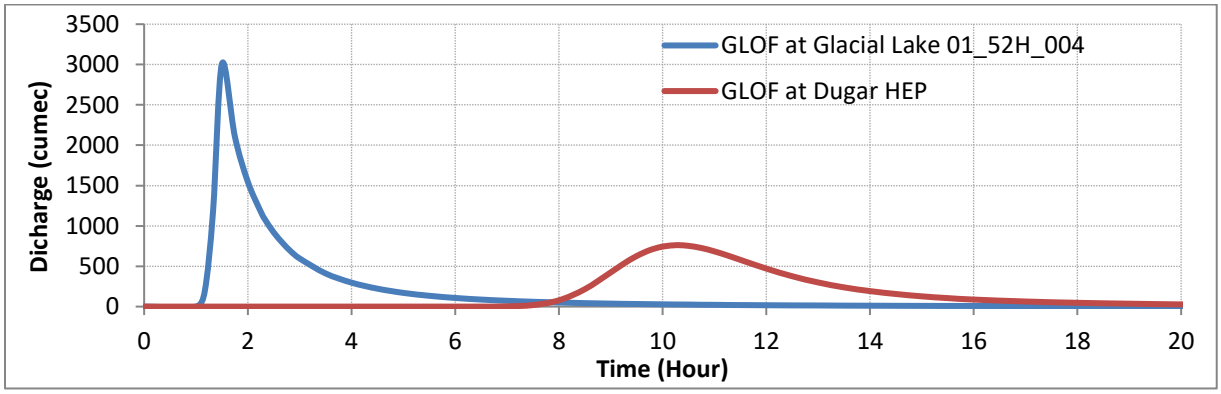

Figure 5: GLOF hydrograph at Dugar HEP Site based on 2014 satellite imagery

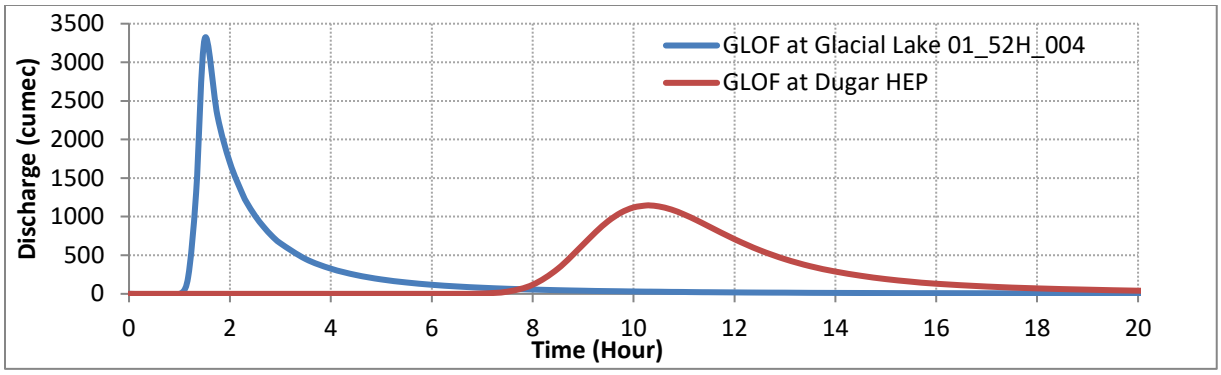

Figure 6: GLOF hydrograph at Dugar HEP Site based on year 2020 satellite imagery

5. CONCLUSION

It is an established fact that climate change is severely impacting high mountainous region around the globe and resulting in retreat of glaciers. This phenomenon has increased quite a fold in last few decades resulting in formation of new glacial lakes in river basins and also resulted in expansion of existing lakes. It has raised the risk to existing downstream water resources projects due to more impoundment in reservoir of lakes. Hence, the very first step in minimizing the threat can be to start the monitoring of vulnerable lakes more actively and regularly. The next step would be to carry out detailed studies and model simulation of potentially vulnerable lakes and to share the outcome with the concerned stakeholders. It is also important to closely assess the bathymetric changes of identified lakes, instead relying only on satellite and remote sensing data. It would be helpful to plan any mitigation solutions accordingly. It will reduce the pressure on downstream water resources projects, thus minimising their possibilities of breach.

In the present study, based on the analysis of satellite imagery and simulation of GLOF modeling at Dugar HEP in Chenab basin, it can be concluded that an increase in glacial lake volume may have a disastrous effect on downstream projects in the basin. An increase of 81% in water spread area of glacial lake has led to an increase of 50% in GLOF peak at project site. In this case, two flood events have been selected to carry out GLOF model simulation. The first flood event for the initial conditions of the channel has been taken as average annual flow at respective project site. This condition corresponds to the average flow condition of the river. The second flood event for the initial condition of the river has been taken as 100 year return period flood. The glacial lake outburst may be associated with a flood event. The extent of flood attenuation during hydrodynamic wave approach of channel routing depends on the breach dimension, breach formation time and initial conditions of flow in the entire study reach of the river/channel. Thus, to get reasonable estimate of GLOF at the dam site, the flood due to lake breach needs to be channel routed along with some flood event.

An additional flood cushion may be provided during construction stage of projects to accommodate the increased discharge due to increase in size of glacial lakes. Early Flood Warning System at such potentially dangerous lakes may also be provided to prevent and minimize the flood induced hazards.

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HYDROLOGICAL AND HYDRODYNAMIC ASSESSMENT OF KEDARNATH FLOOD OF JUNE 2013

N. N. RAI*

ABSTRACT

Uttarakhand and neighboring states experienced heavy to very heavy rainfall during 16-18th June 2013. As per IMD heavy rainfall more than 10 cm in a day were reported at many stations in Uttarakhand and heavy rainfall is also reported at number of stations in Himachal Pradesh, Haryana and Punjab. The incessant, heavy rainfall over three days coupled with bursting of Chorabari glacial lake resulted in very severe flooding and landslides at different places in Uttarakhand. The devastation due to rain and landslide has been huge but the largest impact has been at the temple town of Kedarnath, which was in the midst of the annual pilgrimage season. In the present paper an attempt has been made to simulate the flooding phenomenon of Kedarnath during 16-17th June 2013 using hydrological and hydrodynamic models. The flooding event of 16th June 2013 has been analysed using kinematic wave flood model of HEC-HMS. The Chorabari lake outburst event has been simulated using dam break and hydrodynamic modules of MIKE11 mathematical model. For hydrodynamic routing of dam break flood the cross sections of river from Chorabari lake location upto downstream of Kedarnath complex has been extracted from GIS processing of ASTER DEM. From the cartosat imagery available at Bhuvan it was possible to estimate the breach parameters for moraine dam of Chorabari lake.

Keywords —Glacial lake; kinematic wave flood model; hydrodynamic model; hydrodynamic routing

1.0 INTRODUCTION

Uttarakhand and neighboring states experienced heavy to very heavy rainfall during 16-18th June 2013. As per IMD heavy rainfall (more than 10cm) in a day were reported at many stations in Uttarakhand and heavy rainfall is also reported at number of stations in Himachal Pradesh, Haryana and Punjab. The incessant, heavy rainfall over three days coupled with bursting of Chorabari glacial lake resulted in very severe flooding and landslides at different places in Uttarakhand. The India Meteorological Department (IMD) linked heavy to very heavy rain-fall on the higher Uttarakhand, Himachal and Nepal Himalaya to the convergence of the Southwest Monsoon trough and westerly disturbances, which led to the formation of dense cloud over the Uttarakhand Himalaya. The devastation due to rain and landslide has been huge but the largest impact has been at the temple town of Kedarnath, which was in the midst of the annual pilgrimage season. The flash flood in Mandakini river originating from the Chorabari Glacier near Kedarnath in Uttarakhand, on 16-17 June 2014, resulted huge loss of life and property in Kedarnath valley. A huge rock got stuck behind Kedarnath Temple and protected it from the ravages of the flood. The waters gushed on both the sides of the temple destroying everything in their path. Even eyewitness observed that one large rock got carried to the rear side of Kedarnath Temple, thus causing obstruction to the debris, diverting the flow of river and debris to the sides of the temple avoiding damage. The spatial distribution of rainfall on 16th and 17th June 2013 is shown in Fig.1. In the present paper an attempt has been made to analyze the flooding

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phenomenon of Kedarnath during 16-17th June 2013.

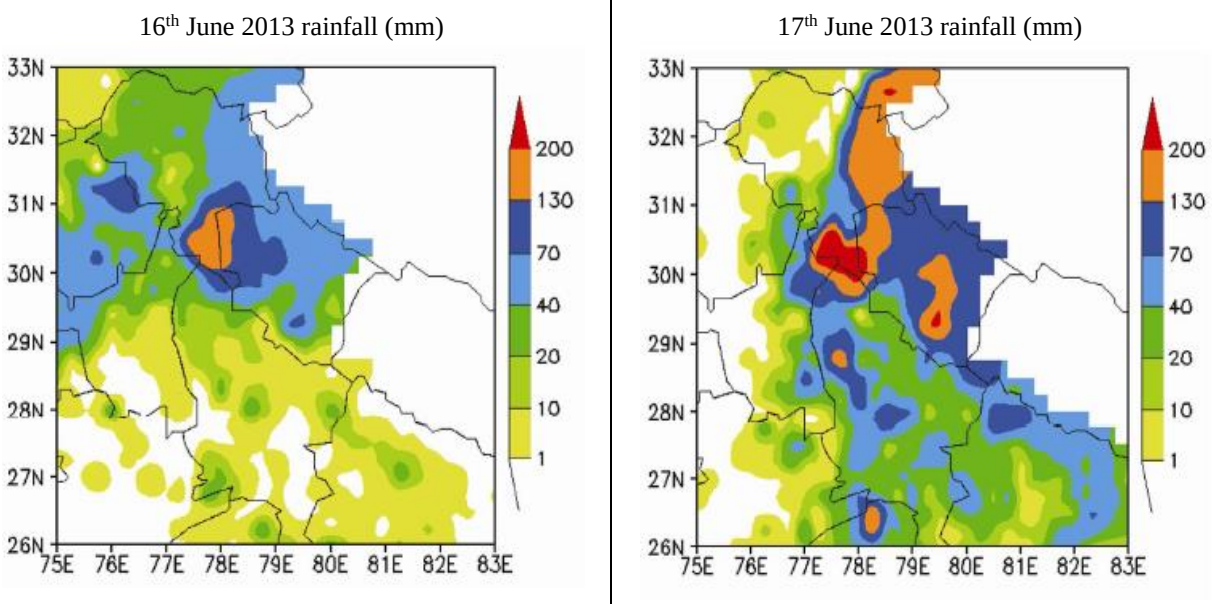

Fig. 1: Spatial distribution of 16-17 June 2013 rainfall in Uttarakhand and other neighboring States (source: IMD)

2.0 FLOOD DISASTER AT KEDARNATH

Kedarnath area was subjected to two consecutive flood disasters at an interval of about 12 hours. As per the WIHG scientific correspondence published in Current Science Journal, the first flood event occurred on 16 June 2013 at 5:15PM when the torrential rains flooded the Saraswati river and Dudh Ganga catchment area, resulting in excessive flow across all the channels. Due to heavy downpour, the town of Rambara was completely washed away on 16 June evening. The second event occurred on 17 June 2013 at 6:45a.m., after overflow and collapse of the moraine dammed Chorabari Lake which released large volume of water that caused another flash flood in the Kedarnath town leading to heavy devastation downstream viz Gaurikund, Sonprayag, Phata, etc. Kedarnath area is situated in the U shaped valley where the elevation varies from about 2700 m to 6900 m.

River Mandakini originates from Chorabari glacier situated upstream of Kedarnath temple complex. The river is joined by Saraswati River near Kedarnath which originates from Companion glacier of Chorabari glacier upstream of Kedarnath. The river passes Rambara and Gaurikund. The Madhu Ganga and Dudh Ganga are the main tributaries that merge into the Mandakini River at Kedarnath town. Another equally important tributary of Mandakini River is Son Ganga which originates from Vasuki Lake and has a confluence with Mandakini River at Sonprayag. The river finally merges with Alaknanda River at Rudraprayag.

The drainage area of Mandakini river at Rambara has been mapped using ASTER DEM. The is about 64 sq.km, out of which about 14 sq.km lies above elevation 5000 m as shown in Fig.2.

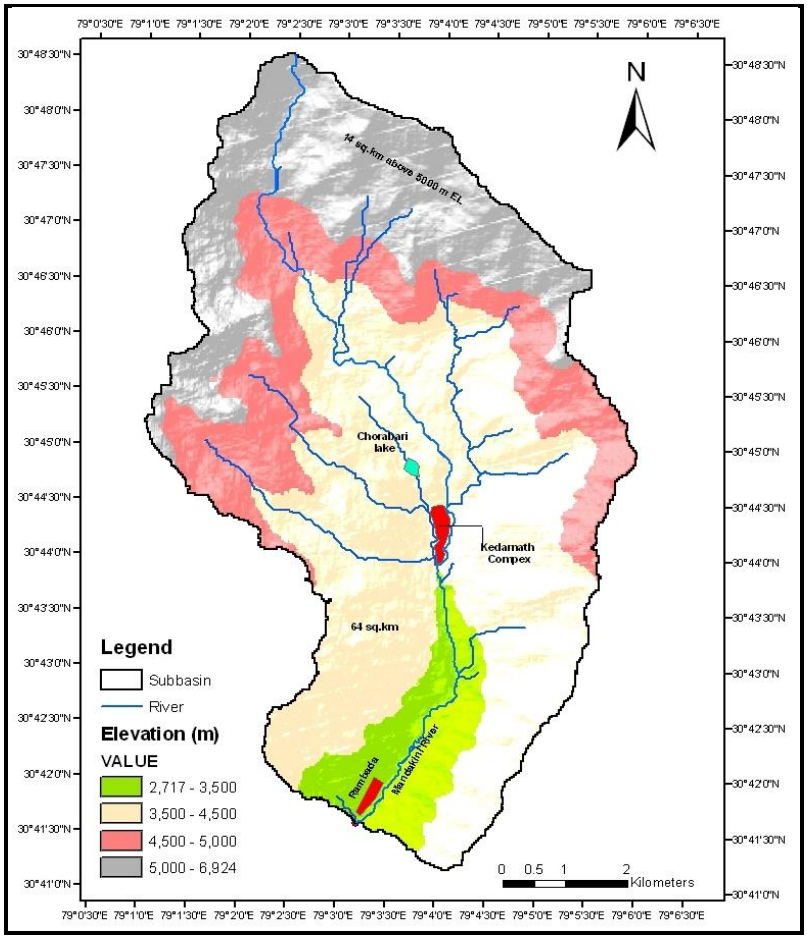

Fig.2: Drainage area map of Mandakini river upto Rambara

3.0 SIMULATION OF FLOODING EVENT OCCURRED ON 16TH JUNE 2013 AT 5:15 PM

To flooding event of 16th June 2015 has been analysed on HEC-HMS. Since the area is having very steep topography and small catchment (rainfed area of about 50 sq.km and time of concentration less than 1 hour), in such case kinematic wave flood model is ideally suited. The total rainfall during from 15th June 5:00 PM to 16th June 5:00 PM was about 325 mm as reported by WIHG observatory at Chorabarai glacier. The hourly distribution of rainfall could not be obtained. However, based on the various Self Recording Rain Gauges (SRRG) in Uttrakhand, IMD has suggested some suitable distribution for June -2013 rainfall in Uttarakhand. Though the same may not be strictly applicable for rainfall occurred near Kedarnath area, but in the absence of any other SRRG data the same has been adopted for the present analysis. As per IMD hourly distribution the maximum possible rainfall in one hour duration is about 41 mm.

The kinematic wave flood simulation results are shown in Fig.3. The flood peak estimated at Rambara is about 576 cumec. This flood peak passed Rambara with a shooting velocity of about 8.5 m/s resulting rise in water level by about 4.5 m. For about 50 sq.km rainfed catchment area

the yield of catchment is about 11 cumec / sq.km, which is very high flood from all accounts. The time series of water level as obtained from MIKE11 simulation is plotted in Fig.4.

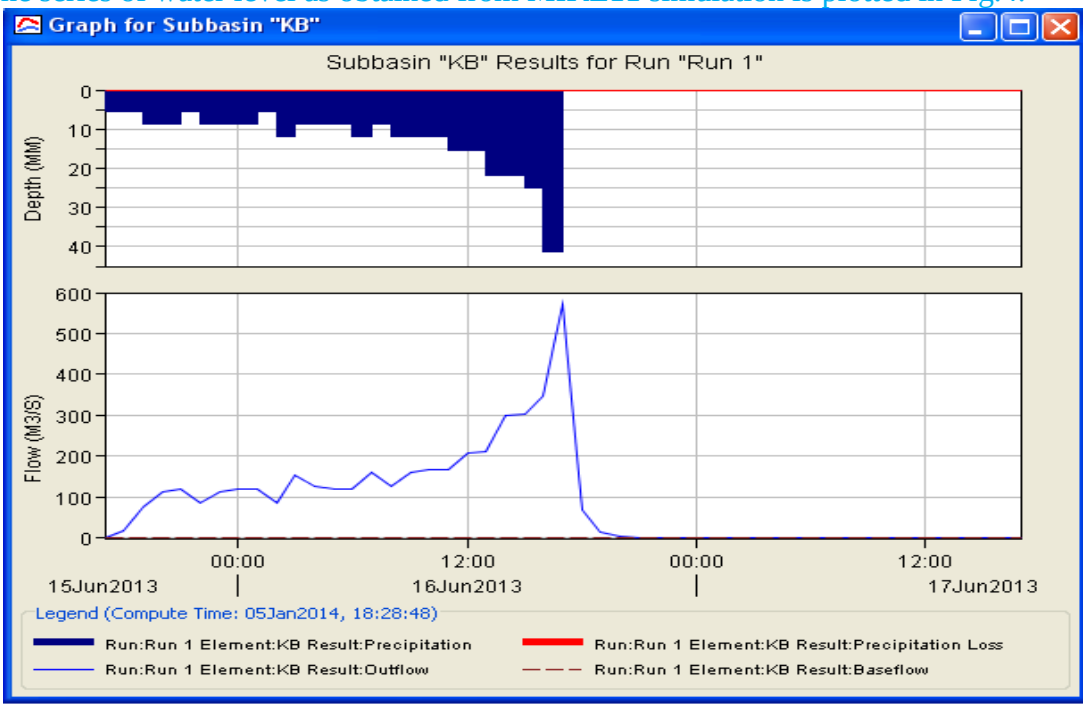

Fig. 3: Flood Hydograph at Rambara due to 15 and 16th June 2013 rainfall

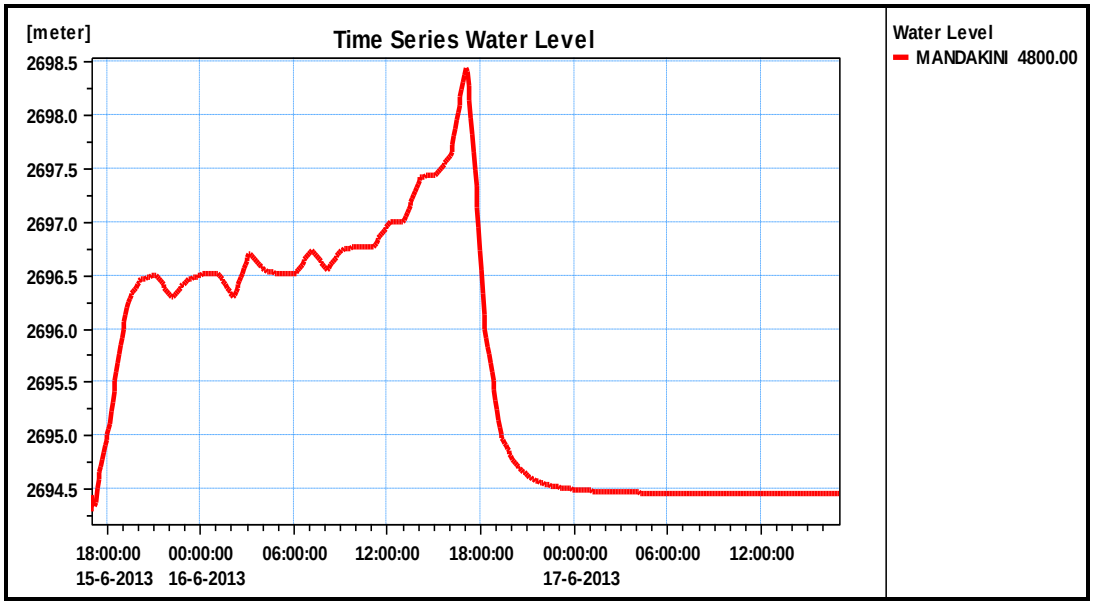

Fig. 4: Time series of water level at Rambara

4.0 SIMULATION OF CHORABARI LAKE OUTBURST FLOOD EVENT OCCURRED ON 17TH JUNE 2013 AT 6:15 AM

Chorabari lake outburst occurred in early morning of 17th June 2013. The lake was emptied in less than 15 minute resulting devastating flood in Kedarnath temple complex and huge loss of lives. The Chorabari lake was located at an elevation 3960 m, about 2.1 km upstream of Kedarnath temple complex. The Kedarnath temple complex and Chorabari lake location is shown in Figure-9. The breach location of moraine dam lake is shown in Figure-10. As per WIHG this lake was about 400 m long, 200 m wide and about 15-20 m deep. The Chorabari lake outburst event has been simulated using MIKE11 mathematical model. For the purpose of hydrodynamic routing the cross sections of river from lake location upto downstream of Kedarnath complex has been extracted from ASTER DEM. From the cartosat imagery available at Bhuvan it was possible to estimate the breach parameters for moraine dam. The breach parameter has been adopted as breach bottom width : 40 m, breach side slope : 0.75H:1V, breach development time: 10 minutes

The GLOF flood near Chorabari lake has been estimated about 1273 cumec. The same near Kedarnath comlex is about 1200 cumec. The velocity of flood peak has been found as 9.7 m/s. The GLOF hydrograph and velocity plot near Kedarnath complex is shown in Fig.5.

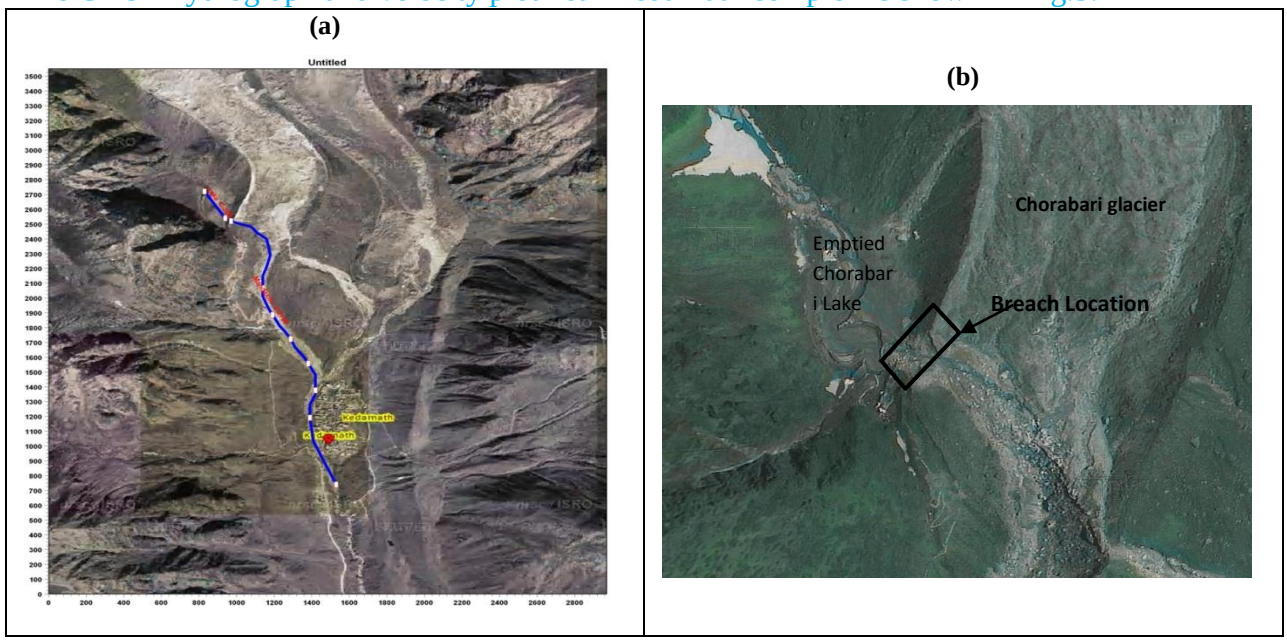

Fig. 5: Mike11 model set up for GLOF (a) and Cartosat imagery Chorabari lake (b)

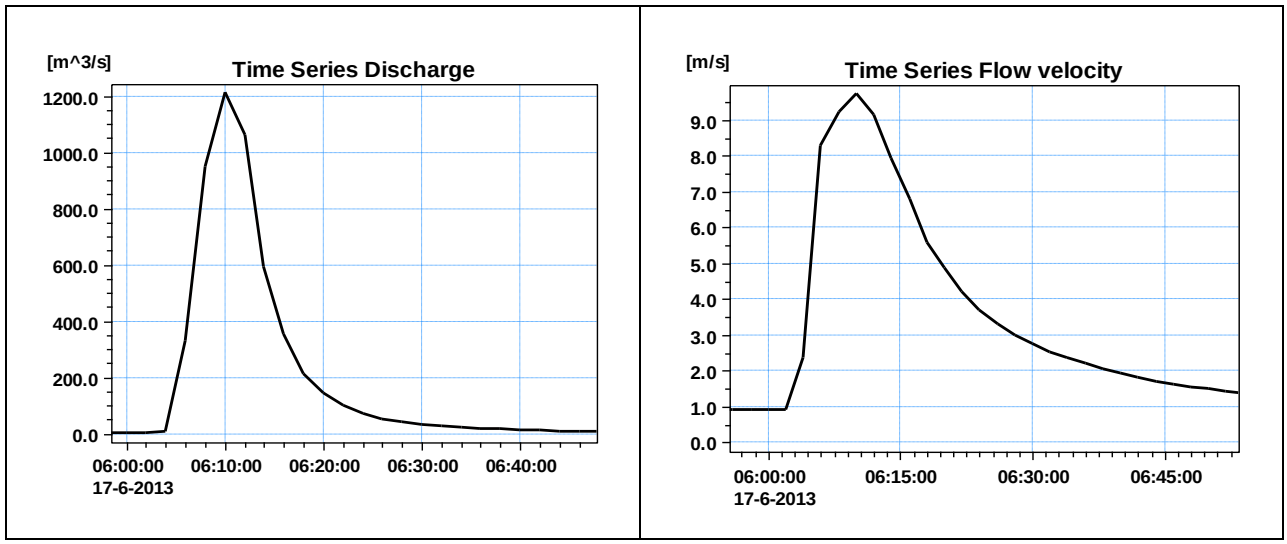

Figure-11: Discharge and velocity time series near Kedarnath complex due to Chorabari lake outburst

5.0 CONCLUSION

The slope of hills near Kedarnath area is about 30 degree from vertical resulting time of concentration of about 1 hr only. Due to saturated terrain condition because of continuous rain and small time of concentration only two hours consecutive rainfall of intensity about 40 mm/hr was sufficient to create flash flood of the order of 600 cumec. The average slope of the river from Kedarnath up to Rambara is about 160 m/km, which created a shooting flood wave of 4.5 m deep travelling with velocity of about 8.5 m/s, causing devastation of Rambara and some of the portions of Kedarnath on evening of 16th June 2013. The Chorabari lake outburst flood was about 1200 cumec, which caused sudden rise is water level by about 5 m near Kedarnath and 6 m near Rambara. This flood wave translated with a shooting velocity of about 9.5 m/s, resulting complete devastation of Kedarnath, Rambara and other locations.

Disclaimer: The views expressed in the paper are purely personal and not necessarily the views of the organisation.

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MONITORING OF ENVIRONMENTAL FLOW IN GANGA BASIN

ANUPAM PRASAD[1], RAJESH KUMAR[2]

1. INTRODUCTION

Rivers have played an extraordinarily role in our lifelines and acted as cradles for the growth and development of human civilization. In India Rivers have acquired a central place in the social, cultural, economic & spiritual significance in the life of its people since time immemorial.

The River Ganga is the most sacred and deeply revered by the people of this country and the Ganga River Basin is the largest river basin in India in terms of catchment area covering 11 states viz Uttarakhand, Uttar Pradesh, Madhya Pradesh, Bihar, Rajasthan, West Bengal, Haryana, Himachal Pradesh, Jharkhand, Chhattisgarh and the Union Territory of Delhi constituting twenty-six per cent of the country's land mass and supporting about half a billion population. It traverses a course of 2525 km before flowing into the Bay of Bengal. The Government of India accords highest priority to the conservation of river Ganga and committed to restore and maintain the wholesomeness of the rivers ensuring appropriate environment flows. It is considered necessary to ensure that uninterrupted flows of water are maintained throughout its length at all times in River Ganga to ensure continuity of flows in the river without altering the seasonal variations. To ensure the minimum environment flow in the river Ganga and its tributaries Central Government vide Gazette notification dated 9th October, 2018 has notified the minimum environmental flow (E-flow) to be maintain at various reaches from Origin in Uttarakhand upto Unnao in Uttar Pradesh.

2. Gazette Notification of E-flow

The Central Government issued an Order vide Gazette Notification number S.O.519(E) dated 09.10.2018 read with its amendment dated 14.09.2019 specifying the minimum environmental flows to be maintained in river Ganga in the identified stretches at locations downstream of structures or projects meant for diversion of river flows for the purposes like irrigation, hydropower, domestic, industrial and other requirements.

