HYDROLOGY PROJECT
CRUCIAL FOR INDIA

India Water Resources Management Program

Hydrology Project Phase 3

Ministry of Water Resources, River Development & Ganga Rejuvenation

Government of India

PROJECT IMPLEMENTATION PLAN

Irrigation & Waterways Department

Government of West Bengal

SUMMARY SHEET

1. ***Implementing Agency*:** **Irrigation & Waterways Department, West Bengal**

2. ***Nodal Officer:*** Engineer-in-Chief & Ex-Officio Secretary, Water Investigation & Development Department, Govt. of West Bengal

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4. ***Project Summary:*** Being the lowermost riparian state of Ganga Basin and situated at the foothills of several Himalayan rivers of Brahamaputra Basin, the problem of flood management and drainage in the State of West Bengal is quite acute. Other than flood, various allied problems like bank erosion, drainage congestion and cyclonic disaster accentuate the flood situation. Coastal areas along with Sundarban deltic region often experience high tidal surge resulting severe erosion and inundation to the country sides. Significant variation in the average annual rainfall, geo-physical characteristics and soil properties have also made this State a draught prone one. Another aspect is that West Bengal is one of the most densely populated States in India and as such identification of surface water resources and their proper utilization as well as management are very important for the State.

   Therefore monitoring, modelling and forecasting of flood processes along with studies on flood hazards, studies on siltation and sedimentation of different rivers /reservoirs for the preparation of Comprehensive Disaster Management Plans, setting up of real time hydro-meteorological data base systems and assessment of surface water resources for the preparation of Comprehensive Water Resource Management Plans as well as up-gradation of River Research Institute to a pioneer institute of Hydrology in the eastern zone of our country are the need of the hour which can be addressed through the implementation of Hydrological Project-III in the State.

5. Financial Outlay:

	(in Crore INR)		
Project Component	**World Bank**	**Government**	**Total**
A. Improving Hydrological Information System (HIS)	Rs. 84.69 Crore	Rs. 36.30 Crore	Rs. 120.99 Crore
B. Improving Water Resources Information Systems	0	0	0
C. Water Resources Management Applications	Rs. 1.51 Crore	Rs. 0.65 Crore	Rs. 2.16 Crore
D. Strengthening Institutions and Capacity Building	Rs. 32.25Crore	Rs. 13.82 Crore	Rs. 46.07 Crore
TOTAL	Rs. 118.45 Crore	Rs. 50.76 Crore	Rs. 169.22 Crore

PROJECT IMPLEMENTATION PLAN DESCRIPTION

1. Introduction

Table 1: Basic features of State

Sl. No.	Description	Remarks
1.	Geographical Area	88, 752 sq. km
2.	Population	9.13 crore (2011 census)
3.	Major Rivers	Ganges, Hooghly, Damodar, Rupnarayan, Mahananda and Teesta
4.	River Basins	Ganga-Bhagirathi, Brahamaputra, Subarnarekha
5.	Surface Water	132.90 lakh ha-m
6.	Ground Water	14.60lakh ha-m
7.	Number of Major Reservoirs	Three (Kangsabati, Mayurakshi&Hinglow)
8.	Number of Major Barrages	Three (Durgapur, Tilpara&Teesta)
9.	Existing Storage of Reservoirs	1,530 mcum (live storage)
10.	Actual Irrigated Area	11.97 lakh ha (2013-14)
11.	Flood Affected Area	37, 660 sq. km
12.	Area already protected	22, 005 sq. km
13.	River Basin Organization	River Research Institute

2. Background description of State Water Sector

- *General description of water sector (SW)*

Irrigation Sector:

Irrigation & Waterways Department is basically an engineering department involving gross economic affairs of the State specially in irrigation sector. It has indirect impact of all sections of the society by way of irrigating land for producing agricultural products for the masses.