This Gazette Notification inter-alia provides that:

(vi) The Central Water Commission shall be the designated authority and the custodian of the data and shall be responsible for supervision, monitoring, regulation of flows and reporting of necessary information to the appropriate authority as and when required and also authorised to take emergent decisions about the water storage norms in case of any emergency. The Central Water Commission shall submit flow monitoring-cum-compliance report on quarterly basis to National Mission for Clean Ganga;

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(vii) The concerned project developers or authorities shall install automatic data acquisition and data transmission facilities or required necessary infrastructure at project sites at appropriate locations specified by the Central Water Commission within six months from the date of this order. The installation, calibration, maintenance of flow monitoring facility shall be the responsibility of the project developers or authorities and they shall submit the data to the Central Water Commission from time to time.

(2) Now, therefore, in exercise of the powers conferred by sub-section (3) of section 3 of the Environment (Protection) Act 1986 and read with sub paragraph (3) of paragraph 39 and item(h) of sub-paragraph(2) of paragraph 41 of the River Ganga (Rejuvenation, Protection and Management) Authorities Order, 2016, the Central Government hereby notifies the following minimum environmental flows to be maintained at locations downstream of structures or projects meant for diversion of river flows for purposes like irrigation, hydropower, domestic and industrial and other requirements, namely:-

I. For Upper Ganga River Basin (Origin to Haridwar) in Uttarakhand:

S. No.	Season	Months	(%) Percentage of Monthly Average Flow observed during each of preceding 10-daily period
1	Dry	November to March	20
2	Lean	October, April and May	25
3	High Flow season	June to September	30*

***30% of monthly flow of high season flow**

II. For river Ganga below Haridwar, Uttarakhand upto Unnao, Uttar Pradesh:

S. No	Location of Barrage	Minimum flow releases Immediately downstream of barrages (in Cumecs) Non-Monsoon (October to May)	Minimum flow releases immediately downstream of barrages (in Cumecs) Monsoon (June to September)
1	Bhimgoda	36	57
2	Bijnor	24	48
3	Narora	24	48
4	Kanpur	24	48

The above Notification will apply to the upper Ganga River Basin starting from originating glaciers and through respective confluences of its head tributaries finally meeting at Devaprayag upto Haridwar and the main stem of River Ganga up to Unnao district of Uttar Pradesh. The compliance of minimum environmental flow is applicable to all existing, under-construction and future projects. The existing projects which currently do not meet the norms will have to ensure that the desired environmental flow norms are complied within a period of three years. The mini and micro projects which do not alter the flow characteristics of the river or stream significantly are exempted from these environmental flows.

The flow conditions in these river reaches shall be monitored at hourly intervals from time to time. The Central Water Commission has been entrusted the responsibility for supervision, monitoring, regulation of flows and reporting of necessary information to the appropriate authority as and when required and also take emergent decisions about the water storage norms in case of any emergency.

3. Projects under E-flow monitoring

In the environmental flow (E-flow) monitoring reach of river Ganga upto Unnao, there are many manmade interventions utilising the water for various developmental and important needs such as drinking water, irrigation, hydro power etc. These projects impact the natural flows in the river. In upper Ganga basin upto Haridwar, there are a number of hydro-electric projects. The most of the projects are run-of-the river (ROR) projects with Tehri being a major storage project having gross storage of 3.54 BCM, live storage 2.615 BCM. At Haridwar, Ganga opens to the Gangetic Plains, where Bhimgoda barrage diverts a large quantity of its waters into the Upper Ganga Canal, to provide water for irrigation and other consumptive uses. Further, about 76 km downstream of Haridwar, at Bijnor, another barrage diverts water into the Madhya Ganga Canal but only during monsoon months. At Narora, there is further diversion of water into the Lower Ganga Canal from Narora barrage which is about 155 km downstream of Bijnor barrage. From the barrage at Kanpur, Ganga water is being diverted to meet the drinking water requirements.

Presently E-flow monitoring by Hydrological Observation Circle, Dehradun office under Upper Ganga Basin Organisation, Central Water Commission, Lucknow is being carried out for following 11 projects in Ganga Basin from Origin to Unnao:

S.No	Name of Projects	River	Agency
1	Maneri Bhali-I Hydroelectric Project	Bhagirathi	UJVNL
2	Maneri Bhali-II Hydroelectric Project	Bhagirathi	UJVNL
3	Tehri-Koteshwar Project	Bhagirathi	THDC
4	Vishnuprayag Hydroelectric Project	Alaknanda	JPVL
5	Singoli Bhatwari Hydroelectric Project	Mandakini	ReNew Jal Urja Limited
6	Srinagar Hydroelectric Project	Alaknanda	GVK Power & Infrastructure Ltd
7	Pashulok Barrage	Ganga	UJVNL
8	Bhimgoda Barrage	Ganga	UP Irrigation &WRD
9	Bijnor barrage	Ganga	UP Irrigation &WRD
10	Narora Barrage	Ganga	UP Irrigation &WRD
11	Kanpur Barrage	Ganga	UP Irrigation &WRD

Data from the above project is being collected through email/sms. CWC has also opened seven exclusively e-flow sites in the u/s and d/s location of project in addition to some of existing H.O sites for e-flow monitoring. CWC is also going to install five velocity sensor in the u/s and d/s locations of these projects to monitor real time eflow released by the project authority.

4. Standard Operating Procedure of E-flow monitoring

New Standard Operating Procedures for implementation/monitoring of minimum environmental flows in River Ganga. The new Standard Operating Procedures (SOP) for implementation/monitoring of minimum environmental flows in River Ganga was approved by National Mission for Clean Ganga (NMCG) vide letter F. No. 5/46/2017-Hyd (NE) dated 24.01.2020. Accordingly, the e-flow for monsoon season i.e. June to September has been calculated as per new SOP. During June to September (Monsoon Period) Looking the high variability in the flows during monsoon period, the mandated eflows for this period shall comprise of two components:

(i) e-flows corresponding to Baseline Inflows 30 percent of the 10-daily average of baseline inflows is considered as baseline eflows for corresponding 10 daily period. The baseline inflows at a given project location may be assessed based on fitted trend line (10 per moving average) on lower envelope of past 10 years' inflow at the project location. As baseline inflows shall be available with degree of reliability, the e-flows corresponding to baseline inflows would be Mandated e-flow release as per target for each ten-daily period.

(ii) e-flows Corresponding to Flood Fluxes As flood fluxes are stochastic in nature, e-flows corresponding to flood fluxes may be released any time during the month preferably at the time of high flood wave(s). The project authorities shall be at liberty to release the E-flows corresponding to flood fluxes at any time during the month. However, the quantum of e-flow component from flood fluxes should be adequate so as to meet overall target of eflows (30 percent of gross inflows during the

5. Protocol for E-flow monitoring and compliance:

The protocol for environmental flow monitoring and compliance is as follows:

The data of inflows, diversions, downstream releases and changes in storage shall be monitored on hourly basis.

Till installation of automatic data acquisition and transmission, the data shall be transmitted by project authorities to CWC on daily basis by 11am.

The average environmental release target for the project in the current 10 daily period shall be decided based on average inflows in the preceding 10 daily period.

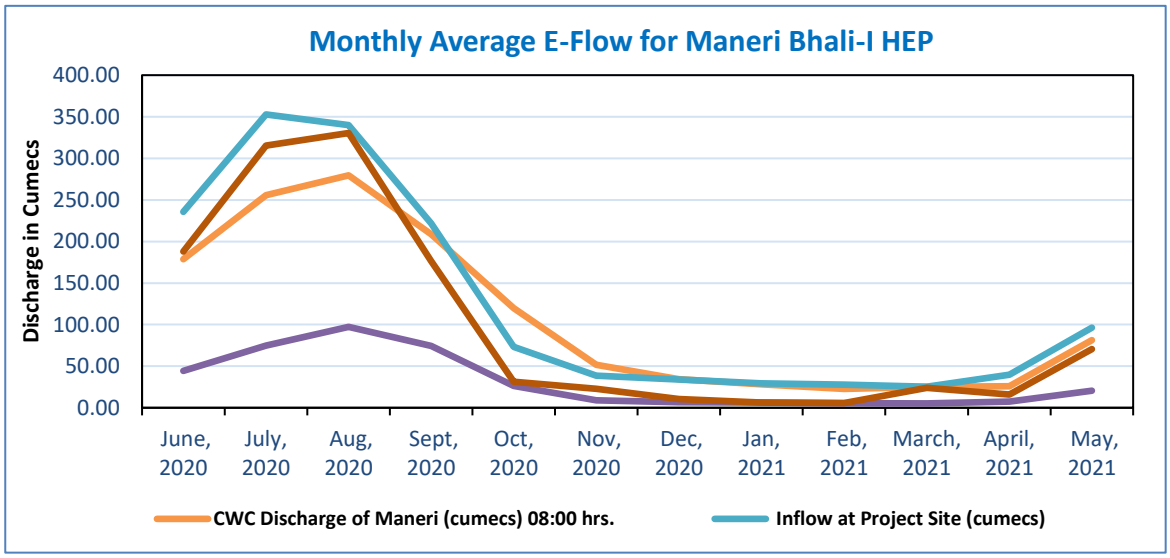
The flow release rate (discharge) during the day may vary within 20 percent range of target flow rate. However, the flow volume released during day shall not be less than the targeted daily volume of release. Any shortfall in preceding day shall be compensated in the next day.

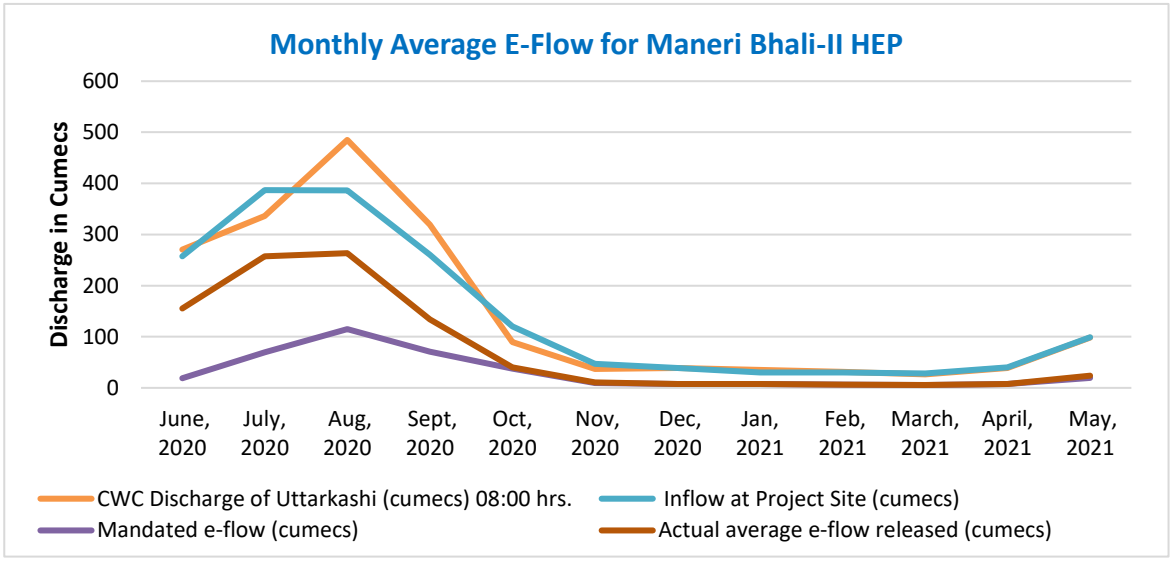
Any shortfall in the releases shall be reported to project authorities on the same day. If project authorities fail to meet the release target in the next day also, a warning shall be issued to project authorities by CWC with a copy to NMCG and state authorities. Influence of any exceptional high flood in the preceding 10 daily period on the target releases in the current 10 daily period shall be duly accounted during flood period.

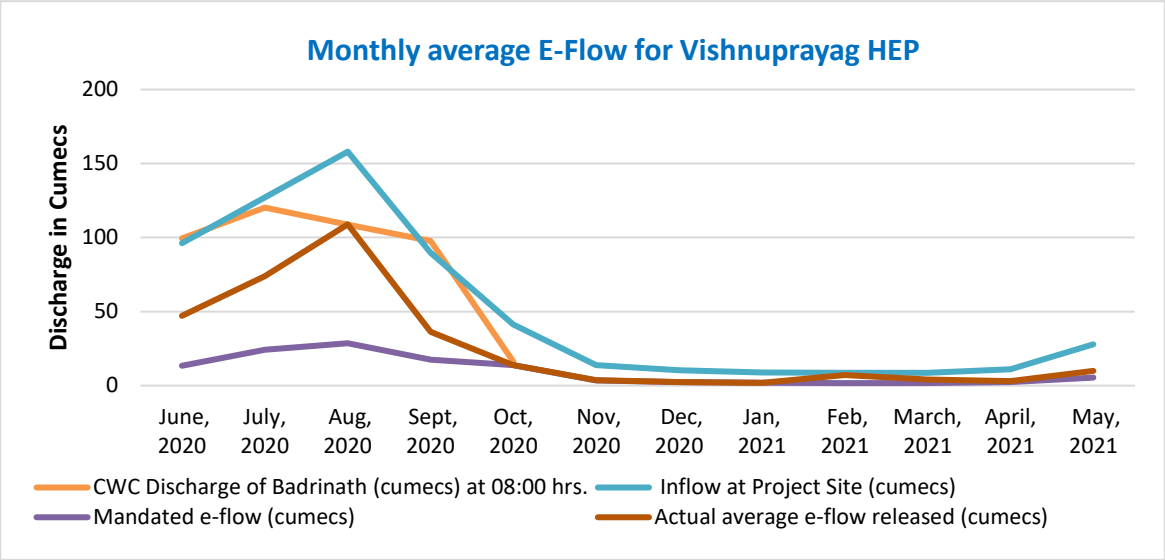
If non-compliance continued for more than 5 days without any compelling circumstances, a penalty may be imposed on project authorities by NMCG undersection 3 of Env (Protection) Act 1986

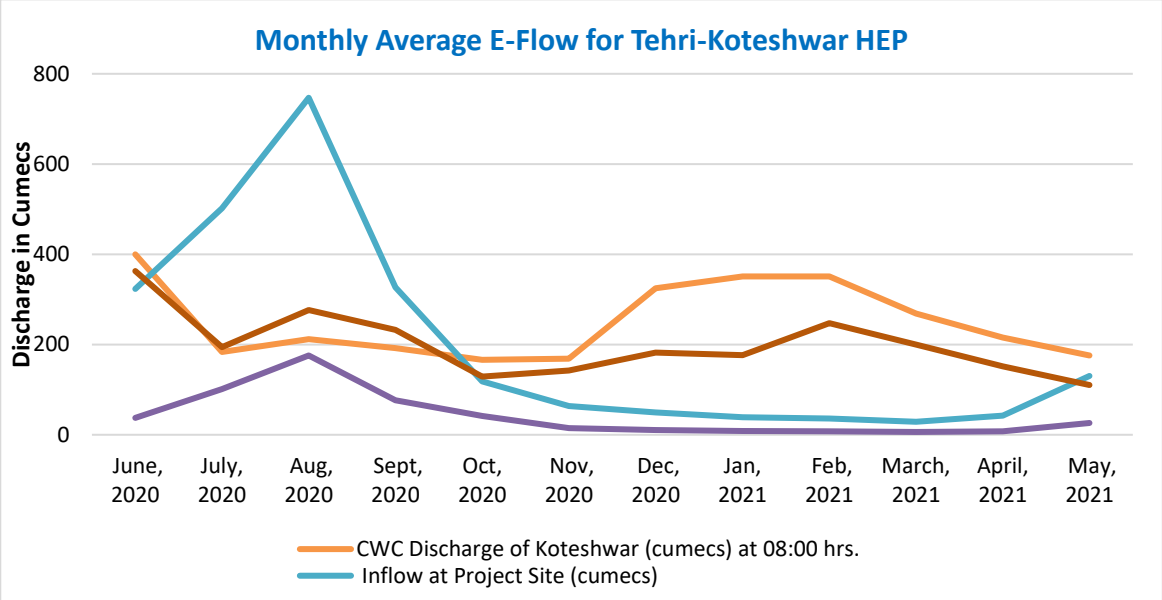
The framework for appropriate penalty shall be decided by NMCG in consultation with state authorities.

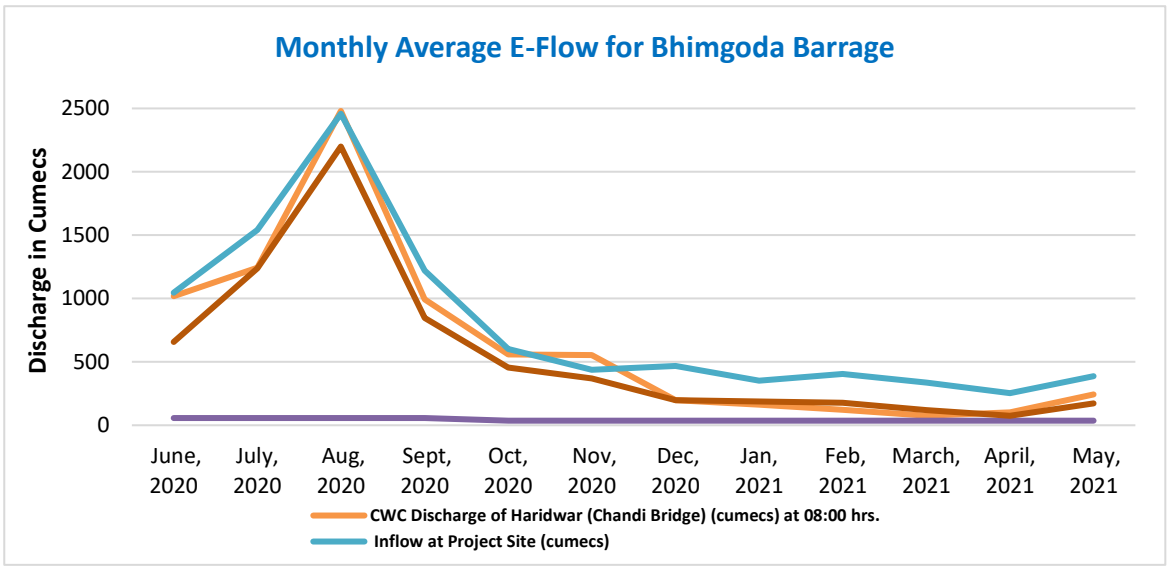
6. Monthly Chart of E-flow monitoring of Projects for water year 2020-21

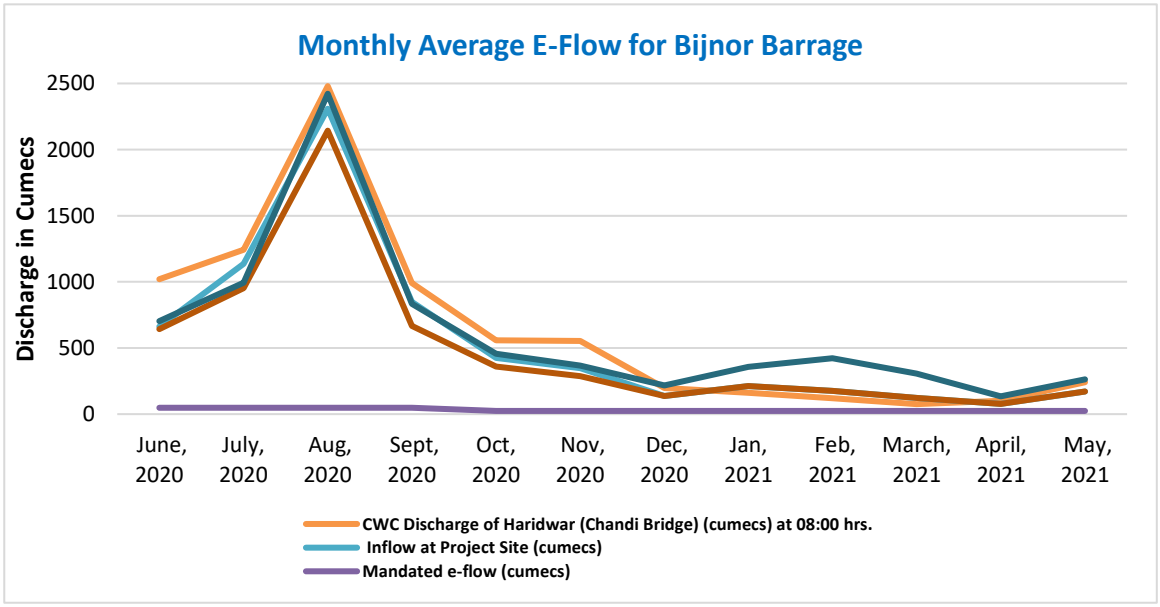


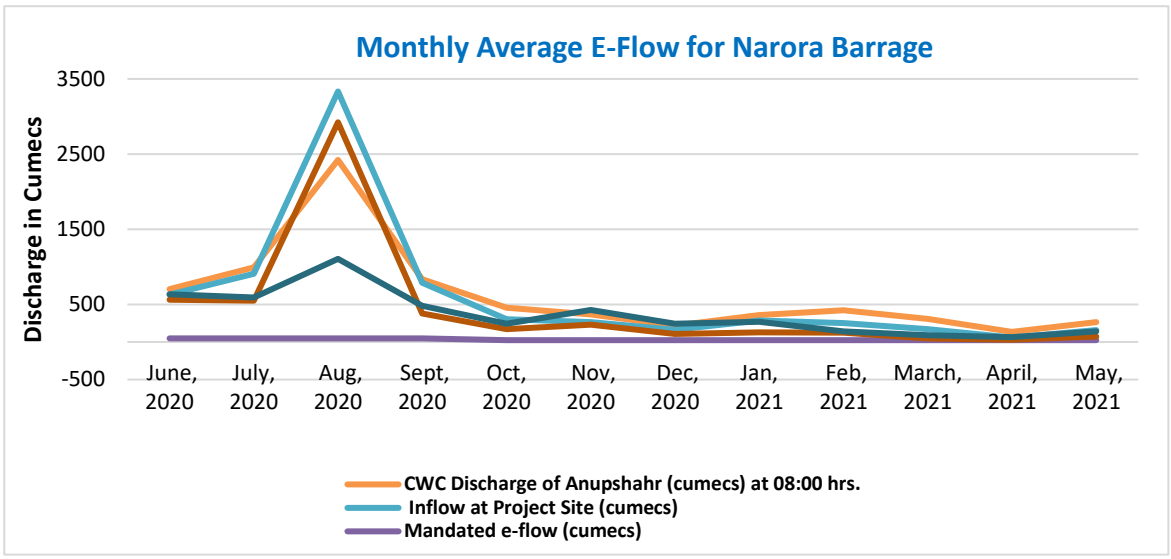



Monthly average E-Flow for Vishnuprayag HEP
Discharge in Cumecs
200
150
100
50
0
June, 2020
July, 2020
Aug, 2020
Sept, 2020
Oct, 2020
Nov, 2020
Dec, 2020
Jan, 2021
Feb, 2021
March, 2021
April, 2021
May, 2021
CWC Discharge of Badrinath (cumecs) at 08:00 hrs.
Inflow at Project Site (cumecs)
Mandated e-flow (cumecs)
Actual average e-flow released (cumecs)


Monthly Average E-Flow for Tehri-Koteshwar HEP
Discharge in Cumecs
800
600
400
200
0
June, 2020
July, 2020
Aug, 2020
Sept, 2020
Oct, 2020
Nov, 2020
Dec, 2020
Jan, 2021
Feb, 2021
March, 2021
April, 2021
May, 2021
CWC Discharge of Koteshwar (cumecs) at 08:00 hrs.
Inflow at Project Site (cumecs)


Monthly Average E-Flow for Bhimgoda Barrage
Discharge in Cumecs
2500
2000
1500
1000
500
0
June, 2020
July, 2020
Aug, 2020
Sept, 2020
Oct, 2020
Nov, 2020
Dec, 2020
Jan, 2021
Feb, 2021
March, 2021
April, 2021
May, 2021
CWC Discharge of Haridwar (Chandi Bridge) (cumecs) at 08:00 hrs.
Inflow at Project Site (cumecs)


Monthly Average E-Flow for Bijnor Barrage
Discharge in Cumecs
2500
2000
1500
1000
500
0
June, 2020
July, 2020
Aug, 2020
Sept, 2020
Oct, 2020
Nov, 2020
Dec, 2020
Jan, 2021
Feb, 2021
March, 2021
April, 2021
May, 2021
CWC Discharge of Haridwar (Chandi Bridge) (cumecs) at 08:00 hrs.
Inflow at Project Site (cumecs)
Mandated e-flow (cumecs)


Monthly Average E-Flow for Narora Barrage
Discharge in Cumecs
3500
2500
1500
500
-500
June, 2020
July, 2020
Aug, 2020
Sept, 2020
Oct, 2020
Nov, 2020
Dec, 2020
Jan, 2021
Feb, 2021
March, 2021
April, 2021
May, 2021
CWC Discharge of Anupshahr (cumecs) at 08:00 hrs.
Inflow at Project Site (cumecs)
Mandated e-flow (cumecs)

WATER RESOURCES IN PARLIAMENT

LOK SABHA

DREDGING OF RIVERS

Erosion and deposition of silt is a natural process in alluvial rivers. Rivers pickup, carry and drop silt load as per their regime conditions i.e. discharge in the river, river slope, morphology, nature of silt etc. A Committee headed by Dr. B.K. Mittal, Former Chairman, Central Water Commission has opined that large scale desilting or dredging of rivers in general is not feasible technically due to several reasons like non-sustainability, non-availability of vast land required for the disposal of dredged material etc. Cost effective measures for removal of drainage congestion in specific reaches of rivers for channel capacity improvement and navigation purposes are formulated and implemented by concerned States / agencies as per requirement. The Union Government renders assistance to States which is technical, advisory, catalytic and promotional in nature. As informed by Uttar Pradesh Government, sectorial dredging has been carried out for relieving the pressure on the banks due to flooding. Dredging has been carried out at Assi Ghat (Varanasi), Dubey Chhapra (Ballia), Katri Bichhuiya (Hardoi) and at Shuklaganj (Unnao) for varying lengths.

As informed by Inland Waterways Authority of India (IWAI), a project for undertaking dredging in two selected stretches Sirajganj-Daikhowa (175 km) stretch of Jamuna River and Ashuganj-Zakiganj (295 km) stretch of Khusiyara River of Bangladesh inland waterways and its maintenance, with a view to provide regular connectivity between NW-1 and NW-2 through Indo - Bangladesh Protocol route is being implemented at a cost of Rs.305 crore with India and Bangladesh sharing the cost in the ratio on 80:20 basis. Project is funded by Ministry of External Affairs on behalf of India.

RESTORATION OF WATER BODIES

A scheme titled Repair, Renovation and Restoration (RRR) of Water Bodies is being implemented under Pradhan Mantri Krishi Sinchayee Yojana - Har Khet Ko Pani (PMKSY – HKKP). Objectives of the scheme include expanding cultivable area under assured irrigation by improvement and restoration of water bodies thereby increasing the tank storage capacity and revival of lost irrigation potential, improving water use efficiency, ground water recharge, increased availability of drinking water, improvement of catchment of tank commands, and development of tourism & cultural activities, etc. From XIIth Plan onwards, 2,218 water bodies with an estimated cost of about Rs. 1,910 crore have been included under RRR of water bodies scheme from various States. Total expenditure reported on these projects till March, 2021 is Rs. 963.82 crore, for which central assistance of Rs.469.68 crore has been released during this

period. Out of these 2,218 water bodies, works in 1,591 water bodies have been completed till March, 2021. However, no proposal for projects pertaining to NCR or Jharkhand have been received for inclusion under the scheme.

Water being a State subject, it is for the State Governments concerned to take up schemes related to water bodies, including those for cleaning of traditional water bodies. Role of Government of India is limited to providing technical support and, in some cases, partial financial assistance under the existing schemes. In order to supplement the efforts of State Governments in this regard, Government of India has taken up a number of measures. Under RRR of water bodies scheme under Har Khet Ko Pani, work in some of the projects also includes cleaning of traditional water bodies. For the period April 2016 to March, 2021, a 924 projects have been included for repair, renovation and restoration of water bodies, under the scheme. Rs. 279.14 crore has been spent on these projects during April 2016 to March, 2021, against which central assistance of Rs.178.1 crore has been released during this period. Out of these, work for RRR of 428 water bodies has been completed during April, 2016 to March, 2021. However, none of these projects pertains to NCR or Jharkhand. Rejuvenation of water bodies, including cleaning of traditional water bodies, is also a component under water supply sector of Atal Mission for Rejuvenation and Urban Transformation (AMRUT) scheme under Ministry of Housing & Urban Affairs. Such projects with total estimated cost of Rs. 1,878.19 crore are ongoing/completed and 106 water bodies have been rejuvenated under this scheme. While there is no project under AMRUT from NCR, details of projects from Jharkhand under this scheme, are as below:

Sr. No.	Name of City	Project Title	Cost (Rs. in crore)	Mile Stone	No of Water Bodies Rejuvenated
1	Ranchi	Ranchi Water Supply (Ph-I)	266.15	Ongoing	4
2	Adityapur	Adityapur Water Supply Project	326.55	Ongoing	3
3	Chas	Chas Water Supply Project	129.29	Ongoing	3
4	Giridih	Giridih Water Supply Project	36.32	Completed	3
5	Dhanbad	Dhanbad Water Supply (Ph-I)	159.31	Ongoing	7
6	Hazaribag	Hazaribag Water Supply Project	416.56	Ongoing	4

Water being a State subject, it is for the State Governments concerned to take up programmes and schemes for prevention of encroachment of its water bodies. However, in order

to supplement the efforts of State Governments, Government of India has taken up a number of important measures in this regard. In 2019, Jal Shakti Abhiyan was launched by the Government. This was followed in 2021, by "Jal Shakti Abhiyan: Catch The Rain" (JSA: CTR) campaign, taken up in all districts of the country, including NCR and Jharkhand. Focused interventions under these annual campaigns taken up by the Government of India and the State Governments, inter-alia, include renovation of traditional and other water bodies/ tanks, enumeration, geo-tagging and making inventory of all water bodies, and removal of encroachments of tanks/ lakes, and de-silting of tanks.

DATABASE ON WATER

The Central Government has created National Water Informatics Centre (NWIC), a subordinate organization under this Department in March, 2018 to act as a central repository with a mandate to collect, collate, maintain and disseminate all information related to water resources in the country. NWIC maintains a web platform with web-link https://indiawris.gov.in in public domain which hosts the comprehensive data related to water sector.

Ministry of Earth Sciences has publised a report in 2020 "Assessment of Climate Change over the Indian Region," which includes the impact on water resources. In addition, a number of research projects on the impact of climate change on water resources have been taken up through IITs, NITs etc. (c) Water is a State subject but the Central Government supports the States with technical and financial support. The Government has taken a number of important measures for conservation, management of ground water and effective implementation of rain water harvesting in the country including over-exploited areas, which can be seen at URL:http://jalshaktidowr.gov.in/sites/default/files/Steps_to_control_water_depletion_Feb2021.pdf.

In addition, a number of States have done notable work in the field of water conservation/harvesting such as 'Mukhyamantri Jal Swavlamban Abhiyan' in Rajasthan, 'Jalyukt Shibar' in Maharashtra, 'Sujalam Sufalam Abhiyan' in Gujarat, 'Mission Kakatiya' in Telangana, Neeru Chettu' in Andhra Pradesh, Jal Jeevan Hariyali in Bihar, 'Jal Hi Jeevan' in Haryana, and Kudimaramath scheme in Tamil Nadu.

Ministry of Jal Shakti has taken up the "Jal Shakti Abhiyan: Catch the Rain" (JSA:CTR) with the theme "Catch the Rain - Where it Falls When it Falls" to cover all the blocks of all districts (rural as well as urban areas) across the country during 22nd March 2021 to 30th November 2021. The campaign was launched by the Hon'ble Prime Minister on 22 March 2021.

REJUVENATION OF RIVERS

Rivers in the country are polluted due to discharge of untreated and partially treated sewage from cities/towns and industrial effluents in their respective catchments, problems in operation and maintenance of sewage/effluent treatment plants, lack of dilution and other non-point sources of pollution. Cleaning/rejuvenation of rivers is an ongoing activity. It is the

responsibility of the States/UTs, Local Bodies and industrial units to ensure required treatment of sewage and industrial effluents in sewage treatment plants (STPs)/effluent treatment plants (ETPs) to the prescribed norms before discharging into river and other water bodies, coastal waters or land to prevent and control of pollution therein. For conservation/rejuvenation of rivers, this Ministry has been supplementing efforts of the States/UTs by providing financial and technical assistance for abatement of pollution in identified stretches of rivers in the country through the Central Sector Scheme of Namami Gange for Ganga and its tributaries and the Centrally Sponsored Scheme of National River Conservation Plan (NRCP) for other rivers. Setting up of STPs is one of the important components of these programmes. NRCP has so far covered polluted stretches on 34 rivers in 77 towns spread over 16 States in the country with the project sanctioned cost of Rs.5961.75 crore, and inter-alia, a sewage treatment capacity of 2677 million litres per day (mld) has been created. Under the Namami Gange programme, a total of 353 projects, including 157 projects for sewage treatment of 4952 mld and sewer network of 5212 kms, have been sanctioned at a cost of Rs.30458 crore. Under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) programme of Ministry of Housing & Urban Affairs, 883 sewerage & septage management projects amounting to Rs.34,081 crore have been taken up, of which 370 projects costing Rs.8,258 crore have been completed so far. Under the Swachh Bharat Mission (Urban) 2.0 launched in October, 2021, Rs.15883 crore has been allocated to States/UTs for wastewater/used water management, including setting up of STPs and FSTPs (fecal sludge treatment plants). As per the Provisions of Environment (Protection) Act, 1986 and Water (Prevention & Control of Pollution), Act 1974, industrial units are required to install effluent treatment plants (ETPs) and treat their effluents to comply with stipulated environmental standards before discharging into river and water bodies. Accordingly, CPCB, State Pollution Control Boards/Pollution Control Committees monitor industries with respect to effluent discharge standards and take action for non-compliance under provisions of these Acts. Besides, in compliance of the orders of National Green Tribunal (NGT) in Original Application No.673/2018 regarding rejuvenation of polluted river stretches in the country, States/UTs are required to implement approved action plans, including installation of wastewater treatment plants, for restoration of the polluted stretches in their jurisdiction as identified by CPCB and published in their report of 2018, within the stipulated timelines. As per the orders of NGT, regular review on implementation of action plans is undertaken in the States/UTs and also at Central level.

HAR GHAR NAL SE JAL YOJANA

To make provision of potable tap water supply to every rural household by 2024,since August 2019, Government of India is implementing Jal Jeevan Mission (JJM) in partnership with States. At the time of announcement of JJM on 15th August, 2019, only 3.23 Crore (16.83%) rural households in the country were reported to have tap water connection. Since then, provision of potable tap water supply has been made to additional 5.42 Crore (28.21%) rural households.

As a result, presently about 8.65 Crore (45.04%) rural households are having provision of potable tap water supply. The estimated outlay of Jal Jeevan Mission is Rs. 3.60 lakh Crore, out of which Central share is Rs. 2.08 lakh Crore. During the current year, Central allocation to States/ UTs under JJM has been increased substantially as Government of India is committed to provide adequate funds to make provision of tap water supply to every rural household and public institutions like schools, anganwadi centers, ashramshalas, health centres, etc. The details of Central grant allocated to Bihar and drawn by the State Government and reported utilization under JJM, are as follows:

(Amount in Rs. Crore)

Year	Central share					Expenditure under State share
	Opening Balance	Budget allocation	Fund drawn by the State	Total available fund	Reported utilization	
2019-20	313.16	787.31	417.35	730.51	473.33	150.34
2020-21	257.18	1,839.16	353.60	610.78	551.82	374.42
2021-22	59.95	6,608.25	ND	58.95	1.04	8304

ND : Not Drawn

During the current year, Government of Bihar has informed that it does not require fund under Jal Jeevan Mission. As reported by the State Government, in June, 2019, only 3.16 lakh (1.84%) rural households in the State were reported to have provision of tap water supply, which has now increased to 1.52 Crore (88.75%) rural households. The State/ UT, district and village-wise detailed information is available on JJM dashboard, which is in public domain at: https://ejalshakti.gov.in/jjmreport/JJMIndia.aspx

REJUVENATION OF WATER STREAMS

It is the responsibility of the States/Union Territories (UTs), local bodies and industrial units to ensure required treatment of sewage and industrial effluents to the prescribed norms before discharging into river and other water bodies, coastal waters or land to prevent and control of pollution therein. For conservation of rivers, this Ministry has been supplementing efforts of the States/UTs by providing financial and technical assistance for abatement of pollution in identified stretches of rivers in the country through the Central Sector Scheme of Namami Gange for rivers in Ganga basin and Centrally Sponsored Scheme of National River Conservation Plan (NRCP) for other rivers. Further, priority for effective rejuvenation of small rivers has been accorded under the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). No such proposal for conservation of river has been received from the Government of Himachal Pradesh under NRCP.

Himachal Pradesh has enacted the Groundwater Act in 2005 to regulate extraction of groundwater in the vulnerable areas of the State, which has now been extended all over the State. Further, Hydro-Electric Projects (HEPs) located on the catchment of rivers are mandated to ensure minimum 15% discharge of lean season flow on the downstream of the HEP into river body. Also, Real Time Water Quality Monitoring Stations (RTWQMS) with radar system for water quality and flow measurement have been set up to maintain environmental flow in the rivers/nallahs, including river Kaushalya near village Kamli, river Markanda in Ogli and Kala Amb town in Himachal Pradesh.

This Ministry launched the Pradhan Mantri Krishi Sinchayee Yojna (PMKSY) 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. The Central Assistance under the schemes of Surface Minor Irrigation (SMI) as well as RRR (Repair, renovation & restoration) of Water Bodies, which are components under PMKSY, is provided in the form of grant, which is 90% of the project cost in the 7 North Eastern States and hilly States/UTs (Himachal Pradesh, Uttarakhand and J&K, including Ladhak). Further, Central Assistance under both the schemes is 60% of project cost for projects in special areas that includes Drought Prone Area Programme (DPAP) areas. 6 clusters of 154 SMI schemes are ongoing in several districts of Himachal Pradesh, including Shimla, under PMKSY (Har Khet Ko Pani) with an estimated cost of Rs.499.26 crore and targeted irrigation potential of 0.25525 lakh-hectare. Central Assistance amounting to Rs.356.70 crore has been released for these schemes and 97 schemes have been reported to be completed with achievement of 0.18434 lakh hectare irrigation potential up to March, 2021.

This Ministry has also launched a campaign "Catch the Rain". Activities under this campaign include drives to make Rain Water Harvesting Structures (RWHS) like Rooftop RWHS, ponds, water harvesting pits, check dams, etc; enumeration and geo-tagging of all water bodies in the districts; removal of encroachments and de-silting of tanks to increase their storage capacity; removal of obstructions in the channels which bring water to them; repairs to step-wells and using defunct bore-wells to put the water back to aquifers; rejuvenation of rivulets and rivers; conservation and restoration of wetlands, etc. A massive awareness generation campaign with Nehru Yuva Kendra Sangthan (NYKS) has also been launched on 21st December, 2020 to cover all districts in the country.

In addition, the "Jal Shakti Abhiyan: Catch The Rain" (JSA:CTR) campaign was launched by Hon'ble Prime Minister on 22 March 2021, the World Water Day, with the theme – "Catch The Rain, Where it falls, When it falls". JSA:CTR has been taken up in all districts (rural as well as urban areas) of the country during the pre-monsoon and monsoon period in the country i.e. from March, 2021 to 30thNovember, 2021. No separate funds were allocated for JSA:CTR. However, under the above mentioned interventions, funds were utilized by convergence of different Central and State Government Schemes to achieve the goal of the campaign. As per

available data as on 14th December 2021, Rs.22,352 crore has been spent from MGNREGA funds on works relating to water conservation and Rainwater Harvesting structures.

ECOLOGICAL FLOW OF RIVERS

Hon'ble National Green Tribunal (NGT) in OA 498 of 2015 has directed all States to maintain a minimum environmental flow of 15-20% of the average lean season flow in their rivers. Government of India vide Notification dated 9th October, 2018 has notified minimum environmental flows to be maintained in river Ganga from its origin to Unnao in Uttar Pradesh. The notified environmental flow regime is monitored and supervised by the Central Water Commission (CWC).

Studies, including assessment of environmental flow of rivers Dibang, Teesta, Lohit, Tawang, Kameng, Bichom, Beas (in Himachal Pradesh) and Satluj were carried out from the year 2014 onwards by Ministry of Environment, Forest & Climate Change (MoEF&CC). Cumulative impact assessment and carrying capacity study of Siang and Subansiri basins were also carried out by CWC during the year 2013-14. These 2 reports of Siang and Subansiri have since been accepted by MoEF&CC. Assessment of environmental flows is an integral part of these studies.

MoEF&CC in the Standards Terms of Reference (ToR) for conducting Environment Impact Assessment (EIA) studies for any proposed River Valley & Hydroelectric Project have mentioned the norms for release of environmental flows, which is 30% in monsoon season, 20% in lean season and 25% in non-monsoon & non-lean season, to be followed corresponding to flow of 90% dependable year. These norms along with the site specific requirements for environmental flow releases as per the studies are then stipulated in the Environment Clearance (EC) letter for compliance.

The Regional Offices of MoEF&CC and the Central Pollution Control Board (CPCB) along with the State Pollution Control Boards concerned have been mandated for monitoring of all the environmental aspects of the Hydro Power Projects, including maintenance/release of environmental flows.

Also, for rejuvenation of polluted rivers identified by CPCB, action plans have been prepared by a four member Committee called "River Rejuvenation Committee'' of the respective 28 State Governments & 2 Union Territory (UT) Administrations under the overall supervision and coordination of Principal Secretary, Environment of the State Governments/UTs. The action plans covers aspects such as Source control (Municipal sewage management, Industrial pollution control, Waste management), River catchment/Basin Management (Adoption of good irrigation practices, Utilization of treated sewage, Ground water recharge aspects), Flood Plain Zone protection and its management (Setting up of bio-diversity parks, Removal of encroachments, Rain water harvesting, Plantation on both sides of the river), and Watershed management, including Ecological/Environmental Flow (E-Flow) for ensuring uninterrupted flow in the rivers.

RASHTRIYA JAL JEEVAN KOSH

Government of India is implementing Jal Jeevan Mission (JJM) in partnership with States including Maharashtra, to make provision of potable tap water supply to every rural household and public institutions like schools, anganwadi centres, ashramshalas, health centres, etc. in the country by 2024. To enable individuals; institutions; corporates; foreign donors; philanthropists, etc., who have a desire to 'give back to the society' and be a part of this movement, a 'Rashtriya Jal Jeevan Kosh (RJJK)' has been set up to receive contributions/ donations. A dedicated website https://jaljeevankosh.gov.in has been put in place to facilitate donation/ contribution from donors. The contribution can be made directly through RJJK website and also through JJM mobile app. The funds received in RJJK are to be utilized inter alia which includes to make provision of tap water supply to schools, anganwadi centres, tribal residential schools, health-cum-wellness centres, etc. in the country including those in Wardha and Amravati districts of Maharashtra.

CONSTRUCTION OF NEW DAMS

Water resources projects are planned, funded, executed, and maintained by the State Governments themselves as per their own resources and priorities. Role of Government of India is limited to providing technical support and, in some cases, partial financial assistance under the existing schemes being implemented by the Ministry of Jal Shakti. However, for the major and medium irrigation projects on inter- state river systems, techno-economic viability is to be appraised by Central Water Commission (CWC)under Ministry of Jal Shakti.

A total of 21 dam projects are presently under appraisal at CWC, as per list below:

Sl. No.	Name of the project	Category	State
1.	Par-Tapi Narmada Link Project	Major/ Interlinking	Gujarat/ Maharashtra
2.	Bina Complex Irrigation & Multipurpose project	Major	Madhya Pradesh
3.	Kalisindh Multipurpose Irrigation Project Ph-II	Major	Rajasthan
4.	Eastern Rajasthan Canal Project	Major	Rajasthan
5.	Indrapuri Reservoir Project-PPR	Major	Bihar
6.	Lower Vamsadhara Stage-1 Project	Major	Odisha
7.	Phina Singh Medium Irrigation Project	Multipurpose	Himachal Pradesh
8.	Attapady Irrigation Project	Medium	Kerala
9.	ModikuntaVagu Medium Irrigation Project	Medium	Telangana
10.	Chindrinala Irrigation Project	Medium	Odisha
11.	Mankada irrigation Project	Medium	Odisha
12.	Hidsing Irrigation Project	Medium	Odisha
13.	Puthimari Irrigation Project	Medium	Assam

14.	Construction of Multipurpose dam on Ali Khad near the confluence of Ali Khad with Govind Sagar Lake	Medium	Himachal Pradesh
15.	Construction of Dam across Seer Khad near villageKabareta in Tehsil Jhandutta District Bilaspur, Himachal Pradesh	Medium	Himachal Pradesh
16.	Mekedatu balancing reservoir cum drinking water project.	Drinking water	Karnataka
17.	Kalasa Nala Diversion Scheme	Drinking water	Karnataka
18.	Bhandura Nala Diversion Scheme	Drinking water	Karnataka
19.	Diversion of Surplus water of Sabarmati basin for filling of Jawai Dam (PFR)	Drinking water	Rajasthan

OLD DAMS

As per the National Register of Large Dams (2019) maintained by the Central Water Commission based on the information provided by the project authorities, India has 1175 number of large dams (including one dam of Punjab, namely Nangal dam) which are more than 50 years old (constructed in or before 1971). Further, the Country is having 227 number of large dams having more than 100 years of service life (constructed in or before 1921). State-wise number of these dams is enclosed as **Annexure-l.**

Dams in India are owned and operated either by the State Governments or Central and State Public Sector Undertakings. A few dams are owned by private entities. The safety of dams in India is the principal concern of the State Agencies/Organizations who own the dams. Dam owners generally carry out pre- monsoon and post-monsoon inspection of their dams. Some States have also constituted Dam Safety Review Panels for comprehensive audit and required follow up action on their dams. The life of a dam is normally considered till such time that it performs its intended functions, without jeopardizing the safety of people living in its vicinity.

The Dam Safety Bill, 2021 has been passed by both the Houses of Parliament. The Dam Safety Bill, 2021, inter alia, provides for surveillance, inspection, operation and maintenance of the specified dams for prevention of dam failure related disasters.

Proposals for replacement of old dams, if required, need to be formulated by the dam owners.

State-wise Number of Large dams having more than 50 years and 100 years of Age

S.N.	State/UT	No. of Large dams more than 50 years old (constructed in or before 1971)	No. of Large dams more than 100 years old (constructed in or before 1921)
1.	Andhra Pradesh	33	5

2.	Bihar	10	1
3.	Chhattisgarh	32	7
4.	Gujarat	217	30
5.	Himachal Pradesh	1	0
6.	Jammu and Kashmir	2	0
7.	Jharkhand	16	0
8.	Karnataka	82	15
9.	Kerala	26	1
10.	Madhya Pradesh	194	62
11.	Maharashtra	274	42
12.	Meghalaya	4	0
13.	Odisha	16	3
14.	Punjab	1	0
15.	Rajasthan	85	25
16.	Tamil Nadu	46	1
17.	Uttar Pradesh	71	17
18.	Uttarakhand	5	0
19.	West Bengal	2	0
20.	Telangana	58	18
	Total	**1175**	**227**

GIS MAPPING OF WATER BODIES

Keeping in view the presence of multiple agencies for handling water in the state governments and limited availability of technical knowledge on appropriate Rain Water Harvesting Structure (RWHS) at local level, States Governments including the District Magistrates (DMs) have been requested to set-up "Jal Shakti Kendras" in every district as a part of Jal Shakti Abhiyan: Catch the Rain (JSA:CTR) campaign. These Jal Shakti Kendras are set up to work as "knowledge centres" for disseminating information related to water conservation techniques and to provide technical guidance to people. As per data available on portal for JSA:CTR, so far 264 Jal Shakti Kendras have been set up in various states.

Ministry of Jal Shakti has also launched the first Census of water bodies in convergence with the Sixth round of Minor Irrigation Census (Reference year 2017-18) with the objective of census of water bodies and to develop a national database of all water bodies in the country.

Under India-WRIS project, around 7.99 lakh water bodies of size more than 0.01 ha. was mapped using satellite imageries of 2009-10 and made available online on the India-WRIS portal. Using satellite imagery, National Remote Sensing Centre has also been mapping nationwide water bodies at regular intervals of time depending on their size.

Under the Jal Shakti Abhiyan: Catch the Rain campaign implemented by the National Water Mission, Ministry of Jal Shakti, the District Magistrates/Collectors have been asked to enumerate with the help of old revenue records and using remote sensing images from NRSA and GIS mapping technology all existing water-bodies/ water harvesting structures, mark their boundaries, geo-tag them, integrate available data from NIC-MI census, National Water

Informatics Centre (NWIC), State Water Resources Information systems and using the data for preparing Scientific Water Conservation plans. NWM has prepared guidelines for preparation of GIS based water conservation plans and inventory of water bodies of districts and forwarded it to all the districts for its implementation.

POLLUTION IN RIVER GANGA

Under the Namami Gange Programme, Central Pollution Control Board (CPCB) is carrying out monitoring for assessment of River Ganga water quality at 30 locations in Uttar Pradesh through Uttar Pradesh Pollution Control Board. River water quality is assessed for notified primary water quality criteria for bathing water w.r.t parameters potential Hydrogen (pH) (6.5-8.5), Dissolved Oxygen (≥ 5 mg/l), Biochemical Oxygen Demand (≤ 3 mg/l) and Faecal Coliforms (≤ 2500 MPN/100 ml). All the locations in Uttar Pradesh are monitored on fortnightly basis.

Based on the manual water quality assessment by CPCB's in 2021 (Jan to May), pH (median) and DO (median) are meeting the primary water quality criteria for bathing at all the monitoring locations in Uttar Pradesh. Biochemical Oxygen Demand (BOD) has been found within the acceptable limits except marginal exceedance (BOD: 3.1 to 4.1 mg/L) in locations/stretches (a) Bithoor, Kanpur to Kala Kankar, Rai Bareilly and (b) from Down stream (D/s) Mirzapur to Tarighat, Ghazipur (except (U/s) Varanasi, Assighat). Faecal Coliforms (FC) (median) is meeting the primary water quality criteria for bathing in the entire stretch of river in Uttar Pradesh except (i) Up Stream (U/s) Kanpur (Ranighat), Shuklaganj D/s to Bathing Ghat (Jajmau bridge) (ii) Down stream (D/s) Mirzapur to Tarighat, Ghazipur (except U/s Varanasi, Assighat).

The pollution in river Ganga is not only due to discharge of effluents from industries but also due to domestic waste water as well as from solid waste ingress into the river.

As per the inventorization of 2020-21, 913 Grossly Polluting industries (GPIs) discharging into river Ganga in the State of Uttar Pradesh were inspected by CPCB through 16 third party technical institutes and respective actions are already taken by State Pollution Control Boards (SPCBs)/ Pollution Control Committee (PCC). As per CPCB's data on Grossly Polluting industries (GPIs) inspection in 2020-21, it is observed that about 139.419 Million Litres per Day (MLD) effluents is being discharged into river Ganga in Uttar Pradesh having BOD load of 4.58 Tons Per Day (TPD).

The steps taken by the Government to tackle the pollution of river Ganga are as follows:

Under Namami Gange Programme, a diverse set of interventions for cleaning and rejuvenation of river Ganga and its tributaries have been taken up. These includes pollution abatement activities including domestic sewage, industrial effluent, solid waste, River front Management, Aviral Dhara, Rural Sanitation, Afforestation, Biodiversity Conservation, Public Participation etc. A total of 353 projects are taken up at a sanctioned cost of Rs.30,458 crore out of which, 178 projects have been completed.

The polluted river stretches in the country are being rejuvenated through approved action plans to achieve the target of outdoor bathing criteria notified by Ministry of Environment, Forest & Climate Change (MoEF&CC). At present, State Governments are implementing Action

Plans drawn by State River Rejuvenation Committees for restoration of water quality of the identified polluted river stretches. The implementation is being monitored regularly at State level by Chief Secretary of the respective State/UT and at Central level by the Central Monitoring Committee under the Chairmanship of Secretary, Ministry of Jal Shakti.

Stringent monitoring and regulation of industries and pollution sources is undertaken to assess the compliance status of Grossly Polluting Industries (GPIs) for enforcing regulatory framework on the polluting industries. Stringent action is taken by Central Pollution Control Board (CPCB)/State Pollution Control Boards (SPCBs)/ Pollution Control Committees against the GPIs discharging into main stem of Ganga River & its tributaries which are non-complying with respect to the prescribed norms.

MoEF&CC formulates and notifies standards for emission or discharge of environmental pollutants viz. air pollutants and water pollutants from industries, operations or processes with an aim to protect and improve the quality of the environment and abate environmental pollution.

Industry specific effluent/emission standards are notified under Schedule-I: 'Standards for Emission or Discharge of Environmental Pollutants from Various Industries' of Environment Protection Act, 1986. State Pollution Control Boards and Pollution Control Committees in States and Union Territories, respectively are adhered to ensure the compliance of these standards. So far, 47 industry specific effluent standards and 63 industry specific emission standards have been notified.

Further, the identification and assessment of quality and quantity of major drains joining river Ganga and its tributaries, establishment/upgradation of Waste Water Treatment Plants (STPs and CETPs) for the towns located on Ganga main stem and its tributaries, performance evaluation of those Sewage Treatment Plants (STPs) and Common Effluent Treatment Plans (CETPs) are undertaken.

Construction works are under progress for 20 MLD Common Effluent Treatment Plan (CETP) for Jajmau tannery cluster Kanpur, largest of its type in the country, for pollution abatement in River Ganga at a cost of Rs.617 crore. This addresses a long-standing challenge posed to river Ganga due to pollution from tannery cluster in Jajmau area.

Up-gradation projects for other CETPs have been sanctioned in the tannery clusters of Unnao, Banther and textile cluster at Mathura.

FUNDS FOR NAMAMI GANGE PROGRAMME

Cleaning of rivers is a continuous process and Government of India is supplementing the efforts of the State Governments in addressing the challenges of pollution in river Ganga and its tributaries by providing financial and technical assistance under Namami Gange Programme.

Under this Programme, a diverse set of interventions for cleaning and rejuvenation of river Ganga has been taken up including waste water treatment, solid waste management, river front management (ghat and crematoria development), maintaining continuous flow, rural sanitation, afforestation, biodiversity conservation and public participation, etc. Under the Namami Gange Programme, so far a total of 353 projects have been sanctioned at an estimated cost of Rs. 30,458 crore, out of which 178 projects have been completed and made operational.

157 sewerage infrastructure projects from among these have been taken up with a sanctioned cost of Rs. 24,249 crore for creation & rehabilitation of 4952 Million Litres per Day (MLD) of Sewage Treatment Plant (STP) capacity and laying of around 5212 KM sewerage network, out of which, 74 projects have been completed resulting in creation & rehabilitation of 1092 MLD of STP capacity and laying of 3752 KM sewerage network.

As per Central Pollution Control Boards (CPCB's) water quality median data for 2021(January to May), the observed water quality of river Ganga indicates that Dissolved Oxygen (DO) which is an indicator of river health, has been found to be within acceptable limits of notified primary bathing water quality criteria across all 84 monitoring locations. Other important river health indicators, i.e. Biochemical Oxygen Demand (BOD) and Faecal Coliform (FC), have also been found to be within acceptable limits of notified primary bathing water quality criteria across 68 monitoring locations (out of 84 locations) and 33 monitoring locations (out of 80 locations) respectively. As a result of multi sectoral interventions, the median values of these water quality parameters viz., Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD) and Faecal Coliform (FC) have improved at 40 locations, 41 locations and 21 locations respectively in 2021 (January-May) as compared to 2014.

The allocation under the Namami Gange Programme from Financial Year (FY) 2014-15 onwards till 31st October 2021 is Rs.15,074.88 crore.

The Government of India releases funds to National Mission for Clean Ganga (NMCG) for the implementation of the river Ganga rejuvenation program. Thereafter, funds are released by NMCG for implementation of the said programme. From the financial year 2014-15 onwards till 31.10.2021, Government of India has released Rs.11,017.02 crore under the Namami Ganga Programme, which includes Rs.217.00 crore under Ghat works. NMCG has disbursed Rs.171.32 crore under Ghat works to States/ Executing agencies.

The Implementing and /or Executive Agencies render Utilization Certificates/ Interim Un-Audited Financial Reports, Monthly Expenditure Reports and other Reports from time to time. On the basis of these documents, the amount of funds utilized is being monitored by National Mission for Clean Ganga. Further, through Public Financial Management System (PFMS), the funds available with the Implementing and Executive Agencies can also be monitored. To ensure timely utilization of the funds by the States, NMCG has taken following steps:-

(i) National Mission for Clean Ganga (NMCG) has constituted Budget Review Committee and Audit Review Committee. Fourteen joint meetings of these Committees have been held so far.

(ii) NMCG is ensuring that the fund demand is based on realistic assessment of expenditure linked to physical progress on the ground with a view to avoid unspent balances at the end of the financial years with the Executive and Implementing Agencies.

(iii) NMCG has also introduced a Monthly Expenditure Report (MER) from all State

Programme Management Groups (SPMGs), wherein the expenditure incurred against the funds available including balance at the end of the month are provided on a regular monthly basis.

(iv) NMCG has put in place a robust mechanism for ensuring that the Utilization Certificates are rendered by SPMGs and other Executive Agencies on a quarterly basis for bringing a greater discipline in Financial and Budgetary management matters.

61 projects (including one river front development project in Patna) have been sanctioned for construction of 210 ghats and 57 crematoria, out of which, 173 ghats and 45 crematoria have been completed.

CLEARANCE TO UPPER BHADRA PROJECT

A detailed techno-economic appraisal has been undertaken by Central Water Commission under this Ministry, involving key aspects such as hydrology & water availability, irrigation planning, inter-state aspects, environmental clearance, forest clearance, cost estimate etc. Thereafter, Upper Bhadra irrigation project has been accepted by the Advisory Committee on Irrigation, Flood Control and Multipurpose Project of this Ministry of Jal Shakti, in its 147th meeting held in December, 2020. Thereafter, in April, 2021, the project has been accorded investment clearance by this Ministry for estimated cost of Rs. 16,125.48 crore at 2018-19 price level.

Inter-state clearance for the project has been accorded on the basis of its allocation being within the overall allocation to Karnataka State by the Krishna Water Dispute Tribunal-I.

The project has been accorded environment clearance by Ministry of Environment, Forest and Climate Change (MoEF & CC), in May, 2010 and July, 2017. Further the project has also been accorded forest clearance in June, 2020 for an area of 96.95 hectares by MoEF & CC. Thereafter, in December, 2017, forest clearance for 111.57 ha and 110.10 ha, has also been accorded by MoEF & CC.