There are 7 nos. major irrigation projects and severaL medium irrigation schemes being managed by this Department. The Barrage & Irrigation System of the Damodar Valley Project, Mayurakshi Reservoir Project, Kangsabati Reservoir Project, Hinglow Reservoir Project and the Midnapore Canals are taken and completed before Tenth Five year Plan (2002-2007). Teesta Barrage Project and Subarnarekha Barrage Project are the two major on-going schemes. In addition to the above irrigation schemes, two schemes namely Darakeswar-Gandheswari Reservoir Project and Siddheswari-NoonBeel Reservoir Project have been contemplated to be taken up in XI-th Five Year Plan.

Out of total 30 nos. medium irrigation schemes, 25 nos. in the district of Purulia and 5 nos. in the districts of Bankura, Darjeeling and Bardhaman are being maintained by this department. Another 7 nos. medium irrigation schemes in the district of Purulia are under in implementation stage.

In addition to many small watershed Management Projects, the state is enriched by the back water drainage channel irrigation system (tidal irrigation) which are also maintained by the department.

Till 2013-14, total irrigation potential created in the State through these above mentioned schemes is around 16.50 lakh ha.

Flood Sector:

This department is also entrusted with the flood protection works and other activities like Anti-Erosion and Anti-water logging measures through which society at large, is benefited from the decrease of losses due to flood and other natural calamities.

Most of the rivers of the States are either Inter-State or International in character. The flood problems of the state are of different nature at different regions. In North Bengal, the rivers **Teesta, Torsa, Jaldhaka, Raidak-I, Raidak-II** etc. flowing through the districts of Jalpaiguri and Cooch Behar originate in the neighbouring country of Bhutan and the state of Sikkim and flow down to Bangladesh, another neighbouring country to meet the Bramhaputra at different locations.

The rivers of the districts of Uttar Dinajpur and Dakshin Dinajpur viz. **Tangon, Atreyee** and **Punarbhaba** originating at Bangladesh passes through these districts and then joins the Ganga-Padma at downstream of Farakka in Bangladesh. Both the places of origin and also the outfall of most of these rivers are in Bangladesh.

The district of Malda through which the river **Ganga** flows receives its flood water from about 11 States and is battered by the run-off flow generated from these vast areas. Ultimately the river flows down the Farakka Barrage to Bangladesh. Another portion of the Malda district receives floodwaters of the **Mahananda**, which again originates in the hills of the neighbouring country of Nepal and has some catchment area in the neighbouring state of Bihar and then passes through the district to join the **Ganga-Padma** at downstream of Farakka Barrage in Bangladesh.

Major contributing factors to flood in North Bengal regions are the run-off because of heavy local rainfall, discharge of upper basin areas and also outfall condition in the neighbouring countries. The Mahananda and most of the rivers of Uttar and Dakshin Dinajpur districts get stagnated when the Ganga upstream and downstream of Farakka Barrage rules high thereby not allowing drainage of flood discharge during that period.

In South Bengal, there are certain distinctive features of drainage condition which give rise to flood situation.The flood in this zone becomes voluminous because of the shape of the catchment area, its steep slope starting from a high level plateau area and sloping sharply down to a flat terrain near the outfall of limited capacity. This feature is again adversely affected by tidal condition as is generally noticed in the month of September, the likely month of occurrence of flood.

Basin-wise there are quite a number of river systems on the west bank of the river **Bhagirathi-Hooghly**, like **Pagla-Bansloi, Dwarka-Bramhani**, **Mayurakshi-Babla-Uttarasan**, **Bakreswar-Kuye** and **Ajoy.** These rivers between them drain an area of 17,684 sq. km, spread over the state of Jharkhand (the old Bihar Plateau) and the districts of Birbhum, part of Murshidabad (west of Bhagirathi) and Burdwan to outfall into river Bhagirathi. Carrying capacity of the river Bhagirathi is only 25% of the combined peak flood discharges generatedfrom these basins because of simultaneous heavy rainfall, as it occurred during the flood of September 2000.In this vast tract of land there is one major reservoir i.e. Massanjore Dam over river Mayurakshi which interferes the flood discharge of only 11% of aforesaid combinedcatchments.