FLOODS AND DROUGHT FORECASTING

Central Water Commission (CWC) issues flood forecasts as a non-structural measure of flood management throughout the country. CWC also issues inflow forecasts to identified reservoirs for proper reservoir regulations during floods. Flood forecast formulation methodology used by CWC includes gauge to gauge correlation technique for short range (up to 24 hours) forecasting and numerical modelling technique for 5 days advisory forecasts. Presently, flood forecasts are issued by CWC at 331 stations (132 Inflow Forecast Stations + 199 Level Forecast Stations) in the country as per Standard Operating Procedure.

India Meteorological Department (IMD) supports flood warning services of CWC by providing observed and forecasted rainfall. CWC is working in close association with IMD and State Governments for timely flood forecast whenever the river water levels rise above warning level. In order to meet specific requirements of flood forecasting by CWC, IMD operates Flood Meteorological Offices (FMOs) at fourteen locations viz., Agra, Ahmedabad, Asansol, Bhubaneshwar, Bengaluru, Chennai, Guwahati, Hyderabad, Jalpaiguri, Lucknow, New Delhi,

Patna, Srinagar and Thiruvananthapuram. Apart from this, IMD also supports Damodar Valley Corporation (DVC).

In order to cater to the services of hydro-meteorological events occurring in short duration of time, IMD is issuing Flash Flood Guidance (FFG) by which a diagnostic value within a watershed required to produce flooding at the outlet of the catchment is estimated, to support the flood warning services. IMD provides actual and forecast rainfall information in different spatial and temporal scales like districts, States & meteorological subdivisions level and daily, weekly & seasonal scale to the Ministry of Agriculture for drought monitoring.

North Eastern Space Applications Centre (NESAC)/DOS has developed and operationalized Flood Early Warning System (FLEWS) for Assam since 2012 till date, with funding from Assam State Disaster Management Authority (ASDMA).

CWC has taken up the work of Early Flood Warning System in Ganga Basin, including inundation forecast under National Hydrology Project (NHP) covering 11 states of Ganga basin.

Under NHP, National Remote Sensing Centre (NRSC)/ISRO has developed medium range spatial flood early warning models for Tapi and Godavari river basins, using space based inputs in collaboration with CWC.

SECURITY OF PROJECTS UNDER KRMB AND GRMB

The relevant provisions governing this aspect in the Gazette Notification dated 15.07.2021, regarding Krishna River Management Board (KRMB) and Godavari River Management Board (GRMB), May be mentioned.

As per Clause 1(e) of Gazette Notification dated 15.07.2021 regarding Krishna River Management Board (KRMB), “On and from the date of commencement of this notification, the Central Industrial Security Force constituted under the Central Industrial Security Force Act, 1968 shall assist the KRMB in the day-to-day management of projects specified in Schedule-2 and any other work related to Security as assigned by the KRMB, on such terms and conditions as the Central Government may specify.”

Similarly, as per Clause 1(e) of Gazette Notification dated 15.07.2021 regarding Godavari River Management Board (GRMB), “On and from the date of commencement of this notification, the Central Industrial Security Force constituted under the Central Industrial Security Force Act, 1968 shall assist the GRMB in the day-to-day management of projects specified in Schedule-2 and any other work related to Security as assigned by the GRMB, on such terms and conditions as the Central Government may specify.”

KRISHNA RIVER DISPUTE

Krishna Water Disputes Tribunal (KWDT) was constituted by the Government of India in April, 1969. The Tribunal gave its report in 1973 and Further Report in 1976.

Subsequently, on the requests made by the States of erstwhile undivided Andhra Pradesh, Karnataka and Maharashtra, under Section 3 of the Inter-State River Water Disputes Act of 1956 (the Act), Krishna Water Disputes Tribunal (KWDT-II) was constituted by the Central

Government in April 2004 for adjudicating on inter-State river Krishna and the river valley thereof between the States of Maharashtra, Karnataka and erstwhile Andhra Pradesh

The Tribunal gave its report and decision on 30.12.2010. The party States and the Central Government sought clarification from the Tribunal under Section 5(3) of the Act. The Tribunal forwarded its report on 29.11.2013 under section 5(3) of the Act. However, on account of stay by Hon'ble Supreme Court videits order dated 16.09.2011, the Award as per report of KWDT-II dated 29.11.2013 was not published in the official gazette in terms of section 6(1) of the Act.

Further, in order to address the terms of reference specified in clauses (a) and (b) of the section 89 of Andhra Pradesh Reorganisation Act (APRA), 2014, the Ministry of WR RD&GR has extended the tenure of the Tribunal for 2 years w.e.f. 01.08.2014. Subsequently, the term of the Tribunal has been extended from time-to-time on yearly basis. Recently the tenure of the Tribunal has been extended for a period of one year with effect from 01.08.2021.

However, Government of Telangana vide letter dated 14.7.2014 submitted a complaint under Section 3of the ISRWD Act, 1956 requesting Union Government to refer the same to a new Tribunal or to the existing KWDT-II regarding use, distribution, control of Krishna River Waters.

Recently, during the 2nd Meeting of the Apex Council held under the Chairmanship of Hon'ble Minister for Jal Shakti on 06.10.2020, it was, inter alia, decided that "For considering the request of Telangana for a Tribunal under Section 3 of the ISRWD Act of 1956, Telangana has to withdraw the case it has filed in the Supreme Court on the subject. After receiving such assurance, Ministry of Jal Shakti, GOI will seek legal opinion on whether a new Tribunal has to be appointed or new terms of reference can be issued to KWDT-II to hear the matter. Hon`ble CM of Telangana agreed to withdraw the case in Supreme Court."

` The Government of Telangana informed that they have filed an Interlocutory Application (IA) beforethe Hon'ble Supreme Court in the WP(C) 545 of 2015 on 09.06.2021 to withdraw the said Writ Petition fromHon'ble Supreme Court.

STRESS ON HIMALAYAN RIVER SYSTEMS

Snow and glacier are perennial source of water for rivers originating from the Himalayas. Glaciers receive and accumulate snow in winter and release melt water in summer through surface flow, ground water seepage, etc. Studies have revealed that the Himalayan glaciers are retreating in general but not at a rapid pace. The rate of melting/recession varies from glaciers to glaciers depending on its topography and climatic variability of the region. Studies have shown that glaciers with an area of more than 10 square km are unlikely to get affected appreciably in the coming years. However, smaller glaciers of less than 2 square Km area are likely to show rapid changes.

Water being a State subject, steps for augmentation, conservation and efficient management in order to ensure sustainability of water resources are primarily undertaken by the respective State Governments which include creation of storages, restoration of water bodies, rain water harvesting, artificial recharge to ground water, integrated water shed development, adopting of better irrigation practices, etc. In order to supplement the efforts of the State Governments, Central Government provides technical and financial assistance to them through

various schemes and programmes. The National Water Policy-2012 also emphasizes conservation & protection of water and highlights the need for augmenting the availability of water through rain water harvesting, direct use of rainfall and other management measures. National Water Mission (NWM) of Ministry of Jal Shakti has initiated "Jal Shakti Abhiyan: Catch the Rain" campaign in order to promote creation of Rain Water Harvesting Structures (RWHS) suitable to the climatic conditions and sub-soil strata to store rain water. Central Ground Water Board is implementing a nationwide programme of "National Aquifer Mapping and Management (NAQUIM)" for mapping of aquifers (Water bearing formations), their characterization and development of aquifer management plans to facilitate sustainable development of ground water resources. Atal Bhujal Yojana (ABHY), a scheme for sustainable management of ground water with community participation is being taken up in the identified over-exploited and water stressed areas in seven States

POLLUTION IN SATLUJ AND BEAS RIVERS

The Central Pollution Control Board (CPCB) in association with Pollution Control Boards/Committees in different States/Union Territories (UTs), has been monitoring water quality of rivers and other water bodies in the country through a network of monitoring stations under the National Water Quality Monitoring Programme. Based on water quality monitoring results, pollution assessment of rivers has been carried out by CPCB from time to time. As per the latest report published by CPCB in September 2018, 351 polluted stretches were identified on 323 rivers based on monitoring results in terms of Bio- chemical Oxygen Demand, an indicator of organic pollution. These included one stretch each on Satluj and Beas rivers and Kaliben (tributary of river Beas) which confluence upstream of Harike Barrage from where Rajasthan Feeder/Indira Gandhi Canal and Ferozpur Feeder originate.

Rivers in the country, including identified stretches of rivers Satluj and Beas in Punjab, are polluted mainly due to discharge of untreated or partially treated sewage from cities/towns and industrial effluents in their respective catchments, problems in operation and maintenance of sewage/effluent treatment plants, lack of dilution and other non-point sources of pollution. Rapid urbanization and industrialization have compounded the problems.

Cleaning of rivers is an ongoing process. It is the responsibility of the States/UTs and local bodies to ensure required treatment of sewage and industrial effluents to the prescribed norms before discharging into water bodies or land to prevent and control of pollution therein. For conservation of rivers excluding Ganga and its tributaries, the Central Government has been supplementing efforts of the States/UTs by providing financial and technical assistance for abatement of pollution in identified stretches of rivers/tributaries in the country through the Centrally Sponsored Scheme of National River Conservation Plan (NRCP). Under NRCP, pollution abatement projects for conservation of Satluj and Beas rivers have been implemented in 14towns of Punjab, namely, Banga, Bholath, Dasuya, Hoshiarpur, Jalandhar, Kapurthala, Ludhiana, Moga, Mukerian, Nawanshehar, Phagwara, Phillaur, Sultanpur Lodhi and Tanda at a total cost of Rs.717.32 crore with sewage treatment capacity of 648.20 million litres per day (MLD) created in these towns.

Buddha nallah, carrying untreated sewage, industrial effluents and other wastes from Ludhiana town, remains the major source of pollution in Satluj river. To address the issue of pollution, Buddha Nallah Rejuvenation Project has been launched in December, 2020 at a total

estimated cost of Rs. 840 crore with implementation period of 2 years. The project envisages construction of 2 new sewage treatment plants (STPs) at Jamalpur (225 MLD) and at Balloke (60 MLD), refurbishment of 4 existing STPs of 418 MLD total capacity, Common Effluent Treatment Plants (CETPs) of capacity 40 MLD, 50 MLD and 15 MLD for cluster of small/medium scale dyeing industries, two Effluent Treatment Plants (ETPs) for 6 MLD waste from two dairy complexes, etc. To address the gap between sewage generation and treatment for remaining catchment areas of rivers Sutlej and Beas, more STPs have been proposed.

Discharge of industrial effluents is monitored by CPCB and the respective State Pollution Control Boards/Committees through the provisions of the Environment (Protection) Act, 1986 and the Water (Prevention and Control of Pollution) Act, 1974. The Central Government has notified general discharge standards and also industry specific effluent discharge standards under the Environment (Protection) Rules, 1986 which are required to be complied by the industrial units, STPs and/or the CETPs for prevention and control of pollution in water bodies. In case of non compliance with the prescribed norms, punitive actions are taken by the regulatory bodies under the relevant statutory provisions.

CPCB has issued directions from time to time to Punjab Pollution Control Board, Rajasthan State Pollution Control Board and the urban local bodies to ensure required treatment of municipal and industrial waste waters before discharging to rivers Satluj, Beas and their tributaries to prevent contamination of canals emanating from Harike Barrage.

Based on inspections carried out by CPCB in June, 2021, actions have been initiated as per the statutory provisions against the STPs, CETPs and the ETPs of grossly water polluting units found non- compliant.

In compliance of the orders of National Green Tribunal (NGT) in Original Application No.673/2018regarding polluted river stretches in the country, States/UTs are required to implement approved action plans for restoration of the said stretches in their jurisdiction within the stipulated timelines. As per theorders of NGT, regular review on implementation of action plans is undertaken in the States/UTs and also at Central level.

The water released in Ferozpur Feeder Canal is utilized for drinking and irrigation purposes in Malwa region of Punjab and some part of Rajasthan through Gang Canal. Indira Gandhi Feeder/Canal passes through the States of Punjab, Haryana and Rajasthan. In Rajasthan, Indira Gandhi Canal traverses through western part covering districts of Barmer, Bikaner, Churu, Hanumangarh, Jaisalmer, Jodhpur, Sriganganagar and Nagaur to provide water for drinking and irrigation in these areas. Canal waters as reported by the Punjab Pollution Control Board and Rajasthan State Pollution Control Board, require conventional treatment and disinfection to make it suitable for drinking purposes, and not having adverse effects on human beings/beneficiaries.

INTEGRATED SCHEME FOR BEKI AND MANAS RIVER

The DPR on “Integrated flood and erosion management of Manas and Beki river in districts of Baksa and Barpeta in Brahmaputra valley within Assam (Review) [(DPR proposed under Assam Integrated River Basin Management Project (AIRBAG-phase-I) funded by World Bank)]” at an estimated cost of Rs.200.93 Cr was examined in detail in Central Water

Commission (CWC) and a note for consideration of advisory Committee of DoWR, RD & GR was prepared.

The scheme was deleted by CWC vide letter dated 27.5.2021 due to the reason that Government of Assam has subsequently enhanced scope of work in its 82nd State TAC meeting and revised it's cost to Rs. 288.43 crores; the revised DPR of the same is awaited from State Government.

Government of Assam has undertaken 08 nos. schemes in North Salmara Area for it's protection fromerosion during last five years at cost Rs.3581.02 lakh. Out of these, 06 nos. schemes costing Rs.3181.02 lakh have been completed and 02 nos. schemes costing Rs.400.00 lakh are under execution.

YETTINAHOLE LIFT IRRIGATION PROJECT

Yettinahole Lift Irrigation Project is a state project, funded and executed by the state of Karnataka. The project was approved by the Government of Karnataka on 17.02.2014 for Rs.12912.36 crores. It aims to divert 24.01 TMC of surplus water from west flowing streams of Western Ghats to provide drinking water to 6557 villages and 38 towns in 29 taluks of 7 drought prone districts of Chikkaballapur, Kolar, Chikkamagalur, Hassan, Tumkur, Ramanagar and Bangalore Rural. The project will utilize 15.029 TMC for the same. Further, it will utilize 8.967 TMC to fill 527 Minor Irrigation Tanks of 5 districts (Chikkaballapur, Kolar, Hassan, Tumkur, and Bangalore Rural). The project is being implemented in two Phases. Phase I of the project comprises of lift components, and is nearing completion. Under Phase II of the project, Byragondlu reservoir and feeder canals of T.G Halli, Ramnagara, Madhugiri and Gowribidnur are in progress. Construction of Kundana Lift, Kolar & Srinivaspura Feeders are yet to be taken up.

Reasons for delay as reported by the Government of Karnataka are: Land Acquisition problem, delayed approvals from other Departments like KPTCL, NHAI, Railway, GAIL, Clearance from Forest Department and Covid-19 Pandemic.

Out of initial estimated cost of Rs.12912.36 crores, expenditure incurred so far is Rs.9006.27 Crores (including land acquisition cost).

The entire project is planned to be completed by December 2023.

PER CAPITA AVAILABILITY OF WATER

The study "Reassessment of Water Availability in India using Space Inputs" has been carried out by CWC in 2019. The average annual water resources of the 20 basins of the country have been assessed as 1999.20 Billion Cubic Meters (BCM). The per capita water availability is estimated by dividing the annual average water availability by the population. The average annual per capita water availability in the year 2011 has been assessed as 1545 cubic meters. Further, based on the above study, the average annual per capita water availability may further reduce to 1486 cubic meters by 2021. This is an average figure and will vary depending on the season and region. Water resource data is maintained basin-wise and not state- wise.

Water being a State subject, steps for augmentation, conservation and efficient management of water resources are primarily undertaken by the respective State Governments. In order to supplement the efforts of the State Governments, Central Government provides technical and financial assistance to them through various schemes and programmes.

Government of India launched Jal Shakti Abhiyan (JSA) in 2019, a time bound campaign with a mission mode approach intended to improve water availability including ground water conditions in the water stressed blocks of 256 districts in India. Further, Jal Shakti Abhiyan : Catch the Rain campaign has been launched by the Hon'ble Prime Minister of India on 22nd March, 2021 under which various activities will be carried out for rainwater conservation in all the districts of the country.

Central Government has formulated the National Perspective Plan (NPP) for Water Resources Development which envisages transfer of water from water surplus basins to water deficit basins to improve availability of water.

Government of India, in partnership with States, is implementing Jal Jeevan Mission (JJM)-Har Ghar Jal, which aims at providing potable water in adequate quantity of prescribed quality on long-termbasis to every rural households, including tribal areas of the country, through tap water connection by2024.

Government of India has launched Atal Mission for Rejuvenation and Urban Transformation(AMRUT) on 25th June, 2015 in select 500 cities and towns across the country with focus on development of basic urban infrastructure in the Mission cities. One of the key objectives of the Mission is to ensure that every household has access to a tap connection with assured supply of water.

Ministry of Housing & Urban Affairs has formulated guidelines for the States to adopt measures suitable to local conditions to promote recharge of ground water. Adequate focus has been given on requirement of rainwater harvesting and water conservation measures in Unified Building Bye Laws (UBBL) of Delhi, 2016, Model Building Bylaws (MBBL), 2016 and Urban and Regional Development Plan Formulation and Implementation (URDPFI) Guidelines, 2014.

Some other initiatives/measures taken by the Central Government to control water depletion and promote rain water harvesting / conservation are available at the URL: http://jalshakti-dowr.gov.in/sites/default /file/Steps_to_control_water_depletion_Feb2021.pdf

EROSION BY GANDAK RIVER

Water Resource Department, Government of Bihar has informed that severe erosion occurred on theembankments of River Gandak in Gopalganj District of Bihar due to heavy rainfall in catchment area of RiverGandak in Nepal during the monsoon season of year 2020. Several breaches in embankment along RiverGandak occurred in Gopalganj District of Bihar at Bhaisahi Purrena Charki, Saran, Bandhauli Shitalpur Faizullahpur Jamindari Bundh and Baikunthpur Retired Line. The flood management and anti-erosion schemesare planned, implemented and maintained by State Governments with their own resources as per their priority. The necessary action for breach closure, raising/strengthening of these embankments is to be taken by StateGovernment of Bihar. The Union Government supplements the efforts of the States by providing technical guidance and promotional financial assistance for management of

floods in critical areas. During XI & XIIPlan Flood Management Programme (FMP) was undertaken for providing Central Assistance to States forworks related to river management, flood control, anti-erosion, drainage development, anti-sea erosion, etc. which subsequently continued as a component of "Flood Management and Border Areas Programme"(FMBAP) for the period from 2017-18 to 2020-21. So far Central Assistance amounting to Rs.924.41 Croreshas been released to State Government of Bihar under this Programme.

Government of India is having regular dialogue with the Government of Nepal through existingIndia-Nepal bilateral mechanisms for mutual benefit of water resources of the common rivers between the twocountries which includes flood control. A Joint Project through an agreement in the year 1959, later amendedin 1964 on River Gandak has been implemented for irrigation and power benefits to both countries. SpecificIndia-Nepal water management issues related with Gandak River are discussed in the India-Nepal Joint Committee on Kosi and Gandak Project (JCKGP) and Joint Committee on Inundation and Flood Management (JCIFM). JCKGP discusses issues related to Gandak Project like water logging, water supplies to canals, maintenance of pond level, etc. Whereas, JCIFM discusses issues of river training works to be taken up onrivers in Nepal, flood inundation issues on India Nepal border, etc. At present Government of India has no planin discussion with Government of Nepal for construction of new dams or any other new river watermanagement projects on river Gandak.

FLOOD PATTERN

Central Water Commission (CWC) is the nodal Organisation entrusted with the task of flood forecasting &early flood warnings in the country on interstate rivers. Presently, CWC issues flood forecasts at total of 328 forecasting stations (198 river level forecast stations & 130 dam/ barrage inflow forecast stations). These stations cover 20 major interstate river basins & 25 States/Union Territories & National Capital Territory of Delhi. As per CWC, during the last 3 years, in addition to the flood prone states of Assam, Bihar& Uttar Pradesh, instances of extreme floods were witnessed in the states of Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Odisha, Maharashtra, Chhattisgarh, Madhya Pradesh & Rajasthan due to ‘excess’ to ‘large excess’ rainfall in these states combined with extremely heavy rainfall in short duration.

CWC has taken initiative to adopt all the latest technology including remote-sensing, Geographical Information System (GIS), Internet, Artificial Intelligence and Machine Learning in development/ running/ formulation and calibration of Mathematical models for flood forecasting and for providing Inundation Alerts which are closely at par with international standards. CWC is formulating 3 day advisories of flood using Satellite based real time rainfall estimates and 3 day rainfall forecast through Numerical Weather Prediction models being shared by IMD on a seamless fashion.

The flood management & anti-erosion schemes are planned, investigated and implemented by the State Governments with their own resources as per priority within the State. The Union Government supplements the efforts of the States by way of technical guidance and promotional financial assistance for flood management in critical areas. Government of India launched “Flood Management Programme (FMP)” during XI Plan period for providing central assistance to the State Governments for taking up works related to river management, flood control, anti-erosion, drainage development, restoration of damaged flood management works and anti-sea erosion works which was continued during XII Plan. A scheme viz. “Flood

Management and Border Areas Programme (FMBAP)" for flood management works in entire country and River Management activities and works related to Border Areas with an outlay of Rs.3342 crores was under implementation during 2017-18 to 2019-20 later extended upto March, 2021. Central Assistance amounting to Rs.6409.96 crores has been released since XI Plan till March, 2020 under this Programme.

EFFECTS OF SEDIMENTATION OF DAMS

Water is a state subject and water resources projects are planned, executed and maintained by respective State Governments from their own resources and as per their requirements and priorities. The role of the Central Government is limited to supplement the efforts of the State Governments by providing technical guidance and central assistance through its various schemes, if specifically sought by the State Government. In the ongoing Dam Rehabilitation and Improvement Project (DRIP), there is a need based provision for partner agencies to restore the lost capacity of few selected dams.

Under DRIP, Central Water Commission (CWC) has published "Handbook for Assessing and Managing Reservoir Sedimentation" and recommends dam owners to follow this handbook. Further, Guidelines for preparation of operation and Maintenance Manual for Dams has also been published. Also 162 Nos. of Operation and Maintenance Manual have been prepared under ongoing DRIP, it includes correct method and sequence of opening and closing gates, including low level bottom outlets for flushing the sediment out from reservoirs.

Need based provision for restoration of lost capacity of reservoirs have been kept in the proposed DRIP Phases II & III also. Implementation agencies may utilize this opportunity for restoration of reservoir capacities of the selected dams.

CWC carries out Reservoir Sedimentation Studies using Hydro graphic Survey and Remote Sensing Technique. CWC also collects, collates and compiles the sedimentation data from the project authorities/State Government.

The collected data are collated, analyzed and compiled as "Compendium on Siltation of reservoirs in India". Earlier 3 editions of the compendium have been published in years 1991, 2001 and 2015. The 4th edition (the recent one) has been published in 2020 incorporating information of 369 reservoirs. In the Compendium the trends/rates of siltation in various Dams of different regions of the country has been duly analyzed. The details of the compendium is available on CWC Website at http://cwc.gov.in/other-publications-cwc

DISPUTES OVER SHARING OF KRISHNA RIVER WATER

In the second meeting of the Apex Council was held on 06.10.2020 under the Chairmanship of Hon'ble Minister (Jal Shakti) with Hon'ble Chief Ministers of Telangana and Andhra Pradesh, following decisions were taken in respect of disputes between Andhra Pradesh and Telangana with regard to sharing of Krishna river water:

i. Jurisdiction of Krishna River Management Board (KRMB) and Godavari River Management Board (GRMB) shall be notified by the Government of India as per the express mandate of the Andhra Pradesh Reorganization Act-2014.

ii. ii. For considering the request of Telangana for a Tribunal under section-3 of Inter-State River Water Dispute (ISRWD) Act, 1956, Telangana has to withdraw the case it has filed in the Supreme Court on the subject. After receiving such assurance, Ministry of Jal Shakti, Government of India will seek legal opinion on whether a new Tribunal has to be appointed or new Terms of Reference can be issued to the existing Krishna Water Disputes Tribunal-II (KWDT-II) to hear the matter.

RAJYA SABHA

WATER SHARING DISPUTES BETWEEN AP AND TELANGANA

Sharing of Krishna river waters is being carried out as per working arrangement agreed between both the States of Andhra Pradesh (AP) and Telangana, out of the total 811 TMC allocated by Krishna Water Dispute Tribunal-I (KWDT-I), pending award of Krishna Water Dispute Tribunal-II (KWDT-II). However, with regard to sharing of Godavari river waters, there is no agreement between AP and Telangana.

In the second meeting of the Apex Council held on 06.10.2020 under the Chairmanship of Hon'bleMinister (Jal Shakti) with Hon'ble Chief Ministers of Telangana and Andhra Pradesh, following decisions in respect of resolving water sharing disputes between AP and Telangana were taken:

i. For considering the request of Telangana for a Tribunal under section-3 of Inter-State River Water Dispute (ISRWD) Act, 1956, Telangana has to withdraw the case it has filed in the Supreme Court on the subject. After receiving such assurance, Ministry of Jal Shakti, Government of India will seek legal opinion on whether a new Tribunal has to be appointed or new Terms of Reference can be issued to theexisting KWDT-II to hear the matter.

ii. Both the States agreed for setting up of a Godavari Tribunal for adjudicating on the sharing of the waters of Godavari river between AP and Telangana. Hon'ble Union Minister (Jal Shakti) requested both the States to send their proposal for the same.

LINKING OF GODAVARI AND CAUVERY RIVERS

The Kosi-Mechi link scheme of Bihar was submitted by Government of Bihar for inclusion in the scheme of National Project and this scheme has been recommended by the High Powered Steering Committee in the meeting held on 24.11.2020 for inclusion in the scheme of National Projects.

The Government of Tamil Nadu has requested to consider the proposal relating to Cauveryery-Vaigai-Gundar link project as a National Project. The Government of Karnataka has also requested to consider the Yettinihole integrated drinking water project as an extended part of Netravathi-Hemavathi link project and requested to declare it as a National Project.

Inclusion of any project in the category of National Projects depends upon fulfilment of various criteria as per the scheme of National Projects including acceptance by Advisory Committee of Ministry of Jal Shakti, Department of Water Resources, River Development and

Ganga Rejuvenation, from techno-economic angle, investment clearance, and availability of funds.

Cleaning and rejuvenation of rivers is a continuous process and Central Government is supplementing the efforts of the State Governments and Union Territories in addressing the challenges of pollution of rivers by providing financial and technical assistance through schemes like National River Conservation Plan (NRCP) and Namami Gange. Government of Tamil Nadu has recently (November 2020) submitted a Detailed Project Report for rejuvenation of Cauvery River and its tributaries on the lines of Ganga River rejuvenation, namely "Nandanthaai Vaazi Cauvery" at an estimated cost of Rs.1631.32 crores, out of which an amount of Rs.713.39 cores proposed under NRCP. Inclusion of aproposal under NRCP depends on various criteria including availability of adequate funds under the plan, conformityof the project to NRCP guidelines, technical feasibility, and appraisal by individual agency and commitment of StateGovernment to bear the matching share.

Apart from the above, projects for pollution abatement of six rivers in Tamil Nadu namely Adyar, Cooum, Vaigai, Vennar, Cauvery and Tamrabarni have been sanctioned under NRCP at total cost of Rs.908.13 crore for thirteen different towns.

STEPS TAKEN TO LOCATE SARASWATI RIVER

Central Ground Water Board (CGWB) has not conducted any search to locate the Saraswati River. However, this Ministry had constituted an Expert Committee to review available information on Palaeo Channels. The Expert Committee based on Remote Sensing, Geological, Hydro-geological and Archeological evidences has concluded that a large Himalayan born river flowed through the wide channel of Ghaggar-Hakara-Nara from Himalayas to Rann of Kachh. Further, as a part of various studies carried out by CGWB traces of Palaeo-Channels, indicating the existence of river channels in past in parts of Rajasthan, Haryana, Punjab, Gujarat and Uttar Pradesh have been observed.

At present, there is no budget provision in the Ministry of Jal Shakti for Saraswati River project.

MAKING WATER DATA ACCESSIBLE ON OFFICIAL WEBSITE OF THE MINISTRY

Central Government is continuously making efforts to make water data accessible, transparent and accurate on the official website of the Ministry/Department. Data of various central sector and centrally sponsored schemes/ projects of Department of Water Resources, River Development and Ganga Rejuvenation are being regularly monitored/updated and uploaded on the Dashboards which is available on official website of the Department, i.e. https://jalshakti-dowr.gov.in

The Ministry of Jal Shakti has launched the National Hydrology Project (NHP) to improve the extent, quality, and accessibility of water resources information, decision support system for floods and basin level resource assessment/planning. It also aims at strengthen the capacity of targeted water resources professionals and management institutions in India. National Water Informatics Centre (NWIC) has been set up by the Government of India on 28th March,

2018 to act as a central repository of updated water data and allied themes. All the data is available in public domain for all stakeholders and the public in general through website/dashboards (at https://nwic.gov.in).

Jal Jeevan Mission (JJM) is under implementation in partnership with States to make provision of tap water supply to every rural household of the country by 2024. To make the drinking water data under Jal Jeevan Mission (JJM) accessible, an online dashboard has been created, which is available on official website of Department of Drinking Water & Sanitation i.e. https://jalshakti-ddws.gov.in. The data contains drinking water related State/ UT wise data up to the village level. Most of the data on JJM dashboard is updated by States/ UTs regularly, as per the progress made by them in the scheme's implementation. To ensure the transparency of data, the department reviews data of various schemes/ projects regularly.