On the left bank of the Bhagirathi river system the **Bhairab-Jalangi-Sealmarigroup of Rivers** originate from Ganga-Padma at Akherigunj in Murshidabad district and meet the Bhagirathi at Swarupgunj in Nadia District. This system of rivers between them drains a total area of 4,300 sq. km of Murshidabad and Nadia districts. Generally this area suffers from flood because of three reasons – (i) high intensity rainfall in the basin area itself, (ii) inflow of flood water from Ganga-Padma at its high spate and (iii) drainage congestion at its outfall because of highstage of river **Bhagirathi.**

In the **Damodar-Barakar Basin System**, the rivers originate at Choto-Nagpur plateau and flows down the planes of West Bengal to meet the Bhagirathi. The catchment area upto Durgapur Barrage is 18,026 sq. km as against total catchment of 22,015 sq. km. In this catchment area there are only 4 (four) reservoirs having a storage capacity of 1.21 lakh ha-m. The original concept of flood storage was to have an area reserved for storing a volume of 3.58 lakh ha-m. Thus with this limited flood storage capacity the storage dams at present can modify only the peak flood discharge. Any discharge above 70,000 cusecs downstream of Durgapur Barrage may cause flood depending on the outfall condition of the Mundeswari at Harinkhola.

The **Shilabati-Dwarakeswar** and **Kangsabati-KaliaghaiRiver Systems** which have combined catchment areas of 16,761 sq. km spread out in the districts of Purulia, Bankura, Paschimand Purba Medinipur outfall into river Rupnarayan and Haldi respectively which finally meet river Hooghly. The Kangsabati-Kumari dam at Mukutmanipur, Bankura intercepts flood discharge of only 22% of the aforesaid combined catchment area. The dam has a limited flood storage capacity of 29,170 ha-m. In this basin spillway discharge from Kangsabati dam above 50,000 cusecs may cause flood at lower reaches downstream of Midnapore Town (anicut at Mohanpur) depending on tidal condition of the outfall and downstream rainfall.

The Mathabhanga-Churni-Ichamati System of Rivers originate at the Mathabhanga off-taking from Ganga-Padma downstream of Farakka Barrage in Bangladesh and on reaching West Bengal at Majhdia, in Nadia district, bifurcates in two branches – (i) the Churni flowing on South-Westerly direction meeting the Bhagirathi at Ranaghat and (ii) the other branch viz. the Ichamati flowing on South-Easterly direction to meet Bay of Bengal through the creek of Raimangal. The main flood situation in this area arises because of inflow from Ganga-Padma (when it rules high), rainfall in the own catchment area and also tide lockage. In flood 2000 a very unusual situation arose where the Bhagirathi transferred a large volume of its floodwater to this basin area by breaching its embankments at several places.

- ***Water resources issues in the state:***

  Surface water resources issues in the State are given below:

  i. Necessity for development of proper flood forecasting system and inundation area mapping for the major river basins like

     a) Damodar, Ajay, Mayurakshi, Dwarka-Brahamani, Pagla-Bansloi, Subarnarekha, Teesta and Mahananda-Fulharhaving Inter-State boundaries.

     b) Ichamati, Jaldhaka, Torsa, Raidak, Atreyee and Punarbhaba having International boundaries.

c) Kangsabati Reservoir Project, Kaliaghai-Kapaleswai-Baghai and Shilabati-Dwarakeswar basins.

d) Coastal area including Sundarban.

ii. Necessity for proper assessment of surface water resources at micro-catchment level.

iii. Necessity for regular monitoring of water quality and sub-soil data as a part of hydro-morphological study of river systems for development and analysis of mathematical models.

iv. Necessity for development of integrated data base system, capacity building and Institutional strengthening for future Projects.