DESIGNS CHANGES BY CWC OF POLAVARAM HEAD WORKS

Implementation of Polavaram Irrigation Project, including the planning and design of its various components, is being done by the Government of Andhra Pradesh (GoAP). However, approval/ vetting of the designs is being done by Central Water Commission (CWC), to reaffirm their conformity with the relevant codal provisions, as well as with the provisions of Godavari Water Dispute Tribunal Award, 1980.

As informed by GoAP, vetting by CWC has led to changes in design of some components of the project, including height of the upstream and downstream coffer dams, depth of foundations, grades of concrete of spillway in deep blocks, diaphragm wall cutoff for the left side of upstream coffer Dam, chipping in gate grooves, stop log gates grooves, second stage concreting in spillway, etc.

As further informed by GoAP, details of necessary additional works emerging as per the recommendations of the Dam Design Review Panel and as approved by the CWC, are as follows:

S No.	Component	Original Design/ Scope of work	Revised Design
1.	Gap-I	Earth Dam	Earth cum Rockfill Dam with D wall typecutoff and ground improvement work with vibro stone columns and Deep soil mixing.
2.	Gap-III	Earth dam	Concrete Dam
3.	Spill Channel End Cutoff	Z- sheet pile	Reinforcement Cement Concrete Diaphragmwall
4.	Gap-II Ground improvement works	Sand replacement (clay removal)	Vibro stone columns and Deep soil mixing.

5.	Slope protection works for Spillway and Spill Channel	No provision available	Cut slopes with rock bolting, Shotcreting etc.

Government of India is providing 100% reimbursement of the remaining cost of the irrigation component of the project for the period starting from 01.04.2014, to the extent of the cost of the irrigation component on that date.

PROJECT UNDER FLOOD MANAGEMENT PROGRAMME (FMP) IN PUDUCHERRY

Project named "Flood protection works in Yanam" in the UT of Puducherry with an estimated cost of Rs.139.67 Cr was included for central assistance in the year 2010 under Flood Management Programme (FMP) and central assistance amounting to Rs.20.7563 Cr was released to this project. As informed by UT of Puduchery, the work of the project was with held due to various administrative reasons and there were modifications in the project. Thereafter, the revised Detailed Project Report of the project was techno-economically cleared by the Ministry in the year 2018. The investment clearance of the revised project has not been accorded by the Department of Water Resources, River Development & Ganga Rejuvenation due to non receipt of concurrence of Finance Department of UT of Puducherry.

JURISDICTION OVER DAM SAFETY

The safety of the dams is the primary responsibility of the dam owners. This would include all State Governments which own dams. The Dam Safety Bill (DSB), 2021, which has been passed by both Houses of the Parliament, provides an institutional framework and contains provisions for prevention of dam failure related disaster through proper surveillance, inspection, operation and maintenance of dams in India. The DSB, 2021 in no way seeks to alter or dilute the States' ownership of specified dams, or their role in day-to-day operation and management. The provisions of the Bill are aimed at strengthening and empowering the States' own dam safety institutional arrangements, with technical and professional inputs from central institutions.

The DSB, 2021 has a provision for the constitution of a National Committee on Dam Safety by the Government of India, consisting of 21 members, which includes seven representatives of the State Governments as Members of the Committee. This National Committee shall discharge such functions as specified in the First Schedule of DSB, 2021 as may be necessary to prevent dam failure related disasters and to maintain standards of dam safety [Clause 6(1) of DSB, 2021].

The water resources projects are planned, funded, executed and maintained by the concerned State Governments as per their own resources and priority. The Land Acquisition (LA) and Rehabilitation and Resettlement (R&R) works of such projects are also carried out by the concerned State Governments.

WATER STORAGE CAPACITY IN RESERVOIRS

Due to substantial variation in temporal and spatial distribution of rainfall in India, there is a need for adequate storage of water in the Country. As per information available with Central Water Commission (CWC), the gross and live storage capacity created due to the completed projects in the Country is 325.455 BCM and 249.093 BCM respectively. There are 397 dams in the country which are under construction stage with total gross storage capacity of 29.615 BCM.

Further, total water requirement of the country for different uses, for high demand scenario, for the year 2025 and 2050 has been assessed by National Commission on Integrated Water Resources Development (NCIWRD)-1999 as 843 BCM and 1180 BCM respectively.

Water resources projects are planned, funded, executed and maintained by the State Governments themselves as per their own resources and priorities. In order to supplement the efforts of the State Governments, Government of India provides technical and financial assistance to encourage sustainable development and efficient management of water resources through various schemes and programmes.

There are significant reserves of underground water. Master Plan for Artificial Recharge to Groundwater-2020 has been prepared by CGWB in consultation with States/UTs which is a macro level plan indicating various structures for the different terrain conditions of the country. The Master Plan envisages construction of about 1.42 crore rain water harvesting and artificial recharge structures in the country to harness 185 BCM of monsoon rainfall.

Hon'ble Prime Minister of India launched the "Jal Shakti Abhiyan: Catch the Rain" (JSA:CTR) on 22 March, 2021, the World Water Day, with the theme "Catch the Rain-Where it Falls When it Falls". This movement is aimed at creating appropriate rainwater harvesting structures in urban and rural areas of all the districts in the country, with people's active participation during 22 March, 2021 to 30 November, 2021 – the pre-monsoon and monsoon period.

During 2016-17, ninety-nine (99) on-going Major/Medium irrigation projects under Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) – Accelerated Irrigation Benefits Programme (AIBP), having balance estimated cost of Rs.77,595 crore (with central assistance component of Rs.31,342 crore), have been prioritized in consultation with States for completion in phases. Out of these, AIBP works of 46 projects having total gross storage capacity of 27.58 BCM have been reported to be completed.

NEW IRRIGATION TECHNIQUES LAUNCHED BY GOVERNMENT

Water resources projects are planned, funded, executed, and maintained by the State Governments themselves as per their own resources and priorities. Role of Government of India is limited to providing technical support and, in some cases, partial financial assistance under the existing schemes.

However, it is the constant endeavor of this Ministry to promote adoption of new irrigation techniques by the State Governments. For example, piped irrigation network is being promoted for conveyance of irrigation water, to avoid land acquisition and related issues. In order to facilitate its adoption by the States, guidelines on design of pressurized pipe irrigation

system has been published by Central Water Commission in 2017. Further, while minimum 10% micro-irrigation is mandatorily required for command area development works being funded by this Ministry. In this regard, liberal central assistance has been provisioned for projects adopting micro irrigation, either through SCADA or otherwise.

Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) was launched during the year 2015-16, with an aim to enhance physical access of water on farm and expand cultivable area under assured irrigation, improve on-farm water use efficiency, introduce sustainable water conservation practices, etc. It is an umbrella scheme, consisting of two major components being implemented by this Ministry, namely, Accelerated Irrigation Benefits Programme (AIBP), and Har Khet Ko Pani (HKKP). HKKP, in turn, consists of four sub-components, being Command Area Development & Water Management (CAD&WM), Surface Minor Irrigation (SMI), Repair, Renovation and Restoration (RRR) of Water Bodies, and Ground Water (GW) Development component.

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

Achievements of this Ministry during the last three years (2018-21) under the various components of PMKSY, is given below:

i. AIBP : 10.58 lakh hectare irrigation potential has been created. Further, 15 major and medium irrigation projects have been reported as complete during this period.

ii. CADWM : 5.58 lakh hectare culturable command has been covered.

iii. iii. SMI : 975 nos. of schemes have been reported to be completed, with creation of irrigation potential of 0.95 lakh hectare.

iv. RRR : 532 nos. of water bodies have been reported to be renovated, with creation of irrigation potential of 0.42 lakh hectare.

v. GW : 22,391 wells have been constructed, and 37,476 hectare command area has been covered, benefitting 35,931 small & marginal farmers.

vi. PDMC : 32.68 lakh hectare has been covered under micro irrigation.

vii. WDC : 1.49 lakh hectare has been brought under plantation, and 3.28 lakh hectare wasteland has been made culturable.

Role of Government of India in respect of the above, is to provide financial assistance to the State Governments, as per norm of the scheme. The State Governments are to make financial provisions for the commensurate state share, and also to implement the works.

AROUND THE STATES

ANDHRA PRADESH

REVOLVING FUND FOR POLAVARAM PROJECT

Hon'ble Chief Minister, Government of Andhra Pradesh (GoAP), vide letter dated 5th February, 2020 to the Hon'ble Prime Minister, has inter-alia requested for arranging 'Revolving Fund' with the Polavaram Project Authority (PPA) for implementation of Polavaram Irrigation Project (PIP).

In response vide letter dated 06th July 2020, this Ministry has informed the Hon'ble CM, GoAP that Government of India has been reimbursing the expenditure on Irrigation component of the PIP with effect from 01.04.2014, upon receipt of verified bills and recommendations from the PPA and Central Water Commission (CWC), with the approval of Ministry of Finance (MoF).

It has been further informed that funds are being provided for PIP through Extra Budgetary Resources from NABARD, under Long Term Irrigation Fund (LTIF). NABARD raises the funds fromthe market once requirement of requisite amount is conveyed by this Ministry. NABARD normally requires about two to three weeks to arrange funds from market. Thereafter, the funds are transferred to the GoAP promptly by PPA, normally within one or two working days.

ASSAM

JAL JEEVAN MISSION IN ASSAM

Since August 2019, Government of India in partnership with States, is implementing Jal Jeevan Mission (JJM) by subsuming erstwhile National Rural Drinking Water Programme (NRDWP) to make provision of tap water supply to every rural household of the country by 2024. The key features of the Jal Jeevan Mission (JJM) are to make provision of potable water to every rural household through tap water connection at a service level of 55 litre per capita per day (lpcd), of prescribed quality (BIS:10500), on regular and long-term basis.

The details of Central fund allocated, released/ drawn by the State Government and reported utilization in Assam under the then National Rural Drinking Water Programme (NRDWP) in 2018-19 and under JJM in 2019-20, 2020-21 & 2021-22 (as on 06.12.2021) is as under:

(Amount in Rs. Crore)

Year	Central share					Expenditure under State share
	Opening Balance	Allocation	Fund drawn by the State	Total fund available	Reported utilization	
2018-19	394.85	567.89	300.76	695.61	336.25	48.34

2019-20	359.35	694.95	442.36	801.71	358.87	29.01
2020-21	452.45	1,608.51	551.77	1,004.22	880.44	90.02
2021-22	123.78	5,601.16	1,400.29	1,532.37	1,051.15	101.07

Source: JJM, IMIS

As reported, out of total 63.35 lakh rural households in 33 districts of Assam, so far,17.04 lakh (26.9%) households have been provided tap water connections. The State has plannedto provide tap water connections to remaining 46.31 lakh rural households by 2024.

A number of steps have been taken to plan and implement JJM in the whole country including Assam with speed and scale, *inter alia* which includes joint discussion and finalization of annual action plan (AAP) as well as saturation plan of States/ UTs, regular review of implementation, workshops/ conferences/ webinars for capacity building and knowledge sharing, field visits by multi-disciplinary team to provide technical support, etc. A detailed Operational Guideline for the implementation of JJM; Margdarshika for Gram Panchayats & VWSCs to provide safe drinking water in rural households and Guidelines on a special campaign to provide piped water supply in anganwadi centres, ashramshalas and schools have been shared with States/ UTs, including Assam to facilitate planning and implementation of Jal Jeevan Mission. For online monitoring, JJM–Integrated Management Information System (IMIS) and JJM–Dashboard has been put in place. Provision has also been made for transparent online financial management through Public Financial Management System (PFMS).

BIHAR

SWACHH BHARAT MISSION IN BIHAR

The details of Centre share funds allocated and released to Bihar under Swachh Bharat Mission (Grameen) [SBM(G)] during the last three years and utilization thereof as reported by the State are given below:

(Rs. in crore)

Year	Allocation	Release	Utilization
2018-19	5887.48	2943.69	2383.70
2019-20	3104.52	1867.38	1801.20
2020-21	688.37	88.56	797.86

SBM (G) was launched by the Government on 2nd October, 2014 with the main aim to make the country Open Defecation Free (ODF) by 2nd October, 2019 by providing access to toilets to all the rural households. Under the programme, so far, more than 10.86 crore individual household latrines (IHHLs) have been constructed across the country, as reported by the States/UTs on the Integrated Management Information System (IMIS) of SBM (G). In Bihar, under SBM (G),

1.21 crore IHHLs have been constructed. All the villages in the country (including Bihar) declared themselves Open Defecation Free (ODF) as on 2nd October, 2019. Having achieved the

outcomes of ODF, Phase II of SBM (G) is now being implemented with the focus to sustain the ODF status and to cover all villages in the country (including Bihar) with Solid and Liquid Waste Management (SLWM) by 2024-25 i.e. to convert the villages from ODF to ODF Plus.

CHHATTISGARH

JAL JEEVAN MISSION IN CHHATTISGARH

Since August, 2019, Government of India is implementing Jal Jeevan Mission (JJM) in partnership with States including Chhattisgarh, to make provision of potable tap water supplyto every rural household by 2024.

The details of fund allocated to State, fund drawn and reported utilization in Chhattisgarhunder JJM in 2019-20, 2020-21 & as on date in 2021-22, is as under:

(Amount in ₹ Crore)

Year	Central share					Expenditure under State share
	Opening Balance	Allocation	Fund drawn	Total fund available	Reported expenditure	
2019-20	31.58	208.04	65.82	97.4	39.23	37.55
2020-21	58.17	445.52	334.14	392.31	223.8	221.1
2021-22	168.52	1,908.96	453.71	625.38	117.17	159.03

Source: JJM-IMIS

At the time of announcement of Jal Jeevan Mission in August, 2019, out of total 48.59 lakh rural households in Chhattisgarh, only 3.19 lakh (6.6%) households were reported to have tap water connections. Since then, provision of tap water supply has been made to 4.02 lakh households. Thus, as on date, out of 48.59 lakh rural households in the State, 7.21 lakh (14.8%) households have provision of tap water supply. Under Jal Jeevan Mission, the State Government of Chhattisgarh has planned to make provision of potable tap water supply to every rural household by 2023.

State/ UT-wise details of rural households having provision of tap water supply and progress made in providing tap water connections to households since launch of JJM, is **annexed**. The same is in public domain and available on the JJM dashboard at:https://ejalshakti.gov.in/jjmreport/JJMIndia.aspx

State/ UT-wise details of progress since launch of Jal Jeevan Mission and status of rural households (HHs) with provision of tap water supply (as on 28.11.2021)

(Numbers in Lakhs)

S. No.	States/ UTs	Rural HHs provided tap water connection since launch of JJM		Rural HHs with potable tap supply as on 28.11.2021	
		in numbers	in %	in numbers	in %
1.	D&NH and D&D	0.85	100	0.85	100

2.	Bihar	149.5	87	152.66	89
3.	Telangana	38.38	71	54.06	100
4.	A & N Islands	0.33	54	0.62	100
5.	Manipur	2.36	52	2.62	58
6.	Himachal Pradesh	7.76	45	15.38	89
7.	Haryana	13.3	43	30.97	100
8.	Punjab	14.64	43	31.43	91
9.	Arunachal Pradesh	0.91	41	1.14	52
10.	Uttarakhand	6.12	40	7.42	49
11.	Mizoram	0.53	39	0.62	46
12.	Odisha	31.07	36	34.18	40
13.	Tripura	2.62	35	2.87	38
14.	Maharashtra	47.46	33	95.9	67
15.	Meghalaya	1.81	31	1.85	31
16.	Nagaland	1.01	27	1.15	30
17.	Jammu & Kashmir	4.61	25	10.36	56
18.	Madhya Pradesh	30.53	25	44.06	36
19.	Assam	15.59	25	16.71	26
20.	Goa	0.64	24	2.63	100
21.	Ladakh	0.1	23	0.12	26
22.	Tamil Nadu	27.69	22	49.45	39
23.	Andhra Pradesh	18.4	19	49.15	52
24.	Puducherry	0.21	19	1.15	100
25.	Gujarat	17.12	18	82.28	89
26.	Karnataka	16.53	17	41.04	42
27.	West Bengal	25.31	14	27.46	15
28.	Kerala	9.47	13	26.11	37
29.	Sikkim	0.12	12	0.83	79
30.	Uttar Pradesh	29.06	11	34.22	13
31.	Jharkhand	6.13	10	9.58	16
32.	Rajasthan	9.88	10	21.62	21
33.	Chhattisgarh	4	8	7.2	15
Total		**534.04**	**27%**	**858.52**	**45**

Source: JJM, IMIS

MAHARASHTRA

SCHEME FOR SANITIZATION IN MAHARASHTRA

Swachh Bharat Mission (Grameen) [SBM(G)] was launched by the Government on 2nd October, 2014 with the main aim to make the country Open Defecation Free (ODF) by 2nd October, 2019, by providing access to toilets to all the rural households. The progress under the programme is regularly reviewed/monitored by Department of Drinking Water and Sanitation through the online Integrated Management Information System (IMIS) of SBM (G) and review

meetings held with the States. As per the data reported by the States/UTs on the IMIS, more than 10.8 crore individual household latrines (IHHLs) and 1,99,755 Community Sanitary Complexes (CSCs) have so far been constructed from 02.10.2014 to 13.12.2021, across the rural areas of the country (including Maharashtra). State/UT-wise details of IHHLs and CSCs constructed under SBM (G) are given at Annexure. The Department of Drinking Water and Sanitation has also conducted three rounds of National Annual Rural Sanitation Survey (NARSS) during 2017-18, 2018-19 and 2019-20, through an Independent Verification Agency. As per the results of NARSS 2019-20, 94.4% rural households had access to toilets. Rural sanitation coverage in the country as on 2.10.2014 was 38.7%. This has now increased to 100% and all the villages in the country (including Maharashtra) have declared themselves ODF. Having achieved the outcomes of ODF, Phase II of SBM (G) is now being implemented with the focus to sustain the ODF status and to cover all villages in the country with Solid and Liquid Waste Management (SLWM) by 2024-25 i.e. to convert the villages from ODF to ODF Plus.

Under SBM (G), Centre share funds are released to the States. Further, distribution of the same to the districts is done by the States. Total Centre share funds amounting to Rs.4594.47 crore have been released to Maharashtra under SBM (G) from 2014-15 to 2021-22, and as per the utilisation certificates submitted by the State, Rs.4125 crore have been utilised.

State/UT-wise no. of IHHLs & CSCs constructed under SBM(G) from 2.10.2014 to 13.12.2021

Sl. No.	State/UT	No. of IHHLs constructed	No. of CSCs constructed
1	Andaman & Nicobar Islands	22,324	316
2	Andhra Pradesh	,71,845	14,919
3	Arunachal Pradesh	44,571	3,827
4	Assam	,91,832	2,811
5	Bihar	21,25,901	8,094
6	Chhattisgarh	,73,631	4,281
7	D & N Haveli and Daman and Diu	,472	47
8	Goa	,637	731
9	Gujarat	,64,680	15,853
10	Haryana	87,049	5,920
11	Himachal Pradesh	85,484	2,123
12	Jammu & Kashmir	,57,956	5,158
13	Jharkhand	,27,499	730
14	Karnataka	,30,903	1,608
15	Kerala	39,722	1,180
16	Ladakh	,024	161
17	Madhya Pradesh	,53,818	10,965
18	Maharashtra	,66,586	21,427
19	Manipur	68,277	839
20	Meghalaya	59,948	910
21	Mizoram	,777	946

22	Nagaland	40,848	1,663
23	Odisha	),55,310	1,217
24	Puducherry	),628	10
25	Punjab	09,593	5,327
26	Rajasthan	,49,216	14,031
27	Sikkim	),106	638
28	Tamil Nadu	5,07,430	5,599
29	Telangana	,06,178	7,888
30	Tripura	38,861	201
31	Uttar Pradesh	20,02,634	54,874
32	Uttarakhand	21,540	1,534
33	West Bengal	,06,796	3,927
Total		**10,87,61,076**	**1,99,755**

FLOOD POLICY IN MAHARASHTRA

Flood management including erosion control falls within the purview of the States. Flood management and anti-erosion schemes are formulated and implemented by concerned State Governments as per their priority. The Union Government supplements the efforts of the States by providing technical guidance and also promotional financial assistance for management of floods in critical areas. State Government of Maharashtra has informed that an Expert Study Committee was appointed to suggest remedial measures to decrease flood effects in Sangli, Satara and Kolhapur districts of Western Maharashtra. The Committee has submitted its report in October, 2021 and Government of Maharashtra has accepted its recommendations.

State Government of Maharashtra has informed that restrictions are imposed by Krishna water Dispute Tribunal (KWDT-II) award on Inter basin transfer of water. Hence, it is not possible to divert water from flood affected river basin to drought prone river basin. However, presently flood water is being lifted through Lift Irrigation Schemes within the basin for supplying to drought prone area.

State Government of Maharashtra has informed that Koyna Dam has been included in World Bank assisted Dam Rehabilitation and Improvement Program (DRIP-II) for its detailed hydrological and structural review.

GUJARAT

DAMAGES DUE TO FLOODS IN GUJARAT

State Government of Gujarat has informed that rainwater of rivers namely Bhadar, Ozat, Madhuvanti, Minsar, Venu and Sabli passes in SorthiGhed and Vartu, Sorthi, MotiKamadh, NaniKamadh river passes in BardaGhed area and run in to sea. Heavy rains causes flood in all these rivers and its tributaries.

As per the information received from State Government of Gujarat, all the villages of neighboring area are not turned into wetland but some pockets of Ghed area gets inundated. Looking at past years scenario of monsoon pattern, heavy to very heavy rainfall occurs in short period and this results in heavy flood situation and inundation of flood water in Ghed Area for a short period. Indirect benefit of this situation is also taken by farmers of surrounding areas to produce agriculture products by ground water recharge.

Flood management including erosion control falls within the purview of the States. Flood management and anti-erosion schemes are formulated and implemented by concerned State Governments as per their priority. The Union Government supplements the efforts of the States by providing technical guidance and also promotional financial assistance for management of floods in critical areas. State Government of Gujarat is of the view that it is techno-economic unviable to construct protection wall on all the bank of all rivers passing in Ghed Area.

JHARKHAND

MAJOR IRRIGATION PROJECTS IN JHARKHAND

Irrigation projects are planned, implemented and managed by the concerned State Governments, as per their own resources and priorities. Role of Government of India is limited to providing technical support, and partial financial support in some cases, as per the norms of the existing schemes being implemented by Government of India. However, for the projects on inter-state river systems, techno- economic viability is to be appraised by Central Water Commission under Ministry of Jal Shakti.

Presently two major irrigation projects are being implemented by Government of Jharkhand with financial assistance from Ministry of Jal Shakti. Subarnarekha Multipurpose project was earlier being provided financial assistance under Accelerated Irrigation Benefit Programme (AIBP) scheme of this Ministry. With the launch of Pradhan Mantri Krishi Sinchayee Yojana - Accelerated Irrigation Benefit Program (PMKSY-AIBP) in 2016, the project is now being provided central assistance under this scheme, as one of the 99 prioritized projects. The second such project is North Koel Reservoir Project situated in Bihar and Jharkhand, being provided central assistance by Ministry of Jal Shakti for the balance works, since 2017.

No specific complaint of delay has been received in respect of the above mentioned two projects, in the Ministry of Jal Shakti.

The targeted date for completion of Subarnarekha Multipurpose Project is March, 2023, while thecompletion for North Koel Reservoir Project is targeted by March, 2022.

i. Subarnarekha Multipurpose Project : Since its inclusion under Accelerated Irrigation Benefit Programme in 2011-12, so far Rs.1,889.61 crore has been released as central assistance by theMinistry of Jal Shakti. This amount includes Rs.756.73 crore released so far out of the eligiblecentral assistance of Rs.1,373.68 crore under PMKSY-AIBP, as per the progress of work and theterms of funding.

ii. ii North Koel Reservoir Project: Government of India has, in 2017, approved the proposal for balance works at an estimated cost of Rs.1622.27 crore. Against total central assistance of Rs.1378.61 crore for the project, Rs. 721.22 crore has been

released so far by the Ministry of Jal Shakti, as per the progress of work and the terms of funding.

KARNATAKA

FLOODS IN KARNATAKA

Floods are natural calamity that the country faces almost every year, in varying degrees of magnitude. The occurrence of floods can be attributed to various factors, including wide variations in rainfall both in time and space with frequent departures from the normal pattern, inadequate carrying capacities of rivers, river bank erosion and silting of river beds, landslides, poor natural drainage in flood prone areas, snowmelt and glacial lake out-bursts. Central Water Commission (CWC) is the nodal Organisation entrusted with the task of flood forecasting & early flood warnings in the country. As per flood forecasting network of CWC, during the last 3 years, above normal to extreme floods were witnessed in the state of Karnataka in the basins of Krishna, Cauvery and their tributaries, and West flowing rivers from Tapi to Tadri due to excess to large excess rainfall combined with extremely heavy rainfall in short duration. The summary of flood situation in Karnataka as per flood forecasting and monitoring network of CWC from 2019 to 2021 is given in Annexure-I.

The primary responsibility for disaster management rests with the State Government. The concerned State Government undertakes relief measures in the wake of natural disasters from the State Disaster Response Fund (SDRF) already placed at their disposal in accordance with Government of India's approved items and norms. Additional assistance is provided from the National Disaster Response Fund (NDRF) as per established procedure in case the disaster is of severe nature. Upon receipt of the request from the State Government of Karnataka for additional financial assistance from National Disaster Response Fund (NDRF), an Inter-Ministerial Central Team (IMCT) was constituted by this Ministry of Home Affairs and visited the State an on-the-spot assessment of damages caused by the floods/landslides of 2021. Financial assistance is considered by High Level Committee as per laid down procedure. As per IMCT’s report, 20 human lives, 419 livestock were lost and 10018 Nos. of houses/huts and 217897 ha. cropped (Agriculture +Horticulture) area have been lost/damaged in wake of flood/landslides-2021. In the meantime, Government of Karnataka has also sent a communication along with memorandum for financial assistance for flood during October-November-2021. Government has decided to depute the same team for visit to the affected areas of Karnataka. Further, the State Government of Karnataka has been allocated Rs.843.20 crore (Rs.632.80 crore as Central Share + Rs.210.40 crore as state share) under the SDRF for 2021-22. The central share of SDRF has been released, in advance to the State of Karnataka.

Indian Meteorological Department (IMD) has informed that heavy rainfall activity had been one of the reason for flood in Karnataka and it had been due to weather systems like low pressure systems, cyclonic circulations etc. affecting the State in addition to strong monsoon condition in association with strong southwesterly winds over the east central Arabian Sea sometimes occurring during monsoon season (June-September). All these intense rainfall activities had been predicted well in advance to support disaster management work & mitigation measures. India Meteorological Department (IMD) is effectively functioning in the country maintaining accurate weather forecasting services along with monitoring services for early

detection of natural disasters. During the past few years, IMD has been continuously improving weather prediction services in terms of accuracy, lead time and associated impact.

Summary of Flood situation in Karnataka from 2019 to 2021.

Year	No. of flood forecasting station flowed in			Reservoirs having Inflows Above threshold value
	Extreme Flood	Severe Flood	No. of Monitoring Stations other than Flood forecasting Stations which flowed in the EXTREME situation	
2019	-	1	13	13
2020	1	-	5	13
2021(Till Nov)	-	-	3	13

ODISHA

IRRIGATION PROJECTS IN ODISHA

During 2016-17, ninety-nine (99) on-going Major/Medium irrigation projects under Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)- Accelerated Irrigation Benefits Programme (AIBP), have been prioritized in consultation with States, for completion in phases by December, 2019 along with their Command Area Development & Water Management (CADWM) works under Har Khet Ko Pani (HKKP) component. Funding arrangement for both the Central & State share is to be through NABARD under Long Term Irrigation Fund (LTIF). Further, Surface Minor Irrigation (SMI) projects are also covered under HKKP component for financial support through budgetary means.

Though the said scheme was till Dec, 2019, however Ministry of Finance vide their letter dated 10.01.2020 conveyed the continuation of ongoing Centrally Sponsored Schemes for a period up to 31st March 2021.

Of 99 prioritized projects under PMKSY-AIBP & HKKP, eight (8) Projects are from the Odisha, including those benefitting Kalahandi, Bolangir, Koraput (KBK) districts and Drought prone areas of the State. Details of these projects along with their estimated cost, central share and state share, are **annexed** herewith. Further, there is no Surface Minor Irrigation (SMI) project of the State presently included for funding under the PMKSY-HKKP. **Annexure** regarding "Irrigation Projects in Odisha".

The Details of Major & Medium Irrigation Project Under AIBP/CADWM of Odisha

(Rs in crore)

Sl.No	Name of the Project	Districts Benefited	AIBP Component			CADWM (HKKP) component		
			Estimated Cost	Central Share	State Share	Estimated cost	Central Share	State Share

1	Upper Indravati	Kalahandi &Nawarangapur	535.88	18.00	517.88	103.980	51.840	52.14
2	Lower Indra	Nuapada&Bolangir	1595.35	104.88	1490.47	54.510	16.722	37.79
3	Rukura	Sundergarh	240.22	26.35	213.87	389.580	126.030	263.55
4	Subarna-rekha	Mayurbhanj&Balasore	4455.68	642.33	3813.35	334.370	101.570	232.80
5	Integrated Anandpur Barrage	Keonjhar	2864.36	61.32	2803.04	164.850	53.444	111.41
6	Ret	Kalahandi	707.64	110.78	596.86	140.265	44.032	96.23
7	Kanupur	Keonjhar	2301.28	270.28	2031	31.63	10.21	21.44
8	Telengiri	Koraput	932.964	208.91	724.054	46.87	16.552	30.32
		Total	**13633.37**	**1442.85**	**12190.52**	**1266.055**	**420.4**	**845.68**

RAJASTHAN

DRINKING WATER PROJECTS IN RAJASTHAN

To make provision for potable tap water supply to every rural home by 2024, Government of India is implementing Jal Jeevan Mission (JJM) in partnership with States, with an estimated outlay of 3.60 lakh Crore. The erstwhile National Rural Drinking Water Programme (NRDWP) has been subsumed under the Jal Jeevan Mission. Powers to plan, approve and implement water supply schemes including those under NRDWP, are vested with States.