Table 2: *Basic features of river basins in the state*

Sl.No.	River Basins& Sub-Basins	Catchment Area(sq.km)	
		Total	Within West Bengal
1	2	3	4
A.	**Brahamaputra Basin**	**37, 298**	**11, 860**
a.	Sankosh	10,166	172
b.	Raidak	5,313	807
c.	Torsa	6,435	3,419
d.	Jaldhaka	5,489	3,746
e.	Teesta	9,895	3,716
B.	**Ganga-Padma Basin**	**28,141**	**11,280**
a.	Mahananda-Fulhar	19,889	9,640
b.	Punarbhaba	3,960	730
c.	Atreyee	4,292	910
C.	**Bhagirathi-Hooghly Basin**	**93,916**	**63,452**
a.	Pagla-Bansloi	2,094	730
b.	Dwaraka-Bhrahmani	4,093	2,500
c.	Bhagirathi-Hooghly	1,170	1,170
d.	Jalangi	5,344	5,344
e.	Mayurakshi-Babla	5,958	2,720
f.	Ajoy	6,095	2,490
g.	Khari-Gangur-Ghea	4,460	4,460
h.	Churni	2,030	800
i.	Damodar	22,362	5,250
j.	Darkeswar	4,430	4,430
k.	24-Parganas(South & North) and Kolkata Port Drainage Basin	4,619	4,619
l.	Kangsabati	8,369	8,369
m.	Shilabati	3,952	3,952
n.	Rupnarayan	2,548	2,548
o.	Kaliaghai	2,142	2,142

p.	Haldi	980	980
q.	Pichabani	820	820
r.	Rasulpur	1,130	1,130
s.	Tidal zone (Sundarban Area)	8,998	8,998
D.	**Subarnarekha Basin**	**18,951**	**2,160**
	GROSS TOTAL	**1,78,306**	**88,752**

- *Organizational set-up (include an organization scheme)*

– Please provide details including existing setup who does hydrological (weather, river, reservoirs and canal) monitoring; planning and design department/division; Training and research centres with state for water: Reference Table 3.

Table 3: Existing departments associated with Water Resources Planning and Design

Sl. No.	Task	Department responsible	Number of personnel assigned
1	Planning and Design department	i) Director of Designs, Central Design Office ii) Superintending Engineer, Investigation & Planning Circle-I iii) Superintending Engineer, Investigation & Planning Circle-II iv) Superintending Engineer, Teesta Design Circle	A technical set up consisting of Superintending Engineers, Executive Engineers, Assistant Engineers, Sub-Assistant Engineers, Draughtsman, Tracers, Surveyors & Gauge Readers.
2	Hydrological monitoring	Respective Circles & Divisions	
3	Canal and reservoir monitoring	i) Respective Circles & Divisions ii) Dam Safety Organisation	
4	Training	DVC Study Cell	
5	Research center	River Research Institute	A technical set up consisting of Director, Deputy Directors, Research Officers, Assistant Research Officers, Surveyor, Senior Observer, Gauge Readers, Lab. Assistants, Silt Analysts, & Model boys.

Existing organogram who will implement the proposed activities in the project: **ANNEXURE-I**

Proposed organogram for project: **ANNEXURE-II**

3. ***Baseline of present water resources monitoring system (description of existing WRIS) and water resources planning in the state*** *(SW)*

-Give details of monitoring stations maintained by State, other department and central monitoring stations and how they are monitored, manual/automated:

The details of water resources monitoring stations maintained by different agencies are furnished in Table 2 below. All the river and rain gauges, discharge stations maintained by Irrigation & Waterways Department are manually operated. Other State agencies like Agriculture department, Minor Irrigation department and Central agencies like Central Water Commission (CWC), Indian Meteorological Department (IMD) have also installed manual/automatic rain gauge stations within the State. Only during flood season, some of these data from other State and Central agencies are collected and monitored by Irrigation & Waterways Department.

Table 2: Existing Water Resources Monitoring System in the state

Sl. No.	Type	I&WD			CWC			IMD			Others		
		P	S	**T**	P	S	**T**	P	S	**T**	P	S	**T**
1.	Rain Gauge	75	51	**126**	23	0	**23**	21	0	**21**	3	0	**3**
2.	River Gauge	75		**75**	10		**10**			**0**	1		**1**
3.	HOS	10	3	**13**	NA			0	0	**0**	N/A		

* P = Perennial S = Seasonal T = Total HOS = Hydrological Observation Station

How is current transmission and data sharing program and database management is:

The present flood monitoring and management system in the State comprises with the preparation of Daily Flood Report by Central Flood Control Room of I&W Department and transmission of the same to the State Disaster Management Department with the Head Quarter at Kolkata. During emergency, separate Flood Bulletin is issued and the same is disseminated also to the District Disaster Management Cells via email, Fax or SMS. This Daily Flood Report consists with the compilation of last 24-hours cumulative rainfall, water level in different rivers and reservoir level / inflow /outflow data of dams / barrages at 8.00 hrs. These data are collected from different field offices under I&W Department along with other agencies like IMD, CWC and DVC. In this system only 24 hours inflow forecast is issued with respect to Damodar, Mayurakshi and Kangsabati Basins and such prediction needs much improvement in terms of both quantity, quality and extent so that time lag between the forecast and actual should be maximum.

Daily flood report is also uploaded in the departmental web site www.wbiwd.gov.in.

4. Major water sector issues to be addressed under HP-3 (SW)

The major water resources issues that the Irrigation & Waterways Department wishes to address in HP-3 include:

I. Automation of dams and barrages including dissemination of hydrological data through SMS, web-Portal and e-mail.

II. Up gradation of River Research Institute as a centre of excellence for flood, drainage, hydrology related study for the eastern and north-eastern zones of the country.

III. Setting up of new Data Centres and up gradation of existing water quality testing laboratories for monitoring and study on surface water quality, siltation and sedimentation.

IV. Dam break analysis and embankment health study.

5. Overview of Proposed Project Activities

A. Improving Water Resources Monitoring Systems (WRMS)

For collection of quantitative and qualitative real time data like rainfall and discharge, following provisions have been made under HP-III:

i) Presently there are 88 nos. of ORGs (out of 126 nos.) under the jurisdiction of I&WD which are functional. For the development of suitable Flood Forecasting Model with high degree of precision as well as for preparation of Water Resource Management Plans, up gradation of existing ORGs into SRGs as well as installation of new SRGs / AWS (Telemetry+ GSM) at pertinent locations in the upper catchments of Reservoirs have been proposed under HP-III. A preliminary list of locations of 160 nos. of rain gauge sites in both South Bengal and North has been prepared and given in **ANNEXURE-III**. Identification of another 45 nos. of rain gauge sites would be carried out later with the progress of the Project. Those sites where IMD/CWC or Agriculture Department have already installed rain gauge stations would be excluded and replaced with new sites subject to field verification.

ii) Daily water level data of 75 nos. of river gauge stations and water level alongwith discharge data from 5 nos. of river gauge stations under the Jurisdiction of I&WD are presently recorded and monitored during flood season. Installation of Gauge plates / Staff gauges at 40 nos. of existing gauge stations have been proposed under HP-III where the discharge would be measured with the help of ADCPs. Other Stations will be converted to Gauge-Discharge sites where provisions of both automatic and manual systems would be followed. Provision of another 85 nos. of automatic river gauge and discharge measuring stations has been proposed under HP-III for the purpose of assessment of surface water resource potential for future development of irrigation facility, supply of drinking water and industrial allocations. Therefore provisions of total 150 nos. of AWLRs (Radar + V-SAT) as well as 10 nos. current meters have been made in the estimate. A preliminary list of 132 nos. of such stations has been given in **ANNEXURE-IV**.

iii) In order to establish an Integrated Real Time Flood Management System, provision for remote operation of gates alongwith automatic recording and dissemination of hydraulic data for Kangsabati Reservoir, Mayurakshi Reservoir, Durgapur Barrage, Tilpara Barrage etc. has been made under HP-III. For this purpose, a provision of 180 nos. of Gate Censor-Radar with V-SAT/GSM technology has been made in the estimate.

iv) After collecting rainfall and discharge data through installation of rain and river gauges, it is also necessary to conduct ground survey in order to get hold river cross-sections data along with ground contours for the purpose of developing flood forecasting model as well as inundation area mapping. In these context adequate provisions for procurement of surveying instruments like GPS, DGPS and Total Station have been made in the estimate.