Under Jal Jeevan Mission, provision have been made to expedite the implementation of water supply schemes taken up under erstwhile National Rural Drinking Water Programme (NRDWP) in a time-bound manner. To make all such ongoing schemes JJM compliant i.e. water supply at the rate of 55 litre per capita per day (lpcd) and to provide every household with tap water connection, provision is there under JJM to augment and retrofit by utilizing JJM funds.

As on 15th August, 2019, at the time of launch of Jal Jeevan Mission, in Rajasthan, out of 101.32 lakh rural households, 11.74 lakh households (11.59%) had piped water connections. Since then, 8.75 lakh households (8.64%) have been provided tap water connections, thus increasing the tap water supply to 20.50 lakh households (20.23%). Remaining 80.83 lakhs rural households are planned to be provided with tap water connection by 2024

TAMIL NADU

INTER-LINKING OF RIVERS IN TAMIL NADU

The National Perspective Plan (NPP) was prepared by the then Ministry of Irrigation (now Ministry of Jal Shakti) in August 1980 for water resources development through inter basin transfer of water, for transferringwater from water surplus basins to water-deficit basins.

Under the NPP, the National Water Development Agency (NWDA) had identified 30 links (16 under Peninsular Component & 14 under Himalayan Component) for preparation of Feasibility Reports (FRs). Under the Peninsular Component of National Perspective Plan, three link projects have been planned for benefitting the state of Tamil Nadu; i) Pennar-Palar-Cauvery link project ii) Cauvery-Vaigai- Gundar link project and iii) Pamba-Achan kovil-Vaippar link project.

NWDA has completed FR's of the above three links and has sent to concerned State Governments. The Detailed Project Report (DPR) to Cauvery-Vaigai-Gunder link project has also been completed by NWDA and sent to the concerned State Governments.

Works related to water resources development & management are planned, funded, executed and maintained by the State Governments themselves as per their own resources and priorities. In order to supplement the efforts of the State Governments, Government of India provides technical and financial assistance to State Governments to encourage sustainable development and efficient management of water resources through various schemes and programmes such as scheme for Repair, Renovation and Restoration(RRR) of Water Bodies (WB) etc. under PMKSY. No proposal regarding renovation of Velliyenai, Panjapatti and Thalavapalayam lakes has been received from the Government of Tamil Nadu under RRR of WBs scheme.

As regards the interlinking of Amaravthi, Shanmughanadhi and Kudaganaru rivers, it is not part of the Interlinking of Rivers programme of NPP. Further, no request to study the said proposal has been received by NWDA from Government of Tamil Nadu.

WEST BENGAL

PROBLEM OF EROSION BY RIVER GANGA IN WEST BENGAL

The Government is aware of the problem of erosion caused by the river Ganga in Murshidabad District. As informed by State Government of West Bengal, around 730 hectare of land has been eroded during the period between 2005 to 2019 in the adjoining areas of the river Ganga-Padma in the district of Murshidabad comprising Farakka, Samsergunj, Suti-I & II, Raghunathgunj-II, Lalgola, Bhawangola-I & II, Raninagar-II, Jalangi blocks and Dhuliyan Municipality.

Flood management including erosion control falls within the purview of the States. Flood management and anti-erosion schemes are formulated and implemented by concerned State Governments as per their priority. The Union Government supplements the efforts of the States by providing technical guidance and also promotional financial assistance for management of floods in critical areas. During 2017- 2020, Irrigation & Waterways Department (I&WD) of State Government of West Bengal, completed 21 critical spots for protecting river bank covering the Districts of Malda, Murshidabad and Nadia. During 2019-20, I&WD, Government of West Bengal prepared a project proposal for arresting erosion in critical vulnerable reaches on river Ganga-Padma in these districts.

State Government of West Bengal has informed that during the current financial year of 2021-22, bank protection works for a total length of 4525 m at critical vulnerable reaches of river Ganga-Padma at Samsergunj, Farakka, Bhagawangola-I and Jalangi blocks in the Murshidabad District have been approved under State budget.

Farakka Barrage Project has also undertaken river bank protection works, in critical reaches in its jurisdiction, as per the recommendation of Technical Advisory Committee of Farakka Barrage Project.

NEWS

GOVT. CLEARS 8 HYDROPOWER PROJECTS ON INDUS IN LADAKH

The government has cleared eight hydropower projects of 144 MW on the Indus river and its tributaries in Ladakh, the highest so far, sources in the Jal Shakti Ministry said on Thursday. At present, there are several small projects, with a collective capacity of 113 MW on Indus in Ladakh, and the new projects will have much more capacity than those constructed so far, a senior official added. The official said the new projects have been cleared by the Central Water Commission as well as the Indus Commissioner after a separate Union Territory of Ladakh was announced last year. These projects will come up in Kargil and Leh districts of Ladakh.

Because of its topography, it is not feasible to construct big hydropower projects in the Ladakh region. Durbuk Shyok (19 MW), Shankoo (18.5 MW), Nimu Chilling (24 MW), Rongdo (12 MW), Ratan Nag (10.5 MW) hydropower projects have been cleared for Leh, while Mangdum Sangra (19 MW), Kargil Hunderman (25 MW) and Tamasha (12 MW) have been cleared for Kargil, the official added. Many of the existing projects as small as 1 MW of capacity. The construction of the new projects will begin after other mandatory clearances are obtained, the official said. "The designs of these projects have been certified as compliant with the Indus Waters Treaty by the Central Water Commission. The information on the design of these projects is being provided to Pakistan as per the provisions of the treaty," the official said "The development of projects on the Indus river has been slow, especially in the Ladakh region. Only two major projects have been constructed so far --- Chutak project of 44 MW on Suru, a tributary of the Indus, and Nimoo Bazgo of 45 MW on the Indus," the official said. Under the Indus Waters Treaty between New Delhi and Islamabad, the usage of water of Indus and its five tributaries flowing from India to Pakistan have been divided. The treaty specifies that waters of three eastern rivers namely Ravi, Beas and Sutlej, have been reserved for India while that of western rivers, namely Indus, Chenab and Jhelum, are for Pakistan.

However, India claims it has unrestricted rights to develop hydroelectric power projects on the western rivers within the specified parameters of design. Of the total 168 million acre-feet, India's share of water from Ravi, Beas and Sutlej is 33 mcf, which is nearly 20 per cent. India uses nearly 93-94 per cent of its share under the Indus Water Treaty. The rest of the water remains unutilised and goes to Pakistan. The efforts to tap that water through a number of projects like Ujh Multipurpose project, Shahpurkandi Dam project and the second Ravi Beas Link are being made, the official added.

Millennium Post
08.01.2021

EVERY HYDROELECTRIC PROJECT UNDER OBLIGATION TO RELEASE MINIMUM WATER DOWNSTREAM : NGT

The National Green Tribunal has directed state pollution control boards to ensure the release of minimum water downstream by hydroelectric projects, saying business or commercial interests cannot override the requirement of maintaining riverine ecology. A bench headed by NGT Chairperson Justice Adarsh Kumar Goel said every hydroelectric project (HEP) irrespective of the date of its commission is under an obligation to release minimum water downstream “This is a mandate of ‘Sustainable Development' which is part of the right to life. Accordingly, the tribunal directed compliance by all the Hydro-Electric Projects (HEPs), including in States of Uttarakhand, Sikkim, Arunachal Pradesh, West

Bengal (North Region), Assam and Jammu & Kashmir," the bench said. Environmental flow describes the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and wellbeing that depend on these ecosystems.

The tribunal junked the submission of the National Hydroelectric Power Corporation seeking exemption from releasing water to maintain 15 per cent e-flow (the quantity and timing of water that is essential for the river to perform its ecological functions) during the lean period. "We do not find any substance in this submission. The mandate of 'Sustainable Development' has to be complied. We do not see any hurdle in doing so. Whatever changes are required for the purpose can certainly be done.

"Technical and/or commercial limitations cannot be a ground to ignore the mandate of law. No business or commercial interest can override the requirement of maintaining riverine ecology," the bench said. The green panel noted that the Ministry of Jal Shakti has not filed any report even though a period of nine months has passed since its direction. The tribunal was hearing a plea filed by Himachal Pradesh resident Vijay Kumar seeking enforcement of requirement of releasing minimum water downstream by the HEPs in the state.

Economics Times
11.01.2021

OFFICIALS LIFT 10.5 TMC WATER FROM GODAVARI RIVER

Following directions from Chief Minister K Chandrashekhar Rao, authorities of the Kaleshwaram Lift Irrigation Scheme (KLIS) on Sunday decided to pump out 10.5 TMC water from Godavari River.

The officials started two motors (16 and 17) at Laxmi pump house at Kannepalli to fill Sarawathi barrage at Annaram on Sunday. They also switched on the fourth pump at Nandi pump house in Nandi Medaram of Peddapalli district and two motors at Gayatri pump house at Laxmipur in Karimnagar district.

Speaking to Telangana Today, KLIS Engineer-in-Chief (ENC) N Venkateshwarlu said they will pump out eight TMC of water into Lower Manair Dam (LMD) and 2.5 TMC water into Yellampalli project to meet the immediate requirements of Yasangi crops. "We will lift the water as per requirement," he added.

Meanwhile, a Karimnagar report said that since all irrigation projects were filled with water, cultivation area was expected to go up this season. To meet the demand and supply water up to Suryapet, irrigation officials started drawing water from Godavari river by starting motors in Link-I and II of Kaleshwaram project.

About 3,150 cusecs of water is being lifted from Yellampalli project by operating a pump at Nandi pump house and dumped into Nandi reservoir near Nandimedram, Dharmaram mandal of Peddapalli district as part of package 6 of KLIS.

Water is being taken to Gayatri (Laxmi) pump house near Ramadugu mandal, Karimnagar district, as part of package 7 and then on to Mid Manair reservoir. In the wake of the inflows from Gayatri pump house, Mid Manair (Raja Rajeshwara) reservoir officials released water into Lower Manair Dam in the evening with Superintendent Engineer Srikantha Rao lifting two crest gates.

While the project was getting 3,000 cusecs of water from Gayatri pump house, a similar quantity was being discharged into LMD to maintain water level in the MMR.

Speaking to Telangana Today, Engineer-in-Chief, Ramagundam wing, N Venkateshwarlu said they had started drawing water from Medigadda by starting all pumps in link-I and II to meet the water need of agriculture sector. An additional two lakh acre ayacut was expected to be increased under SRSP. Crops are expected to be cultivated in 16.5 lakh acres under SRSP as against its capacity of 14.5 lakh acres.

Telangana Today
18.01.2021

CENTRE NOD FOR CHENAB HYDEL PROJECT DESPITE PAK OBJECTIONS

The Centre on Wednesday decided to go ahead with the long-pending 850 megawatt Ratle hydroelectric power project on the river Chenab in Jammu and Kashmir's Kishtwar district, despite objections raised by the Pakistan government over the same. J&K Lieutenant Governor Manoj Sinha said the approval for the Rs 5,822 crore project came at a cabinet meeting chaired by Prime Minister Narendra Modi earlier in the day.To be built near Drabshalla village in Kishtwar, then Prime Minister Manmohan Singh had laid the foundation stone for the project on June 25, 2013. However, the Pakistan government had objected to the construction of the dam, claiming that it was not in conformity with the Indus Water Treaty.

In August 2017, the World Bank allowed India to construct the dam and the following year, the erstwhile state government approached the Centre with a proposal to resume construction.

Accordingly, an MoU was signed between the National Hydel Power Corporation (NHPC) and the Jammu and Kashmir State Power Development Corporation Limited (JKSPDCL) in the presence of Modi at Vijaypur in Samba district on February 3, 2019 and work on the project began in December 2019. Pakistan has approached the World Bank with fresh protests, but the Centre has now decided to go ahead with the construction.

On Wednesday, L-G Sinha said the project will be a joint venture between the NHPC and the JKSPDC having an equity of 51 per cent and 49 per cent, respectively, and will be completed in five years. The JKSPDCL equity will be paid by the Centre, he said.

The L-G said the power share of J&K from the project will start from 8 per cent and increase to 12 per cent in the 12th year. "It will be the first hydel power project in the country from which we will start getting power from the day it gets commissioned," he said.

"If calculated in terms of money, Jammu and Kashmir will get electricity worth Rs 5,289 crore free of cost," he said, adding that the Union Territory will also get water usage charges worth Rs 9,581 crore over a period of 40 years.

The L-G said the project will generate direct and indirect jobs for 4,000 people in addition to the 2,000 jobs created directly and indirectly in the commissioning of the 540 MW Kwar hydroelectric power project on the Chenab, the MoU for which was signed recently.

Indian Express
21.01.2021

BUDGET 2021: FM SITHARAMAN ALLOCATES RS 50K CRORE FOR JAL JEEVAN MISSION

A whopping Rs 50,000 crore has been earmarked for the Jal Jeevan Mission in Budget 2021-22, even as Finance Minister Nirmala Sitharaman Monday announced the scheme's urban segment that aims to provide tap water connections to 2.86 crore households.

In the budget, the Drinking Water and Sanitation Department under the Jal Shakti Ministry has been allocated Rs 60,030 crore while Rs 9,022.57 crore has been earmarked for the Department of Water Resources, the River Development and Ganga Rejuvenation.

The DWS has seen a hike of more than three times in its budget allocation. In 2019-20, the DWS was allocated Rs 18,264.26 crore. It came down marginally to Rs 17,023.50 in 2020-21. In the coming fiscal year, the DWS has been earmarked Rs 60,030 crore.

Launched in 2019, the Jal Jeevan Mission, a flagship programme of the Modi government, aims to provide tap water connections to rural households by 2024. So far, tap water connections have been given to 3.3 crore rural households. In this budget, Rs 50,000 crore has been earmarked for this scheme. Additionally, Sitharaman announced the urban segment of this scheme.

The ambitious urban segment of the mission will be implemented over five years with an outlay of Rs 2,87,000 crore. "The Jal Jeevan Mission (urban) will be launched. It aims at universal water supply in all 4,378 Urban Local Bodies with 2.86 crore household tap connections, as well as liquid waste management in 500 AMRUT cities. It will be implemented over 5 years, with an outlay of 2,87,000 crores," Sitharaman said in her budget speech.

Business Standard
02.02.2021

CENTRE FAULTS BOTH AP, TS OVER NEW WATER PROJECTS

Centre has categorically asserted that taking up of new projects by Andhra Pradesh and Telangana on Krishna or Godavari rivers is in violation of sections and provisions of the 11th Schedule of Andhra Pradesh Reorganisation act, 2014, hence both the states have been asked not to go ahead with new projects. Replying to a question raised by V Balashowry, YSRCP MP, the minister of state for Jal Shakti, Rattan Lal Kataria, stated here on Thursday that both the governments of Telangana and Andhra Pradesh had mutually complained against each other about new projects on Krishna and Godavari rivers without submitting their detailed project reports (DPR) to Krishna River Management Board (KRMB) and Godavari River Management Board (GRMB) respectively for appraisal and clearance.

He further said an Apex Council was constituted under the AP Reorganisation Act, 2014, for deciding on water related inter-state matters. The second meeting of the Apex Council was held under the Chairmanship of the Union minister (Jal Shakti) with both the Chief Ministers of the states. In the meeting, it was decided that both the states would submit the DPRs of new projects to KRMB/ GRMB for appraisal and subsequent sanction by the Apex Council.

The Hans
04.02.2021

SC ASKS CENTRE TO DO ENVIRONMENT IMPACT ASSESSMENT ON FLOW OF RIVER IN HIMACHAL

Three days after the Uttarakhand disaster, in which a portion of the Nanda Devi glacier broke off triggering an avalanche and a deluge in the Alaknanda river system, the Supreme Court on Wednesday adopted a cautious approach and asked union environment ministry to do an impact assessment on removal of boulders from the river bed system in Himachal Pradesh. The top court asked the Ministry of Environment, Forests and Climate Change (MoEFCC) to assess the impact of removal of boulders from the river bed system in Kullu district of Himachal Pradesh and how it will affect the flow of rivers including its tributaries.

A bench of Chief Justice SA Bobde and Justices AS Bopanna and V Ramasubramanian observed that removal of sand and stones from the river bed has created problems in Kerala, which has witnessed massive floods a couple of years back. It is a well known fact that stones and boulders have a direct impact on the flow of rivers. We find it imperative to direct the MoEFCC to do an Environment Impact Assessment (EIA) of the proposed site and specifically make a report whether it will have an adverse impact on the flow of the river, the bench said. The top court directed that the cost of EIA shall be borne by a company Paras Stone Crusher, who sought court's nod to carry on its business and collect boulders falling in the river bed from nearby forest areas in Kullu district of the state.

Millennium Post
10.02.2021

GODAVARI-KAVERI RIVER LINKING PROJECT: DRAFT DPR FOR LINKING GODAVARI, KRISHNA, KAVERI READY

Godavari-Kaveri river linking project update: The Narendra Modi government has made the draft Detailed Project Report (DPR) for linking the three rivers – Godavari, Krishna and Kaveri ready, said Rattan Lal Kataria, Union Minister of State for Jal Shakti & Social Justice and Empowerment in a written reply in Rajya Sabha. The minister said that the project to connect the rivers includes three links — Godavari (Inchampalli/Janampet)-Krishna (Nagarjunasagar), Krishna (Nagarjunasagar)-Pennar (Somasila) and Pennar (Somasila)-Cauvery (Grand Anicut). According to the draft DPR, around 247 TMC of water can be diverted from Godavari river to Nagarjunsagar dam through lifting and further south for meeting the demands of Krishna, Pennar and Cauvery basins.

“The cost of the project has been estimated as Rs 60,361 crore at the financial year 2018-19 price level by National Water Development Agency (NWDA),” the minister told the upper house. He further said that the stage of implementation of a project would be finalised only after the final DPR is prepared. This would be done with the consensus of the concerned states and only after the requisite statutory clearances are obtained. He also said that the pooling of resources will be decided after completion of the final DPR.

Meanwhile, the proposal for linking these rivers has been around for many years. The Godavari has been prone to flooding whereas Krishna, on the other hand, doesn’t have enough water. On September 15, 2016, water from the Godavari river was diverted to the Prakasam barrage on Krishna river, 124 km away.

Financial Express
10.02.2021

RAJASTHAN SEEKS CENTRAL ASSISTANCE FOR WATER PROJECTS

The Congress government in Rajasthan has sought Centre's financial assistance for the ongoing water projects and reiterated its demand for the national project status for the ambitious Eastern Rajasthan Canal Project (ERCP), which will supply drinking and irrigation waters to 13 districts.

Calls for Oppn. support

Public Health Engineering Minister B.D. Kalla said in the State Assembly that the Opposition should work in cooperation with the State government for raising the water-related issues with the Centre. The State could get the Centre's support if the Opposition leaders put forth the subjects in an assertive manner, he said. Mr. Kalla was replying to the debate on budgetary demands for Public Health Engineering Department, which deals with water supply in the State. The Minister said the Centre's share in the Jal Jeevan Mission should be enhanced to 90% and steps be taken for bringing the State's full share in the Yamuna waters from neighbouring Haryana.

The demands worth ₹8,336.74 crore were passed in the House by voice vote after the debate. Mr. Kalla said strict action would be launched against illegal water connections and steps will be taken to ensure piped water supply till the tail-end.

Plan for summer

The State government has also chalked out a contingency plan for summer. While new water supply schemes will be implemented in both urban and rural areas in 2021-22, Mr. Kalla said new borewells, handpumps, solar power plants and reverse osmosis plants and laboratories would facilitate the supply of adequate water in the villages.

The Hindu
07.03.2021

PM TO LAUNCH 'JAL SHAKTI ABHIYAN : CATCH THE RAIN'

Prime Minister Narendra Modi will launch the "Jal Shakti Abhiyan: Catch the Rain" campaign via video conferencing on the occasion of World Water Day on Monday, an official statement said on Sunday.

The Jal Shakti Abhiyan is the Jal Shakti ministry's flagship water-conservation campaign. The next leg of the programme, dubbed "catch the rain where it falls, when it falls", will be rolled out across the country's 734 districts covering over 600,000 villages. It will be implemented between March 22 and November 30, covering the monsoon period in the country.

During the campaign, geotagging of all water bodies throughout the nation will be carried out, which shall form the basis for assessment of the rejuvenation efforts for water bodies across the country, an official said on condition of anonymity.

According to data from the state-run policy think tank. NITI Aayog, nearly 600 million Indians face "high to extreme water stress" and the country's water demand is likely to double by 2030, potentially costing a 6% loss in gross domestic product by 2050.

The programme will be rolled out across the country's 734 districts covering over 600,000 villages. Under the scheme, the government focuses on rainwater harvesting and water conservation,

including initiatives such as renovation of traditional water bodies and tanks, reuse of water and recharge structures watershed development and afforestation in 256 districts.

"In the first phase interventions were made in 10,104,338 water conservation and rainwater harvesting projects 7,536,381 renovation of traditional and other water bodies, 7,485,025 reuse and recharge structures and 9,696,381 watershed development," minister of state for Jal Shakti Rattan Lal Kataria said recently, quoting figures from his ministry.

India sustains 18% of the world's population and 15% of global livestock with just about 4% of global fresh water resources. India's most water-stressed blocks are in Tamil Nadu (541) followed by Rajasthan (218), Uttar Pradesh (139) and Telangana (137).

On average India receives 1,170mm of rainfall, most of it during the summer monsoon months, but only 10-20% of that is currently tapped. Teams of central government officials will visit each district to sensitise and motivate the public to undertake water harvesting and conservation measures.

Hindustan Times
22.03.2021

REBUILD INDO-PAK TIES WITH INDUS WATER TREATY

The Indus Commissioners of India and Pakistan met in New Delhi on March 23-24. The main issue for discussion was the designs of the upcoming hydel projects on the tributaries of the Chenab river.

The Indus Water Treaty was signed by Pakistan and India at Karachi in 1960, with the World Bank being the third-party guarantor. India, being the upper riparian country to all six rivers (Indus, Jhelum, Chenab, Ravi, Beas and Sutlej), had the first right over the waters of these rivers. Yet, India gave to Pakistan, through this treaty, more than its due share of the waters (more than 80 per cent) of the six rivers. In addition, Pakistan got the waters of four Indian nullahs that join the Ravi. Through this largesse, India hoped to secure lasting peace with Pakistan.

Even if one was to overlook the fact that India is the upper riparian country, basing the allocation on the Indus river basin area of the two countries, the division should have been 65 per cent of the waters to Pakistan and 35 per cent to India.

India's munificence did not end there. Canals which originated from India and carried waters to Pakistan's fields were allowed to continue for the next 10 years, by which time Pakistan was expected to create a new set of headworks and canals as replacement of those flowing from India. India also provided funds to Pakistan for these new canals.

To take further, and somewhat mistaken, advantage, Pakistan was able to insert the devil in the details of the treaty, which it figured would work in its favour. Though the treaty allocates the waters of the three western rivers to irrigate 1.3 million acres of Indian land (in J-K), action to implement this has come under objection by Pakistan. Thus, vast tracts of virgin lands in various valleys in the Ladakh region could not be irrigated.

Pakistan was able to insert in the treaty the clause that the design of the dams to be built by India on the three western rivers could only be the 'run of the river' type. However, it has come to play a negative role for Pakistan. This restriction on the type of dams was, perhaps, due to apprehension that India may, in the event of a conflict, flood Pakistan.

Further, even in the construction of various run-of-the-river dams, such as Sallal, Uri, Dul Hasti, Baglihar and Neelam, Pakistan, along with the World Bank, has been creating impediments and consequent inordinate delays in their completion. In the case of the Sallal dam on the Chenab near Ryasi, which was originally built as a storage dam, it had to be converted, on Pakistan's insistence, into a run-of-the river configuration dam.

These run-of-the-river dams have worked to the disadvantage of both countries, more so for Pakistan. For India, hydel power projects based on the run-of-the-river dams cannot fully exploit the flow of the water because during the rainy season, the flow is more but much less in the dry season, resulting in lesser number of turbines operating during the dry period. So, such dams are not cost-effective. There is also the problem of silting of the dams.

For Pakistan, the disadvantage from such dams is greater because it cannot store excess water of these rivers during the rainy season and, consequently, it flows into the Arabian Sea. As a result, much less water is available during the dry season and Pakistan is highly water-stressed. In addition, fertile soil and nutrients which the waters from storage dams carry downstream are arrested in the run-of-the-river dams.

On its part, India has tried to meet this shortage of water for irrigation by recklessly sanctioning tubewells and providing free electricity to them, which has resulted in the groundwater going down to dangerous levels. India has also failed to fully utilise the waters of the three eastern rivers (Ravi, Beas and Sutlej), more so of the Ravi, due to the delay in the construction of the Shahpur Kandi barrage and stopping of leakage due to poor maintenance of sluice gates at the headworks on these rivers.

In the Ladakh region and at some locations in Himachal Pradesh, where the water current in various rivers/tributaries is very fast, it is possible to make channels and lower turbines into these waters (similar to Persian wheels working in the reverse order and with suitably designed blades). By such improvisations, electricity on a small scale can be produced for local use at remote places. A system to lift and lower turbines can be worked out, depending on changes in the water levels in these rivers.

The current thaw in the strained relations between India and Pakistan needs to be carried forward by changing the clause pertaining to the type of dams that can be built on the three western rivers. Such an amendment to the treaty will be of advantage to Pakistan in four ways.

First, wasteful flow of water into the sea during the rainy season would be reduced. Secondly, the flow of water would be regulated throughout the year for irrigation. Thirdly, abundant electricity generated from hydel projects in J-K and HP (based on storage dams) can be made available to Pakistan at concessional rates. Fourthly, soil nutrients, which otherwise get arrested at the run-of-the-river dams, would flow downstream to fertilise Pakistan's fields.

In any case, the two dams — 850 MW and 3,800 MW — are on the tributaries of the Chenab and not on the main river and, as such, fall outside the purview of the Indus Water Treaty.

Equally, it should accept that some of the waters of the Chenab (Chandra Bhaga, as it is known in Lahaul-Spiti) be diverted into the Beas and, in lieu, some water from the Ravi can be made available to Pakistan to irrigate fields in the Kartarpur Sahib and Lahore regions. Water to this end can be released from the Madhopur headworks and, in exchange, waters of the Chenab can be diverted into the Beas. The height of the dam on the Neelam river, where its waters have been diverted to the Wular lake, can be adjusted so that downstream fields, earlier watered by this river, continue to receive the required quantity of water.

It is time for the two countries to tread the path of goodwill, friendship, and prosperity. It is an appropriate time to carry forward the spirit of goodwill projected by both the PM and the Army Chief of Pakistan.

The Tribune
02.04.2021

TELANGANA PLANS TO MOVE COURT AGAINST CENTRAL NOTIFICATION ON KRMB

The state government is seriously exploring legal options with the Supreme Court to stall the Centre's move to notify the jurisdiction of Krishna River Management Board (KRMB). Stating this, official sources in the irrigation department said this is in view of reports from Delhi that the Union Jal Shakti ministry has completed all the modalities and the Centre is all set to notify the jurisdiction of KRMB.

If notified, all the common projects on River Krishna that serve both Andhra Pradesh and Telangana would come under the administrative and operational control of the board. The KRMB will be the supreme authority and both the states have to seek KRMB approval to take up any new projects. The states will also have to seek approval for continuation of the works on irrigation projects that were already started without seeking approvals from the apex council and also for any redesigning of the existing projects on River Krishna.

As per the AP Reorganisation Act, 2014, both KRMB and GRMB (Godavari river management board) were to be constituted and their jurisdiction notified within 60 days from the date of bifurcation of AP in June 2014. However, it remained pending for nearly seven years due to lack of a consensus between TS and AP. Official sources said the Telangana government wants the Centre to notify the KRMB jurisdiction only after the Krishna Water Disputes Tribunal – II finalized the allocation of Krishna water to TS.

The AP government on the other hand wants the Centre to notify the jurisdiction at the earliest so that the project management would be in the hands of the board, thus ensuring transparency in water allocation and usage. The TS government fears that its projects on River Krishna, namely the Palamur-Rangareddy, Dindi, will be in trouble if the Centre notifies the KRMB jurisdiction without making water allocations. The state government has started these projects without seeking approvals for water allocations.

The AP government had already lodged a complaint with the Union Jal Shakti ministry as well as the KRMB against the Telangana government taking up the Palamur-RR and Dindi projects without obtaining any water allocation approvals. The TS government too lodged a complaint against AP government for taking up the Rayalaseema lift irrigation scheme (RLIS), diverting Krishna water from Srisailam without seeking necessary approvals.

The second apex council meeting was held in October 2020 -- which was attended by the CMs of TS and AP through video conference mode. At this, the Union Jal Shakti minister Gajendra Singh Shekhawat announced that the ministry had decided to notify the jurisdiction of both KRMB and GRMB. Following this, the KRMB has sent the draft working manual to the ministry.

The draft manual was also circulated between both the states several times, but no consensus could be reached. However, as the TS government continued to raise objections, the Centre had in the last

apex council meeting said the states' consensus was not needed and that it would go ahead with the jurisdiction notification.

Deccan Chronicle
14.04.2021

ONLINE FLOOD REPORTING SYSTEM LAUNCHED IN ASSAM

An online flood reporting and information management system was launched on Saturday in Assam, which faces severe deluge every year, an official said. The online system developed jointly by Assam State Disaster Management Agency and UNICEF will replace the existing manual flood control mechanism.

Launching the digital system, Chief Secretary Jishnu Barua said managing floods is a critical administrative function as it involves multiple departments and stakeholders. The current practice of flood reporting passes through a time-consuming manual verification and quality control system, he said.

The new system for online flood reporting on a daily basis will be operational from May 15. The administration is very conversant in dealing with flood, relief and recovery efforts, which depend on situational awareness and availability of data, the chief secretary said. Daily flood reporting between May 15 and October 15 has been made mandatory in Assam. Driven by web-cum-mobile application technology, the new system will help delivery of relief and rehabilitation grants to flood-affected people, the official said. The digital initiative will facilitate tracking of damages to crops and loss of livestock and also help provide financial assistance for restoration, he said.

UNICEF India Chief, Emergency and Disaster Risk Reduction (DRR), Tom White congratulated the Assam government for being the first state to adopt the digital reporting system that will capture critical impact indicators during floods. "Such a system will go a long way in measuring the impact of disaster risk reduction interventions," he said.

Principal Secretary Revenue and Disaster Management Department Avinash Joshi said the digital system will enable information feeding at the source, immediate alert-based verification at defined levels and automatic compilation.

ASDMA Chief Executive Officer GD Tripathi said the required training for their field staffers and officers have already been conducted.

The Mint
08.05.2021

NGT SETS UP PANEL TO PROBE ALLEGED VIOLATION OF NORMS IN MEKEDATU DAM CONSTRUCTION

The National Green Tribunal has constituted a committee to submit a report on alleged violation of norms in the construction of a reservoir across the Cauvery river at Mekedatu in Karnataka. The NGT Southern bench, comprising Justice K Ramakrishnan and expert member K Satyagopal, issued notices to the Ministry of Environment and Forests (MoEF), Department of Water Resources, Central Water Commission, Karnataka and Tamil Nadu governments among others. The Green Bench issued a direction after taking suo motu cognisance of a newspaper report that said Karnataka proposes to construct a dam across the Cauvery river in the area and that the proposal was deferred by the Cauvery Water Management Authority twice in the past following strong opposition from the Tamil Nadu government,

citing the pendency of case before the Supreme Court. "Considering the allegations made in the newspaper report, we are satisfied that there arises a substantial question of environment, which requires the interference of this Tribunal. So, the matter is admitted." "Issue notice to the respondents...along with copy of the newspaper report and gist of the Suo Motu proceeding with full cause title so as to enable them to comply with the direction," the bench said. The committee comprises of senior members from the Integrated Regional Office, MoEF, Bangalore, Cauvery Water Management Authority, Cauvery Neeravari Nigam Limited and the Forest Department not below the rank of Additional Conservator of Forest, Karnataka.

Decan Herald
25.05.2021

YAAS: HM HOLDS REVIEW MEET WITH THREE CMS

Home minister Amit Shah today held a review meeting with chief ministers of West Bengal, Odisha and Andhra Pradesh and the Lt Governor of Andaman & Nicobar Islands to assess their preparedness to deal with Cyclone Yaas forming in the Bay of Bengal. Shah specifically reiterated that the States and the union territory administration should make adequate power back-up arrangements in all Covid19 hospitals, labs, vaccine cold chains and other medical facilities.

He advised them to ensure adequate stocks of all essential medicines and supplies in hospitals, keeping in view the likely disruption of movement of vehicles. For health facilities, including temporary hospitals, likely to be affected by the cyclone, the Home Minister advised them to make adequate arrangements for securing them from losses and for evacuation of patients in advance, if necessary.

He said advance action taken in this regard on the Western coast a few days ago had ensured that there was no adverse impact on any medical facility. Shah assured the States and the Union Territory of all cooperation of the Central Government and its agencies, and directed senior officers for the same. He said that a 24×7 control room is functioning in the MHA, which can be contacted at any time for any assistance by the States and the Union Territory.

The Indian Coast Guard, the Navy, the Army and Air Force units have been put on standby. Odisha chief minister Naveen Patnaik thanked the Central Government for convening the meeting and for extending assistance to the State Government. He said that all necessary steps have been taken by his Government to handle and manage the cyclone. West Bengal chief minister Mamata Banerjee also assured that necessary steps are being taken to ensure that there is minimal loss of life and property due to the impending cyclone, and that the State Government is fully prepared.

Andhra Pradesh chief minister Y S Jaganmohan Reddy said that necessary precautions are being taken. The Lt Governor of Andaman & Nicobar Islands Admiral D K Joshi informed the Home Minister that the cyclone would have little or negligible impact on the Islands.

The safety of all shipping and fishing vessels, and all ports and oil installations in the area was also reviewed during the meeting. The States were asked to ensure that all fishermen are brought back to shore and messages in local languages over mobile phones, television, social media and through village panchayats are disseminated.

The Statesman
25.05.2021

MAY RECORDS 2ND HIGHEST RAINFALL IN 121 YEARS : IMD

May records 2nd highest rainfall in 121 years: IMD May records 2nd highest rainfall in 121 years: IMD BY Team MP11 June 2021 1:11 AM Team MP11 June 2021 1:11 AM New Delhi: May received the second highest rainfall in 121 years, the India Meteorological Department (IMD) said in its monthly report Thursday, attributing two back-to-back cyclones and western disturbances for the record precipitation. It also said that at 34.18 degrees Celsius, the average maximum temperature over India this May was the fourth lowest since 1901. The lowest ever temperature recorded for May was 32.68 degrees Celsius in 1917. The temperature was lowest since 1977 when it was of 33.84 degrees Celsius, the IMD said. There was no significant heat wave spell observed during the month over any parts of India, he said.

Rainfall over the country as a whole for the month of May 2021 shows that it has recorded 107.9 millimetres which is 74 per cent more than its Long Period Average (LPA) of 62 mm. "Rainfall over India during the month of May was second highest since 1901. The ever highest rainfall occurred in the year 1990 (110.7mm)," the IMD said in its monthly report for May. May saw formation of a cyclone each in the Arabian Sea and the Bay of Bengal. Tauktae formed over the Arabian Sea and developed into an 'extremely severe cyclonic storm'. It hit the Gujarat coast on May 17 after battering states along the western coast.

Cyclone 'Yaas' developed over the Bay of Bengal and intensified into a 'very severe cyclonic storm'. It hit the Odisha coast on May 26 and also affected West Bengal. These two systems brought rainfall not only over the states along the western and eastern coasts but also to other parts of the country. For instance, as Cyclone 'Tauktae' weakened, it headed towards north India and brought rains over several parts of north India. Similarly, Yaas' brought rains over east India including Jharkhand, Bihar as it weakened. The IMD said that in all three months of the summer of 2021, frequencies of western disturbance activities over north India were higher than normal.

In March, April and May 2021, it was seven, nine and eight respectively against normal of 4-6 WDs, the IMD added. Western disturbances are cyclonic storms that originate in the Mediterranean, traverse across Central Asia and hit the north India. They are critical to northwest India as they are a major source of snow and rainfall during the winters. Like in March and April 2021, heat wave conditions in May 2021 was occasional and also for shorter periods over very small region. "No significant heat wave occurred during the month over the country except northwest Rajasthan where it was observed for two days on May 29 and 30, the IMD said.

Millennium Post
10.06.2021

SYL PROJECT : CENTRE TO PUSH FOR KHATTAR-AMARINDER MEET

The Centre will push for a joint meeting of Punjab Chief Minister Capt Amarinder Singh and his Haryana counterpart Manohar Lal Khattar to resolve the contentious matter concerning the Sutlej-Yamuna Link (SYL) canal. Khattar told this to the media after having met Union Jal Shakti Minister Gajendra Singh Shekhawat here today. A few months ago, Capt Amarinder had assured the ministry to convene a meeting at his end. It has, however, not materialised yet.

Khattar also met Environment and Forest Minister Prakash Javadekar and urged for exemption from the rule which prohibits operation of industries based on coal and other traditional fuel in areas where LPG, CNG and PNG pipelines have not been laid. The Environment Ministry acceded to Khattar's request with regard to industrial units in eight districts of the state. Also, permission for smooth running of formaldehyde units in Yamunanagar would be granted by the ministry soon.

With regard to sharing of the Yamuna waters with Delhi, Khattar informed Shekhawat that Haryana was providing the national capital more than its share even though Haryana was facing shortage of water. The Centre has sanctioned about Rs 1,120 crore for the implementation of the Jal Jeevan Mission (JJM). Khattar requested that the state should be provided with a financial help of Rs 3,200 crore for its "Mahagram" project, under which sewage pipelines would be laid in 130 villages.

The Tribune
19.06.2021

INDIRA GANDHI CANAL REPAIR ACCOMPLISHED IN RECORD TIME

In an engineering feat, the repair and relining of the Indira Gandhi Canal, the country's longest canal which terminates in irrigation facilities in Thar desert, was accomplished in a record 60-day period amid the second wave of the pandemic, restoring 70 km of both the main canal and the feeder distributaries. The work was taken up mainly in Rajasthan and partly in neighbouring Punjab.

The project was a race against time, as the repairs required closure of the canal system, which directly impacted the drinking and irrigation needs of 1.75 crore people as well as numerous cattle, Army cantonment along the International Border and industrial usage in the border districts. Thousands of workers and officials worked round the clock with strict COVID protocols to achieve the target on time.

After the relining of the 23-km stretch was taken up in Punjab on March 30 this year for execution in 60 days, it was a Herculean task for Rajasthan, which being on the downstream had only 30 days to repair a stretch of 47 km. The State government worked out a water contingency plan for two months for the affected areas and defined a strict deadline for the feeder and main canal.

The safe carrying capacities of Indira Gandhi feeder had dropped from 18,500 cusecs to about 12,000 cusecs over a period of time, while more than 1,000 cusecs of this was being lost in seepage. An initiative from Chief Minister Ashok Gehlot for rehabilitation of the system received support from his Punjab counterpart, as the lining of the canals had been severely damaged because of continuous flow of water.

Farmers' dependence on the Canal is at the minimum during the post-rabi crop season and before the onset of the kharif season, when the maintenance work is usually taken up. "However, never before were the works conducted on this massive scale or for such a long duration in the canal," Naveen Mahajan, Principal Secretary, Water Resources, told The Hindu on Monday.

Though a tripartite agreement for the project was signed among the Union Ministry of Water Resources and the Rajasthan and Punjab governments on January 23, 2019, for rehabilitation of Rajasthan and Sirhind feeders, the pandemic-triggered lockdown halted the process after rabi season in 2020.

When the work was finally taken up during the modified lockdown, as the second wave of pandemic surged across the country, the officials were better prepared for the situation. Mr. Mahajan said the relining of 47-km-long stretch in the State was successfully executed at a cost of ₹238 crore during the 30-day closure period between April 29 and May 28.

"After accounting de-watering and desilting, only 22 to 25 days were actually available for the work," Mr. Mahajan said. Nearly 13,650 cubic metres of concrete was laid on each day, as the feeder canal has bed width of 40 metres with the side sloping height of 11.5 metres. A three-shift and round-the-clock work plan was executed for the first time in the canal.

Mr. Mahajan said an effective management had helped the project to prevent outbreak of the virus infection and led to the achievement of target within the stipulated time. This would bring an additional water supply for the people on the downstream and save on considerable seepage losses, he said.

The Hindu
22.06.2021

WATER ROW : TELANGANA, AP OFFICIALS IN TENSE FACE-OFF

The inter-State river water dispute between Telangana and Andhra Pradesh turned into a tense face-off between the officials of the two States on Thursday even as a huge police force were deployed by both at several key irrigation and hydel projects on either side of the State borders.

Besides the Nagarjunasagar Project (NSP), security was beefed up at the Jurala and Pulichintala projects too. The Telangana police closed the road leading to the hydel power plant of the NSP by setting up barbed wire fencing. Tense moments unfolded during the day when the Superintendent Engineer of NSP Right Canal from AP, Purushotham Reddy, tried to make his way through the police barricade to meet the NSP Chief Engineer on the Telangana side to submit a letter. He was, however, stopped by the police at the State border near the new bridge.

The AP official then called up his Telangana counterpart, who, however, turned down his request to either meet him or accept the letter, leading to some tense moments.

At the Pulichintala project, however, Superintendent Engineer of Irrigation, AP, Shyam Prasad submitted a letter to TS Genco Superintendent Engineer Deshya Naik at Vajinepally in Chinthapalem mandal of Suryapet district demanding that Telangana stop power generation at the project. They held discussions amid tight security from both States. Shyam Prasad alleged that the water level in the project is lower than the Minimum Draw Down Level (MDDL). Deshya Naik informed him that the matter should be taken up with the Engineer-in-Chief of Irrigation, Telangana.

The entire drama was a fallout of the continued defiance of the AP government with regard to stopping works on the Rayalaseema Lift Irrigation Scheme (RLIS) in gross violation of orders issued by both the National Green Tribunal and the Krishna River Management Board. Notwithstanding the friendly approach of the Telangana government, AP drew first blood by taking up the RLIS works and continued to defy the NGT and KRMB orders.

Later, Purushotham Reddy, speaking to the media, expressed his displeasure over the “attitude of Telangana officials.” “What is wrong in accepting a protest letter from us? There is a need to provide irrigation facility to farmers of the right canal ayacut for the monsoon crop. The Telangana government’s decision to generate power at hydel plants at the Nagarjunasagar and Pulichinthala projects at a time when the water level is low water is nothing but wastage of water,” he said.

While Telangana police imposed a ban on the movement of vehicles and people on the Pulichinthala dam, Superintendent of Police, Guntur (Rural), Vishal Gunni said required police forces were deployed in some places. Overall, the situation was peaceful, he added.

Telangana Today
02.07.2021

HEAVY RAINS UNLEASH HAVOC IN WEST, SOUTH INDIA; 129 DIED IN 48 HOURS

A total of 129 people have died in rain-related incidents in Maharashtra in 48 hours, a senior state disaster management official said on Friday, as heavy showers lashed several parts of west and southern India. The toll includes 38 deaths in a landslide in Talai village in coastal Raigad district's Mahad tehsil on Thursday. Besides landslides, several people were swept away in floodwaters. The official put the death toll in various incidents in western Maharashtra's Satara district at 27. Other fatalities included those reported from eastern districts such as Gondia and Chandrapur, official said.

Besides, 10 people are feared trapped after a landslide in the coastal Ratnagiri district, while 11 more on board a bus had a narrow escape as they were rescued just before the vehicle got washed away into a river in Kolhapur district. The Maharashtra government announced an ex-gratia of Rs five lakh each to the kin of people who have died in landslides triggered by heavy rains in different parts of the state. The injured will be treated in hospitals at the government's expense, it said in a statement. Prime Minister Narendra Modi condoled the loss of lives in Raigad district and announced an ex gratia of Rs 2 lakh for the next of kin of the deceased.

The situation is being closely monitored, he said. In addition, three people lost their lives in rain-related incidents in Karnataka and two are missing, with the state government sounding a red alert in seven districts. The India Meteorological Department (IMD), meanwhile, issued two red alerts of heavy to very heavy rainfall for isolated places in eastern and western parts of Madya Pradesh. It issued a red alert for six districts of Maharashtra too, forecasting "extremely heavy" rainfall and recommending preventive actions. The alert was issued for Raigad, Ratnagiri and Sindhudurg in coastal Konkan and also for Pune, Satara and Kolhapur in western Maharashtra.

Several parts of Goa, including Sattari and Bicholim tehsils in the north and Dharbandora in the south, are reeling under a flood-like situation, and a large number of houses were inundated as the water level of some rivers rose following heavy rains over the past few days. Heavy rains in various parts of Karnataka over the past 24 hours have claimed three lives, led to landslides in eight places and evacuation of about 9,000 people. The Indian Coast Guard said that it conducted a day-long rescue operation in the flood-hit Uttara Kannada District and rescued 161 people from Khargejoog village, Unglijoog, Kharejoog and Bodojoog Islands.

The Indian Railways cancelled a few trains due to landslides between Sonalium-Kulem, and Dudhsagar-Caranzol. The rivers Krishna, Cauvery, Tungabhadra, Bhima, Kapila (Kabini) and many others in Malnad and coastal Karnataka are in spate, an official said, sharing details that showed 131 villages in 18 taluks are badly hit, affecting 16,213 people. The red alert has been sounded in Dakshina Kannada, Udupi, Uttara Kannada, Shivamogga, Chikkamagaluru, Hassan and Kodagu districts for the next 24 hours. In Telangana, several low-lying areas faced inundation and road links were disrupted following heavy rains during the last two days. The National Disaster Response Force (NDRF) personnel rescued a group of seven people who were stuck at an ashram in Nizamabad district. Several rivulets and other water bodies were in spate and road links in various villages in the state have been disrupted. Up north, it was a humid day in Delhi and day temperatures were close to normal limits in Punjab and Haryana, while there was light to moderate rainfall and thundershowers at a few places in Uttar Pradesh. The national capital recorded a maximum temperature of 34.8 degrees Celsius and a minimum of 26.3 degrees Celsius, while the humidity levels oscillated between 94 per cent and 64 per cent. The weatherman has predicted partly cloudy skies with the possibility of thundery development for Saturday. The IMD has issued an orange alert for July 26 and has forecast generally cloudy skies with moderate rain and thundershowers accompanied with gusty winds of up to 30-40 km/hr. It has also issued a yellow alert for July 27. In Uttar Pradesh, monsoon rains lashed Jhansi, Mainpuri, Firozabad, Shahjahanpur, Bareilly, Bahraich, Kannauj, Etah, Lalitpur, Jaunpur, Kheri, Ambedkar Nagar, Sitapur, Hamirpur, Aligarh, Pilibhit

and Jalaun on Friday. The weather office said rain and thundershowers are very likely at a few places over western Uttar Pradesh and at isolated places over the eastern part of the state on Saturday. Rain and thundershowers are very likely at many places over western UP and at a few places in the eastern part on July 25, the Met said. In its weather warning, the IMD said isolated extremely heavy falls are very likely over Konkan, Goa and central Maharashtra in the next two days. Scattered to fairly widespread rainfall with isolated heavy falls are likely to continue over Gujarat till July 23, but its intensity will increase from July 24, it said.

Millennium Post
24.07.2021

YAMUNA IS NOT FIT FOR BATHING WITHOUT ENVIRONMENTAL FLOW, CENTRAL GOVT. TOLD

The Yamuna cannot become fit for bathing in the absence of a minimum environmental flow in the river, the Delhi government has said in a report submitted in the Union Jal Shakti Ministry. It also said of the 35 sewage treatment plants in Delhi, 22 do not meet the wastewater standards prescribed by the Delhi Pollution Control Committee (DPCC). Of the 13 Common Effluent Treatment Plants in industrial areas across Delhi, only six comply with the DPCC standards for wastewater. "Minimum environmental flow for the dilution of the polluted water in the Yamuna in Delhi is required to meet the desired water quality levels in the river for bathing purpose i.e. BOD<3 mg/l and DO>5 mg/l," the report read.

According to the International Union for Conservation of Nature, an environmental flow is the water provided within a river, wetland or coastal zone to maintain ecosystems and their benefits where there are competing water uses and where flows are regulated. A study conducted by National Institute of Hydrology, Roorkee, has recommended that 23 cubic metre per second (cumec) water be released in the river from the Hathnikund Barrage in Haryana's Yamuna Nagar district in the lean season for sustaining downstream ecosystems. "The ministry/National Mission for Clean Ganga has observed that the water sharing agreement of 1994 among the riparian states of Uttarakhand, Himachal Pradesh, Uttar Pradesh, Haryana, Rajasthan and Delhi is due for revision only in 2025 unless any of the states so demand, implying that no revision of water sharing will be possible to achieve the E-flow in the Yamuna," the city government's report read. "In the absence of a minimum environmental flow of the Yamuna in Delhi, it is very difficult to achieve bathing quality standards," it said. The 22 km stretch of Yamuna from Wazirabad to Okhla in Delhi, which is less than two per cent of the river length, accounts for about 80 per cent of the pollution load in the river. There are 18 major drains, including Shahdara, Najafgarh and Barapulah, which outfall in the river. Untreated wastewater and poor quality of effluent discharged from CETPs and sewage treatment plants is the major reason behind pollution in the river in Delhi, according to experts.

The DPCC also told the ministry that of the 35 sewage treatment plants in Delhi, 22 do not meet the prescribed wastewater standards with respect to total soluble solid, chemical oxygen demand, biological oxygen demand, dissolved phosphate and ammonical nitrogen. Ammonical nitrogen and phosphate in the wastewater should be less than 5 mg/l and 2 mg/l, respectively. According to DPCC norms, TSS should be less than 10 milligram per litre, BOD should be less than 10 mg/l and COD should be below 50 mg/l. In an inspection conducted in June, 34 of the 35 STPs were found operational. Samples could be collected from 33 STPs. Of these, 11 were found complying to the standards prescribed by the DPCC. Inspections could not be conducted in April and May due to the Covid pandemic, the DPCC said. Delhi generates around 720 million gallons a day of sewage which is treated at these 35 STPs having a cumulative treatment capacity of 597 MGD. Around 86 per cent of the treatment capacity is being utilised at present, according to government data.

Millennium Post
27.07.2021

PURI FIRST CITY IN THE COUNTRY TO SUPPLY CLEAN DRINKING WATER 24X7

On Saturday morning, Odisha housing and urban development minister Pratap Jena filled a glass with water from one of the several water fountains installed on Grand Road leading to the Jagannath Temple before drinking it. As camera flashes went off and TV news reporters swarmed around, Jena also put his mouth close to the water source and drank from it to emphasise the state government's latest announcement of Puri becoming the first Indian city where one can "drink straight from the tap".

While Jena exhorted everyone to drink from the taps, newspapers and TV channels in Odisha have been awash with government advertisements about the holy town becoming the first Indian city to have 24-hour safe drinking water facility like that in London and Singapore. The scheme, named Sujal, was first launched in October last year by chief minister Naveen Patnaik in a pilot mode with an aim to provide clean drinking water from taps to 1.5 million people in 15 towns of Odisha by March 2022. The deadline has now been revised to October 2023.

"While other cities in India like Mumbai, Delhi or Chennai may be providing clean drinking water, it is surely not available for entire 24 hours. Our system is fully automated to correct any anomaly in the supply of clean drinking water through taps to all households in the city. The water from taps is now ready for consumption without any more filtration," said Odisha housing and urban development secretary G Mathivathanan.

In several neighbourhoods of Puri town, the reactions to the government claim have been a mix of incredulity and mild approval. Sabita Das, a 71-year-old woman in Puri's Haragouri Sahi, one of the several people having 24-hour water supply lines, said the water now tastes different. "For several years, I have been drinking water from a water purifier. I somehow don't like the taste of this water."

Sanjib Kumar Panda in Duttatota Sahi of Puri said the water was not of great quality, while Rashmita Mallick of Mangalahat area said the water quality is now good.

Before the tap water scheme was made operational, people like Mallick and Panda in the seaside town received their drinking water from groundwater sucked up by massive pumps in the Baliapanda area. The water was lifted to overhead tanks and then chlorinated before being supplied to houses. Some drew water from their borewells or handpumps which they either boiled or filtered.

Under the Sujal scheme, the government now draws water from the Bhargavi river flowing near the town. The water is then channelised to a reservoir and then sent to a treatment plant at Samang. There, it goes through several processes including chlorination before being sent through a network of pipes to 250,000 people. While the water demand of Puri town is about 32-34 million litres per day, the plant purifies 42 million litres.

Experts say that to supply water that can be had straight from the tap anywhere in India, the water quality has to adhere to at least 30-odd parameters of IS 10500 of BIS. "If any parameter exceeds the limit, the water is considered unfit for human consumption...," said Dr Bharat Sharma, senior researcher at New Delhi's International Water Management Institute. PK Swain, managing director of Water Supply Corporation of Odisha, a government company looking after operation and maintenance of water supply in the state, said the water that is now being supplied conforms to ISO 10500 specifications.

Hindustan Times
02.08.2021

RENEGOTIATE INDUS WATER TREATY TO ADDRESS IMPACT OF CLIMATE CHANGE: PARLIAMENTARY PANEL

A parliamentary panel has recommended renegotiating the Indus Water Treaty with Pakistan to address the impact of climate change on water availability in the river basin, along with other challenges which are not covered under the agreement.

The Standing Committee on Water Resources has also recommended that India should constantly monitor the Chinese actions to ensure that they do not pursue any major interventions on the Brahmaputra river which could adversely affect India's national interests. The panel tabled the report before Lok Sabha on Thursday.

As per the Indus Waters Treaty between India and Pakistan in 1960, all the waters of the eastern rivers — Sutlej, Beas and Ravi — are allocated to India for unrestricted use. The waters of western rivers — Indus, Jhelum, and Chenab — have been assigned largely to Pakistan.

According to the treaty, India has been given the right to generate hydroelectricity through run-of-the-river projects on the western rivers, subject to specific criteria for design and operation. This treaty also gives Pakistan the right to raise objections to Indian hydroelectric project designs on the western rivers.

Discussing the treaty, the committee recommended that the government should examine the feasibility of making the maximum use of the provisions in terms of full utilisation of all accessible water of the eastern rivers and the maximum utilisation of the irrigation and hydropower potential of western rivers including permissible water storage.

The panel observed that although the Indus Water Treaty has stood the test of time, it was framed on the basis of knowledge and technology existing at the time of its agreement in the 1960s. Therefore, the perspective of both the nations at that time was confined to river management and usage of water through construction of dams, barrages, canals and hydro-power generation.

"Present day pressing issues such as climate change, global warming and environmental impact assessment etc were not taken into account by the treaty," said the report

"In view of this, there is a need to renegotiate the treaty so as to establish some kind of institutional structure or legislative framework to address the impact of climate change on water availability in the Indus basin and other challenges which are not covered under the treaty," it added.

Accordingly, the committee urged the government to take necessary diplomatic measures to renegotiate the Indus Water Treaty with Pakistan.

With regards to China, the panel observed that there is no water treaty between New Delhi and Beijing. However, Memoranda of Understanding (MoUs) on Brahmaputra and Sutlej rivers have been signed by the two nations, which will be in force for five years and are renewed regularly.

Further, an Expert Level Mechanism (ELM) between both the nations is also in place for ensuring co-operation with regards to provision of hydrological data by China during flood season, emergency management and other issues pertaining to trans-border rivers as agreed upon by the two countries.

Expressing satisfaction over China sharing hydrological data of the Brahmaputra and Sutlej river, albeit on payment basis, the committee pointed out that the only aberration was the year 2017 when no

data was supplied by it. This coincided with the 73-day Doklam stand-off between the two countries that took place during the peak monsoon period.

Conversely, the committee also expressed its apprehension about the run-of-the-river projects undertaken by China, which may not lead to diversion of waters, but contain every possibility that the water can be stored in pondages and released for running turbines. This may lead to certain diurnal variation in downstream flow and as a consequence have an impact on water flow in the Brahmaputra river, impacting India's endeavours to tap the region's water resources. The Brahmaputra is critical to water security of northeast India and Bangladesh.

"The committee recommend that India should constantly monitor the Chinese actions so as to ensure that they do not pursue any major interventions on Brahmaputra river which would adversely affect our national interests," said the report.

In November last year, Yan Zhiyong, the chairman of the Power Construction Corp of China, said that his country will "implement hydropower exploitation in the downstream of the Yarlung Zangbo River" (the Tibetan name for Brahmaputra) and the project could serve to maintain water resources and domestic security.

Responding to the panel, Ministry of External Affairs (MEA) informed that three hydropower projects on the main stream of Brahmaputra river, in the Tibet Autonomous Region, have been approved by the Chinese authorities and a hydropower project at Zangmu was declared fully operational by Chinese authorities in October 2015.

The MEA said the government is carefully monitoring all the developments on the Brahmaputra and has consistently conveyed its views and concerns to the Chinese authorities in order to ensure that the interests of downstream countries, like India, are not harmed by any activities undertaken in upstream areas.

"China has conveyed to India on several occasions that they are undertaking run-of-the-river hydropower projects which do not involve diversion of the waters of the Brahmaputra," the MEA told the panel.

The Hindu
06.08.2021

190 CHECK DAMS, 12 DAMS TO BE BUILT IN TN: DURAIMURUGAN

As many as 190 check dams, four underground check dams, six barrages and 12 dams will be constructed in the State for the welfare of farmers, announced Minister for Water Resources Duraimurugan in the Assembly on Monday.

During the reply after the debate on demands for grants for the department, the Minister said that steps will be taken to achieve the full capacity of Mettur, Amaravathi, Vaigai, Pechiparai, Gundaru, Rama Nathi, and Wellington dams, and also the Kaveripakkam lake.

"A total of 200 ponds will be rejuvenated in 23 districts under the Prime Minister's Agriculture Irrigation Scheme, and 207 lakes and supply channels of water bodies in 31 districts would be rejuvenated step by step with financial assistance from the National Bank for Agriculture and Rural Development (NABARD)," he added.

Referring to the major irrigation scheme, Duraimurugan said that survey works for seven water resource projects will be carried out this year to study feasibility and prepare a comprehensive assessment. “A total of 50 small irrigation ponds in Sivaganga, Ramanathapuram, Thanjavur and Tiruppur districts will be upgraded. Three ponds will be established in Vellore, Theni and Dindigul districts to store rainwater effectively.

Further, five new water channels will be established in Thiruvannamalai, Viluppuram, Thiruvallur, Tenkasi and Thoothukudi districts,” he further said. He promised to regularise 1,458 temporary staff of the department.

New Indian Express
24.08.2021

KRMB ASKS ANDHRA PRADESH TO SUBMIT DPRS OF NEW IRRIGATION PROJECTS

The Krishna River Management Board (KRMB) has asked the Andhra Pradesh government to furnish views and submit the Detailed Project Reports (DPRs) of the proposed irrigation schemes and projects immediately to it.

In a letter to the Engineer-in-Chief, Andhra Pradesh Water Resources Department, KRMB member DM Raipure referred the letter received from the Engineer-in-Chief, Telangana Irrigation and Command Area Development (CAD) C Muralidhar requesting the board to restrain AP from unauthorised enhancement of scope for surplus water based projects including Telugu Ganga Project (TGP) and Veligonda project by AP government in violation of provisions of Andhra Pradesh Reorganisation Act (APRA) – 2014.

Muralidhar complained to the KRMB that taking up surplus based projects including TGP and Veligonda would be detrimental to the interests of projects in Telangana serving acute drought-prone fluoride affected basin areas apart from the settled ayacuts of Nagarjuna Sagar Project command downstream of Srisailam project in addition to the drinking water needs of Hyderabad.

Moreover, Telangana was pleading before the Krishna Water Disputes Tribunal-II (KWDT-II) to allocate water giving priority to the inside in basin projects. Further, the very question of allowing Pothireddypadu Head Regulator (PRP HR) during flood flows is under adjudication by the KWDT-II under Section 89 proceedings.

Muralidhar requested the KRMB to restrain AP from modifying the scope of TGP and adding new components based on the Krishna waters without proper approvals from officials concerned. He also requested the board to bring the issue to the notice of the Ministry of Water Resources for taking necessary action at the earliest.

Telangana Today
07.09.2021

CENTRE STEPS UP BID TO TAKE UP TS, AP IRRIGATION PROJECTS

The union ministry of Jal Shakti (MoJS) has stepped up efforts to implement its gazette taking over irrigation projects on the Krishna and the Godavari rivers in Telangana and Andhra Pradesh as scheduled from October 14.

The MoJS held a meeting with chairmen of the Krishna River Management Board (KRMB) and the Godavari River Management Board (GRMB) in Delhi on Monday to finalise the modalities for implementing the gazette issued on July 15. The ministry on Monday appointed two chief engineers each for two boards to oversee the implementation of the gazette.

Although both the Telangana and the AP governments have raised several concerns and doubts on the gazette and sought deferment of implementation of the gazette until their concerns and doubts are addressed, the MoJS did not give any hint on deferment, according to official sources in the irrigation department.
Telangana Chief Minister K. Chandrashekar Rao sought deferment of implementation of the gazette when he met union Jal Shakti minister Gajendra Singh Shekhawat during his recent visit to Delhi on September 6. But there has been no response from MoJS on the Chief Minister's request so far.

As the October 14 deadline is just a month away, the MoJS has initiated the process to take over irrigation projects in Telangana and Andhra Pradesh. Both the governments requested the MoJS to take control of only common projects in Krishna basins like Srisailam, Nagarjuna Sagar and Pulichintala and to remove other projects which are under the territorial jurisdiction of respective states from the gazette.

Both the governments also requested to remove projects in the Godavari basin from the gazette since there are no common projects. They urged MoJS to allow respective states to operate projects on their own in consultation with the boards, which are not common projects.

However, the MoJS did not respond to any of the issues raised by the Telangana and the AP governments during the meeting held in Delhi on Monday. Official sources said the MoJS only asked the chairmen of the KRMB and the GRMB to go ahead with the implementation of gazette as scheduled from October 14.

Deccan Chronicle
14.09.2021

KARNATAKA DIRECTED TO RELEASE CAUVERY WATER

The Cauvery Water Management Authority (CWMA) on Monday directed Karnataka to immediately release "some quantity" of water towards making good the shortfall in realisation of the latter's share of Cauvery water.

The release should be as per the Cauvery Water Disputes Tribunal's decision of 2007, which was modified by the Supreme Court in 2018.

Disclosing this, S.K. Haldar, chairman of the Central Water Commission, who is also the head of CWMA, told The Hindu over phone that the situation would be reviewed at the next meeting, scheduled to be held early October. He added that Tamil Nadu too had been asked to clear the deficit in the receipt of water by Puducherry for irrigation in the Karaikal region.

The authority will meet again on October 7, said a member of the Tamil Nadu team of Water Resources Department officials, adding that the State had agreed to release half a thousand million cubic feet (tmc ft) of water to Puducherry.

According to a release issued by the Tamil Nadu government later in the day, the present shortfall in realisation is 33.7 tmc ft. Till September 26, Karnataka has supplied 85.8 tmc ft, since June 1, against the prescribed quantity of 119.5 tmc ft. "Karnataka has not followed the judgment of the Supreme Court

on water sharing for Tamil Nadu properly," the release said. It said the neighbouring State, despite being told by the authority to release water at the previous meeting, did not "fully implement" it.

To persistent queries, Mr. Haldar refused to get drawn into specifying any quantity of water to be released by Karnataka. However, he indicated that "as on date, [the] Mettur [reservoir] has not got the storage it used to have. Going by the 30-year average, it used to have a good storage of 40-45 tmc ft. Compared with that, there is some deficiency, and at least that quantity should be made up. "

On Monday morning, Mettur's storage was 35.774 tmc ft (capacity: 93.47 tmc ft), with the water level remaining at 73.49 ft (full level: 120 ft). Discharge through the river and canal was marginally higher than the inflow, which was about 7,000 cubic feet per second (cusecs).

The CWMA chairman said Karnataka had drawn to his attention the "deficient rainfall" in its part of the Cauvery basin. "We have conceded their point," he said. The meeting, which lasted about two-and-a-half hours, was attended by officials of the Tamil Nadu government, physically, while representatives of other States, including Karnataka, took part virtually.

The Tamil Nadu team consisted of Sandeep Saxena, Additional Chief Secretary (ACS - Water Resources and Public Works); R. Subramanian, chairman of the Cauvery Technical Cell, and Pattabhiraman, member of the cell. Among others present were K. Jaiprakash, managing director, Cauvery Neeravari Nigam Limited of Karnataka; T.K. Jose, ACS (Water Resources) of Kerala, and A. Vikranth Raja, commisioner-cum-Secretary (Public Works) of Puducherry.

The Tamil Nadu government opposed any discussion on the Mekedatu dam project, as the matter was sub judice. The release quoted Mr. Haldar as saying that the matter was not taken up for discussion, as Tamil Nadu, Kerala and Puducherry had opposed it.

The Hindu
28.09.2021

GLOBALLY, INDIA RECORDED THE HIGHEST LOSS IN TERRESTRIAL WATER STORAGE

Terrestrial water storage (TWS) dropped at a rate of 1 cm per year in 20 years (2002-2021), according to a new report *2021 State of Climate Services* released by the World Meteorological Organization (WMO). The biggest losses have occurred in Antarctica and Greenland. But many highly populated, lower latitude locations have also experienced TWS losses, according to the report.

This includes India, where the TWS has been lost at a rate of at least 3 cm per year. In some regions, the loss has been over 4 cm per year too. India has recorded the highest loss in terrestrial water storage if the loss of water storage in Antarctica and Greenland is excluded. India is, therefore, the 'topmost hotspot of TWS loss', according to the WMO analysis. The northern part of India has experienced the maximum loss within the country.

TWS is the sum of all water on the land surface and in the subsurface, ie surface water, soil moisture, snow and ice and ground water. Water is a key prerequisite for human development. But only 0.5 per cent of water on Earth is usable and available as freshwater. Water resources across the world are under tremendous pressure due to human and naturally-induced stressors. These include population growth, urbanisation and decreasing availability of freshwater. Extreme weather events too have been responsible for the pressure on water resources realised across sectors and regions, the WMO noted.

Indian scenario

In India, per capita water availability is reducing due to an increase in population. The average annual per capita water availability has been consistently decreasing. It reduced to 1,545 cubic metres in 2011, from 1,816 cubic metres in 2001.

It is projected to further decrease to 1,367 cubic metres in 2031, according to the Union Ministry of Housing and Urban Affairs. Five of the 21 river basins in India are 'absolute water scarce' (per capita water availability below 500 cubic metres) according to the Falkenmark Water Stress Indicator. Five are 'water scarce' (per capita water availability below 1,000 cubic metres) and three are 'water stressed' (per capita water availability below 1,700 cubic metres).

By 2050, six will become absolute water scarce, six will become water scarce and four will become water stressed, according to the State of India's Environment in figures, 2020. The publication, brought out by *Down To Earth*, based its predictions on projections by the Central Water Commission, India.

Down to Earth
06.10.2021

291 HECTARES OF FOREST LAND TO BE DIVERTED FOR KONDHANE DAM

Just over 291 hectares of forest land (equal to 32 Oval Maidans) in Raigad and Pune districts are likely to be diverted for the controversial Kondhane Dam project which is proposed to be built across the Ulhas River and will provide 245MLD (millions of litre per day) of water a day to emerging localities in the southern end of Navi Mumbai.

The City Industrial Development Corporation (Cidco), which is executing the project, applied for stage-1 forest clearance on October 16, official documents show. The project's total land requirement (including non-forested area), is 400 hectares. At a per capita water requirement of 135 litres per day, the dam is expected to benefit a population of 1,850,000 people. Construction work is estimated to take five years, though it is yet unclear when construction will resume.

Ganesh Phadke, executive engineer (Kondhane-Balganga), Cidco, did not respond to calls seeking comment on Saturday. However, a senior official in Cidco's environment office said, "The project is very much on the cards, but it is starting with a clean slate. The earlier contractor has been blacklisted, and even the detailed project report was prepared afresh by Cidco. Some portion of the water will be used for irrigation, but the majority will go to the Navi Mumbai Airport Influence Notified Area (Naina) region and also Pushpak Nagar, which are expected to see a big boom once the Navi Mumbai International Airport is constructed."

The Kondhane dam was the first of several irrigation projects sanctioned during the Congress-Nationalist Congress Party (NCP) regime and had come under the scanner for alleged corruption and cost escalations during the Maharashtra irrigation scam. The Konkan Irrigation Development Corporation (KIDC) was to initially build the dam at a height of 39 metres at a cost of ₹56.16 crore. The first detailed project report was prepared in 2006-07.

The state water resources department had tried to push the project twice earlier with a much higher cost of ₹443.94 crore and a height of about 71 metres, but could not pass the scrutiny of government agencies. Within months of the KIDC taking up the project, its scope was widened and the cost escalated. Construction began in 2011, and by 2012 the project cost climbed to ₹614 crore

from ₹56.16 crore, as per an investigation by the anti-corruption bureau (ACB). The previous contractor had completed about a quarter of the work, as per previous design specifications. The cost of the revived project, Cidco submitted to the forest department, now stands at ₹155,000 lacs (₹1,550 crore).

The subsequent Bharatiya Janata Party (BJP) government in 2017 revived the project and handed it over to Cidco, this time as a drinking water project for the 644 sq km Naina, which is located 35kms away from the proposed dam. In 2017, Cidco paid ₹99 crore to the water resources department to acquire the project. Presently, the rest of Navi Mumbai draws water from the Hetawane Water Supply Scheme MJP's Patalganga Project, the Navi Mumbai Municipal Corporation's Morbe Dam and MIDC's Barvi Dam.

"The ultimate saturated water demand of present Cidco and Naina area in 2034 is likely to be 1275MLD," Cidco said in a project brief submitted to the forest department. As per current specifications, the Kondhane Dam project "envisages construction of 80m high dam across River Ulhas at Kondhane Village with a full reservoir level at EL (elevation). Around 140.0 metres and corresponding storage of 115.98 million cubic meters (MCM)", the project note clarifies.

The dam will displace two villages, Kondhane and Chochi, and 118 families are proposed to be relocated to about 8kms away. Other villages affected include Udewai, Kune and Nandgaon. As per information submitted to the forest department by Cidco, the process for settlement of rights under the Forest Rights Acts (2006) has been completed.

Hindustan Times
23.10.2021

SOUTHWEST MONSOON WITHDRAWAL FROM COUNTRY THIS YEAR SEVENTH-MOST DELAYED SINCE 1975 : IMD

The southwest monsoon withdrew from the entire country on Monday, making it the seventh-most delayed retreat since 1975, according to the India Meteorological Department (IMD). In view of a significant reduction in rainfall activity over most parts of the country, the southwest monsoon has withdrawn from the entire country today (October 25, 2021). Simultaneously, with the setting in of northeasterly winds in the lower tropospheric levels, the northeast monsoon rain has commenced over extreme south peninsular India today, the IMD said in a statement. The withdrawal of the southwest monsoon 2021 from the entire country is the seventh-most delayed withdrawal (on or after October 25) during 1975-2021, it said.

The southwest monsoon retreated on or after October 25 five times between 2010 and 2021 in 2017, 2010, 2016, 2020 and 2021, the IMD data showed. The southwest monsoon started receding from west Rajasthan and adjoining Gujarat on October 6, making it the second-most delayed withdrawal since 1975. The withdrawal of the southwest monsoon from northwest India usually begins from September 17. The monsoon withdrawal started on September 28 last year, October 9 in 2019, September 29 in 2018, September 27 in 2017 and September 15 in 2016, according to IMD data. The country received "normal" rainfall during the four-month southwest monsoon season from June to September.

All-India monsoon rainfall during June 1 to September 30 was 87 cm against the Long Period Average (LPA) of 88 cm of 1961-2010 (99 per cent of its LPA). This is for the third consecutive year that the country recorded rainfall in the normal or above normal category. Rainfall was above normal in 2019 and 2020. The rainfall over the country as a whole was 110 per cent in June, 93 and 76 per cent in July and August, respectively — the months that bring the maximum rains. However, the shortfall of July and August was compensated in September which recorded rainfall 135 per cent of the LPA. The southwest

monsoon made its onset over Kerala on June 3, after a delay of two days. It rapidly covered central, west, east, northeast and south India by June 15 It also covered many parts of north India, even Barmer and Jaisalmer — its last outposts — but the monsoon winds failed to reach Delhi, parts of Haryana and west Uttar Pradesh. It then witnessed a lull. It finally covered Delhi, parts of Haryana and west Uttar Pradesh, on July 13, five days after its normal onset date, belying IMD's forecasts. The northeast monsoon, which brings rainfall to southern states from October to December, is likely to be normal, according to the IMD.

Millennium Post
26.10.2021

MISSION GANGA ENTERS GUINNESS BOOK OF WORLD RECORDS

The National Mission for Clean Ganga set a Guinness World Record on the first day of the Ganga Utsav for the highest number of photos of handwritten notes uploaded on Facebook in an hour.

Jal Shakti Minister Gajendra Singh Shekhawat posted his message on Facebook, after which the activity was opened for the public at large. An official said the event was held to raise awareness on Ganga rejuvenation and to expand the reach of the festival. People posted poems or articles on 'Maa Ganga' on the Namami Gange Facebook page.

The Hindu
02.11.2021

AP, ODISHA CMS AGREE TO RESOLVE CONTENTIOUS ISSUES

Odisha and Andhra Pradesh on Tuesday decided to work closely on resolving various inter-state issues, including tackling the problem of left-wing extremism and ganja cultivation. Chief Ministers of the two states, Naveen Patnaik and Y S Jagan Mohan Reddy issued a joint statement to this effect at the end of their two-hour-long meeting in Bhubaneswar on Tuesday evening.

The Chief Ministers discussed a number of issues of mutual interest, particularly in the field of water resources, common boundary, energy, and left-wing extremism.

Terming the meeting as "very cordial and fruitful", the Chief Ministers said they decided to work closely on resolving the contentious Kotia border villages issue, construction of Neradi barrage on river Vamsadhara, Janjhavati reservoir, the release of water from Bahuda river, the Polavaram multipurpose project and issuing of mutual no-objection certificate for Balimela and Upper Sileru power projects.

The Chief Ministers decided that the Chief Secretaries will set up an institutional mechanism to deliberate on the outstanding issues and find a solution that is in the best interest of the people of the two states, the joint statement said. The Andhra Pradesh Chief Minister arrived in Bhubaneswar in late afternoon and held a meeting with his Odisha counterpart at the Lok Seva Bhavan here in the evening.

"Had a very cordial and fruitful discussion on a number of issues of mutual interest, particularly on water resources, common boundary, energy and left-wing extremism," Patnaik tweeted. He also posted pictures of the two greeting each other with flowers.

The Andhra Pradesh Chief minister wrote on the micro-blogging site, "I hope these talks will yield good results soon." The Chief Ministers said the states not only share borders, but also a long and glorious history, and heritage.

The two states will work towards setting up a chair for Odia and Telugu languages in the BR Ambedkar University in Srikakulam, Andhra Pradesh, and Berhampur University in Odisha respectively. Appointment of language teachers in schools in border districts, supply of books, and conduct of language examination will also be taken up to promote brotherhood, the joint statement said.

At times of need, the two neighbouring states have extended full cooperation and assistance, a fact borne out during the natural disasters in the past, it said. The two states resolved to "continue the legacy of mutual cooperation and, in the true spirit of federalism, discuss issues."

There have been several flare-ups in recent months over the ownership of 21 of the 28 villages under Kotia panchayat, which is claimed by both Odisha and Andhra Pradesh. Another major issue is the construction of the Neradi barrage on the Vamsadhara river.

The Vamsadhara Water Disputes Tribunal had recently permitted Andhra Pradesh to go ahead with the construction of the Neradi barrage which is expected to submerge over 106 acres of land in the Rayagada and Gajapati districts of Odisha.

The submergence to be caused by the Polavaram multipurpose project is also another issue.

The matter concerning the height of the proposed dam and alleged change done to the construction of the reservoir without the consent of the Odisha government is sub-judice.

New Indian Express
09.11.2021

SOLAR PANELS TO BE DEPLOYED IN 10 RESERVOIRS

This is part of a larger programme aimed at tapping the State's renewable energy potential Grid-connected floating solar panel units will be deployed in 10 reservoirs as part of a larger programme aimed at tapping the renewable energy potential of the State.

The Kerala State Electricity Board (KSEB) has invited requests for qualification (RFQ) from solar power developers for installing floating solar panels in eight reservoirs managed by it and two under the Kerala Water Authority (KWA). The initiative is to be implemented on a design, build, own and operate model with a period of 25 years.

The eight reservoirs under the hydroelectric projects of the KSEB selected for the floating solar programme are Ponmudi, Kallarkutty, Sengulam, Kallar, Kundala, Madupetty, Anayirankal and Banasurasagar. The Aruvikkara and Peppara reservoirs in Thiruvananthapuram district are the two reservoirs under the KWA.

From this project, the KSEB is eyeing a minimum of 100 MW, R. Suku, director (Renewable Energy and Energy Savings), KSEB, says. KSEB has unveiled its first reservoir-based floating solar facility in the Banasurasagar dam reservoir in Wayanad in 2017.

Being a State that produces just 30% of its daily power requirement, Kerala is eyeing solar power in a big way for augmenting domestic generation. Given the State's geographical peculiarities, scarcity of land is a hindrance in establishing large solar farms. On the other hand, the presence of a large number of waterbodies and reservoirs opens up possibilities for floating solar plants or 'floatovoltaics', according to the KSEB.

According to the KSEB, its hydel reservoirs are spread over thousands of hectares. The surfaces of these waterbodies can be partially used to commercially tap solar photovoltaic power, the KSEB notes.

"After a preliminary assessment of technical and environmental feasibility, a detailed bathymetric survey has to be done to map the underwater topography such as depth of bed from the surface and presence of stumps of submerged trees that is usual in dams," the KSEB notes in a November 20 order giving the go-ahead for the initiative.

The Hindu
05.12.2021

CABINET APPROVES KEN-BETWA RIVER INTERLINKING PROJECT; TO COST RS 44,605 CR

The Union Cabinet chaired by Prime Minister Narendra Modi has approved the funding and implementation of the Ken-Betwa river inter-linking project. The total cost of the Ken-Betwa link project has been assessed at Rs 44,605 crore at 2020-21 price levels and it will be completed in eight years. It will generate 103 MW hydropower and 27 MW solar power. An official release said the union cabinet has approved central support of Rs 39,317 crore for the project, covering a grant of Rs 36,290 crore and a loan of Rs 3,027 crore. It said the project will pave the way for more interlinking of river projects in India and "also showcase to the world our ingenuity and vision".

This project involves the transfer of water from Ken to the Betwa river through the construction of Daudhan Dam and a canal linking the two rivers, the Lower Orr Project, Kotha Barrage and Bina Complex Multipurpose Project.

"The project will provide annual irrigation of 10.62 lakh hectares, drinking water supply to a population of about 62 lakh and also generate 103 MW of hydropower and 27 MW solar power. The project is proposed to be implemented in eight years with state of the art technology," the releases said.

It said the project will be of immense benefit to the water-starved Bundelkhand region, spread across the states of Madhya Pradesh and Uttar Pradesh. The project will provide enormous benefits to the districts of Panna, Tikamgarh, Chhatarpur, Sagar, Damoh, Datia, Vidisha, Shivpuri and Raisen of Madhya Pradesh and Banda, Mahoba, Jhansi and Lalitpur of Uttar Pradesh.

The project is expected to boost socio-economic prosperity in the backward Bundelkhand region on account of increased agricultural activities and employment generation. It would also help in arresting distress migration from this region.

"This project also comprehensively provides for environment management and safeguards. For this purpose, a comprehensive landscape management plan is under finalization by the Wildlife Institute of India," the release said.

An agreement was signed on March 22 this year between the Union Minister of Jal Shakti and the chief ministers of Madhya Pradesh and Uttar Pradesh to implement the first major centrally-driven river interlinking project in the country.

"This agreement heralds the beginning of inter- state cooperation to implement the vision of former Prime Minister Atal Bihari Vajpayee to carry water from areas that have surpluses to drought-prone and water deficit areas, through the interlinking of rivers," the release said.

Times of India
08.12.2021

CENTRE ALLOCATES RS.93,000 CR FOR TOP IRRIGATION PLAN & 2 HYDRO PROJECTS

The Cabinet on Wednesday approved an outlay of over Rs 93,000 crore for its ongoing flagship irrigation scheme - Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) - for 2021-26 and central grant of 90% for two national projects - Renukaji dam project, Himachal and Lakhwar multipurpose project, which would provide storage benefitting six states/UT including Delhi, UP, Haryana, and Rajasthan.

These projects are considered quite critical for water supply to Delhi and other participating states. Besides augmenting water supply in six states/UTs, including annual supply of 498 million cubic meters (MCM) for Delhi, these projects would also provide irrigation benefits and hydro-power. Both the projects, cleared in 2018-19, are key components of the Yamuna rejuvenation programme through ensuring uninterrupted water flow in the river. "Twenty-two lakh farmers would be benefitted from these projects. It will also give a new life to the river Yamuna," said 'Jal Shakti' minister Gajendra Singh Shekhawat while sharing details of the Cabinet decision. Launched in 2015, the PMKSY is an umbrella scheme, providing central grants to the states for specific activities.

Times of India
16.12.2021

WE HAVEN'T FINISHED OUR MISSION, BUT LARGE PATCHES OF GANGA ARE CLEAN

Rajeev Ranjan Mishra, *Director-General, National Mission for Clean Ganga (NMCG), spoke to* The Hindu's **Jacob Koshy** *on steering the organisation, tasked with one of the largest clean-ups in history for close to a decade; the challenges in making the Ganga pollution-free; and his reasons for co-authoring the book,* Ganga: Reimagining, Rejuvenating, Reconnecting.

Since 2014, the government has made the cleaning of the Ganga one of its centrepiece missions and earmarked ₹20,000 crore towards it. How has the mission so far progressed?

Today, we have close to 350 projects of various types and about 160 are sewage treatment plants. All the projects in Uttarakhand and Jharkhand are complete; 60% of the projects are complete in U.P. Bihar is slower as lots of projects being made are brand new but in two years 70% of them should be over. In two years, the majority of the projects along the Ganga will be over. U.P., the most important State, will be over before that. We are also looking at several related aspects, such as improving wetlands, improving the ecological flow (e-flow), along with developing sewage treatment plants.

The Clean Ganga Mission was billed as a ₹20,000 crore project. You have sanctioned projects worth ₹30,000 crore. Is the Ganga measurably cleaner than before?

We have sanctioned projects worth ₹30,000 crore for 15 years. The outflow will be much less and people say that you have actually spent only ₹11,000 crore. In five years, we won't be spending a lot. From 1985-2014, only about ₹4,000 crore was spent on Ganga cleaning and by those standards, our spending is a significant boost. We have not finished our mission but large patches of the river are clean. All projects in Uttarakhand are complete and there is an immediate change in the water quality of Haridwar. It's a typical big city and not really a hill city. Its water quality is Class A (the highest grade of cleanliness according to India's water quality monitoring standards). There is a visible difference in the water quality in Kanpur, which until a few years back had deplorable water quality. You don't need measurements; the change is there to see. And this is all through the year.

However, this is just one aspect. You have to keep your urban and local bodies ready. Fifteen years is nothing in the life of a river and cities have to start owning their river. Lots of Municipal Commissioners typically focus on only their small stretch of the river and dump waste outside their jurisdictions. In the last few years, we have been focussed on sensitising authorities in cities and Ganga riparian States to river planning. We have a river-city alliance to achieve this. Taking care of rivers has to be part of cities' master plans.

Do you have an independent monitoring system that measures aspects such as Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) to ascertain water quality?

The Central Pollution Control Board and a special cell has been created to monitor real-time water quality. In terms of DO, the entire stretch of Ganga meets the standards from Uttarakhand to West Bengal. These are measured at nearly 90 stretches. The BOD levels are met in at least 60. The Kanpur BOD used to be 10 at one point and now is three-four. So, there is significant improvement. We have made the ghats cleaner, [with] better crematoria facilities.

The pandemic saw instances of dead bodies dumped into the Ganga in U.P., which even attracted notice from the National Human Rights Commission. What did you find, and did this affect the water quality?

The pandemic created unforeseen challenges which led to unprecedented situations. It called for a series of meetings with the concerned authorities and the rolling out of measures to ensure that the health of the river as well as the lives of the people are safe and protected. We released a notification to all the States to ensure that the cremation of suspected COVID-19 patients were in line with the Government of India's guidelines and that strict vigilance along the length of the river was maintained. We collaborated with a specialised virology testing institute, the Council of Scientific and Industrial Research (CSIR)-Indian Institute of Toxicology Research (IITR) and initiated the investigation of SARS-CoV-2 virus contamination and analysis of water quality due to disposal of dead bodies in the Ganga. The investigation concluded that SARS-CoV-2 was not detected in any of the tested sites. I have mentioned this incident in the book to emphasise the constant challenges being faced, and that river rejuvenation is a dynamic process. We faced a problem which did not have anything to do with the programme and yet had to be immediately tackled by the NMCG.

You mentioned e-flow and a few years back, this was a controversial issue with hunger fasts organised by seers and activists such as G.D. Agrawal (who succumbed after a 100-day fast) demanding a minimum flow of water, and protesting against hydropower projects. How does the NMCG ensure that adequate flows are maintained?

To maintain ecological flow, it is necessary to maintain supply and demand of water and maintain minimum flows at all times for the health of the river. The primary problem is the enormous amounts of water from the Ganga diverted for agriculture. If you see the Haridwar to Kanpur belt, there are several barrages. In the lean season (non-monsoon), there is a paucity of water. In Uttarakhand, you have to deal with hydroelectric projects, and in other States and cities, it is irrigation projects. In Uttarakhand, hydropower project operators initially had reservations but by and large, most are adhering to the revised norms. In these respects, we have been helped by the National Green Tribunal, whose directions on conservation have been significant.

While improving water use efficiency in agriculture is ongoing, a less-discussed aspect is improving wetlands. We are looking at improving wetlands all along the Ganga. In U.P., we are in the process of planning and conserving nearly 250 wetlands. A similar exercise is underway in Bihar. All of this is essential to keep the aquifer recharged and keep groundwater levels high. People somehow don't link groundwater to surface water. If wetlands aren't healthy, it will affect ecological flow. This is not easy and it's a long-term process for every river.

One unique aspect of the Clean Ganga Mission in infrastructure projects is the Hybrid Annuity Model (HAM). Once upon a time, municipalities were charged with taking care of treatment plants. Now, HAM outsources this to private companies and promises them fixed returns. The challenge with water treatment plants is that everything is good in the first few years, after which maintenance slackens. Can you explain how HAM will be any different?

As part of our surveys, we found that more than half the sewage treatment plants were defunct and 30% were under-utilised. They could never be operated well; they lacked enough trained manpower and had no money for maintenance. Earlier too, contracts were given out to private companies but they were all piecemeal and it was a maze of subdivision of labour. Before HAM came, we had decided that we should give a long-term operation and maintenance contract of 10-15 years but with HAM, we felt there was a need to ensure that the operator of the plants had skin in the game. Earlier, government would pay for construction and now we are paying for performance, so there is an element of risk. You do well, contractors stand to make more than they would from a typical project, but if you don't, then there's also a risk of loss. Five years down, that process has stabilised. We have multiple bidders for every project. From here, we progressed onto the One City One Operator model, where a successful bidder will not only make new plants but also maintain the existing plants. This system is now being emulated beyond Ganga projects in other parts of the country.

You are set to retire this month and have co-authored a book with a former colleague, Puskal Upadhyay, on your experiences with the Ganga project...

Given the very unique challenges that such a massive project posed, I thought it is important to document them. I had a chance to be engaged with one mission for a long time and this is usually rare — to be associated for long with one project — in government assignments. So I have some personal attachment. The book is structured to explain the enormity of the challenges, the solutions, and the nature of institutions necessary to solve such environmental challenges.

The Hindu
26.12.2021

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