v) Presently there are 3 nos. major and 36 nos. medium irrigation projects under the jurisdiction of I&WD. The total length of drainage channels in this State is 7000 kms and that of coastal belt is 280 km. Therefore regular monitoring of water quality as well as sedimentation/siltation survey of storage reservoirs, bathymetry survey of drainage channels have become a matter of great concern for the State. In HP-III, the provisions have been made for collection of those data through procurement of suitable instruments like Bathymetric DGPS, AWQS telemetry, Ph Meter, Field Kits etc.

vi) At present I&WD are entrusted for regular maintenance of more than 10000 kms. of flood protective embankments and sea dykes throughout the State most of which are earthen. The stability analysis of these embankments specially at the vulnerable locations have become inevitable nowadays in order to examine their sustainability against high flood discharge and high tidal wave dashes. For this purpose suitable provisions have been made in the estimate for the exploration and collection of sub-soil data. The same would also be made applicable for the stability analysis of various hydraulic structures under the jurisdiction of I&WD.

vii) For collection and dissemination of any site specific instantaneous or regular data, the field staffs would be provided smart phones or mobiles for which procurement of 270 nos. of mobile has been provided in the estimate.

B. Baseline Water Resources Information Systems: None

C. Water Resources Management Applications

Purpose driven study for **Dam Break Analysis:** West Bengal has four major dams and thirty two medium dams. Two numbers of major dams are coming up in future. WRMA will not be fruitful if the risk in breaking of a dam particularly major dam is not known. So it is important to know the damage which may cause due to failure of dam and prepare comprehensive disaster management plan.

Purpose driven study for **Geo Technical Analysis:** Total embankment length in West Bengal is about ten thousand kilometre and most of which are earthen embankment. A breach in the jacketed portion in the river would cause a considerable damage. Therefore using geo technical analysis the health of embankments specially at vulnerable reaches would be assessed for taking necessary steps for their proper strengthening.

D. Strengthening Institutions and Capacity Building

The institutional performance of the Irrigation & Waterways Department needs to be strengthened for data collection, validation, storage and dissemination. Appropriate skills have to be acquired by the staff to operate computers and laboratory equipment provided and to maintain the improved hydro-Meteorological, hydrometric and surface water monitoring networks. Under this category following provisions have made in the estimate.

- Setting up of 8 nos. Data Centers including the infra-structural development of existing water quality monitoring stations for collection, validation, storage and dissemination of all types of data (the proposed locations of Data Centers have been annexed in **ANNEXURE-V**.
- Each Data Center would be provided with Computers, Internet, Software (ArcGIS, MIKE, ERDAS- Imagine, GEO-SLOPE, GEO-STUDIO etc.), video conferencing unit and other essential equipments as well as inspection vehicle.

- These Data Centers would serve as temporary site office where all types of survey instruments will be stored.
- Each Center will be provided with separate office rooms, one Seminar room for the purpose of meeting and training and a guest room.
- Provisions have been made in this Project for domestic training, training and site visits to the other States alongwith International study tours.
- Provision of Technical and Legal Consultant, Equipment Expert (MAT/SWE) and Network Design Expert (MAT/SWE) has been made in the Project as Lump-Sum basis.
- Provision of yearly O&M Cost and other appurtenance cost have been considered in the estimate.
- Provision for web page design including maintenance with servers has been made for each Data Center.
- Last but not the least, a separate provision for up-gradation of River Research Institute (RRI) has been made in this Project. At present RRI needs financial support for its up-gradation and modernization in order to restore its past glory. Institutional support and legal status of Eastern Zonal Centre of Excellence for flood, drainage and river related study can pave the way to establish it as a premier institute to cater the need of water resource related development in this part of the Country.

6. Project Outcome

The major outcomes of the proposed project are:

i. Development of effective disaster managementplan and river basin management plan for the State.

ii. Increase in the irrigation command area of the State.

iii. Inception of future projects like interlinking of rivers, inter basin transfer of water etc.

iv. Effective and timely redressal of inter-state / international conflicts related with water resources.

v. Integration of the Water Resource Data of the State with those of the other States.

7. Institutional Arrangement for HP-3 Implementation

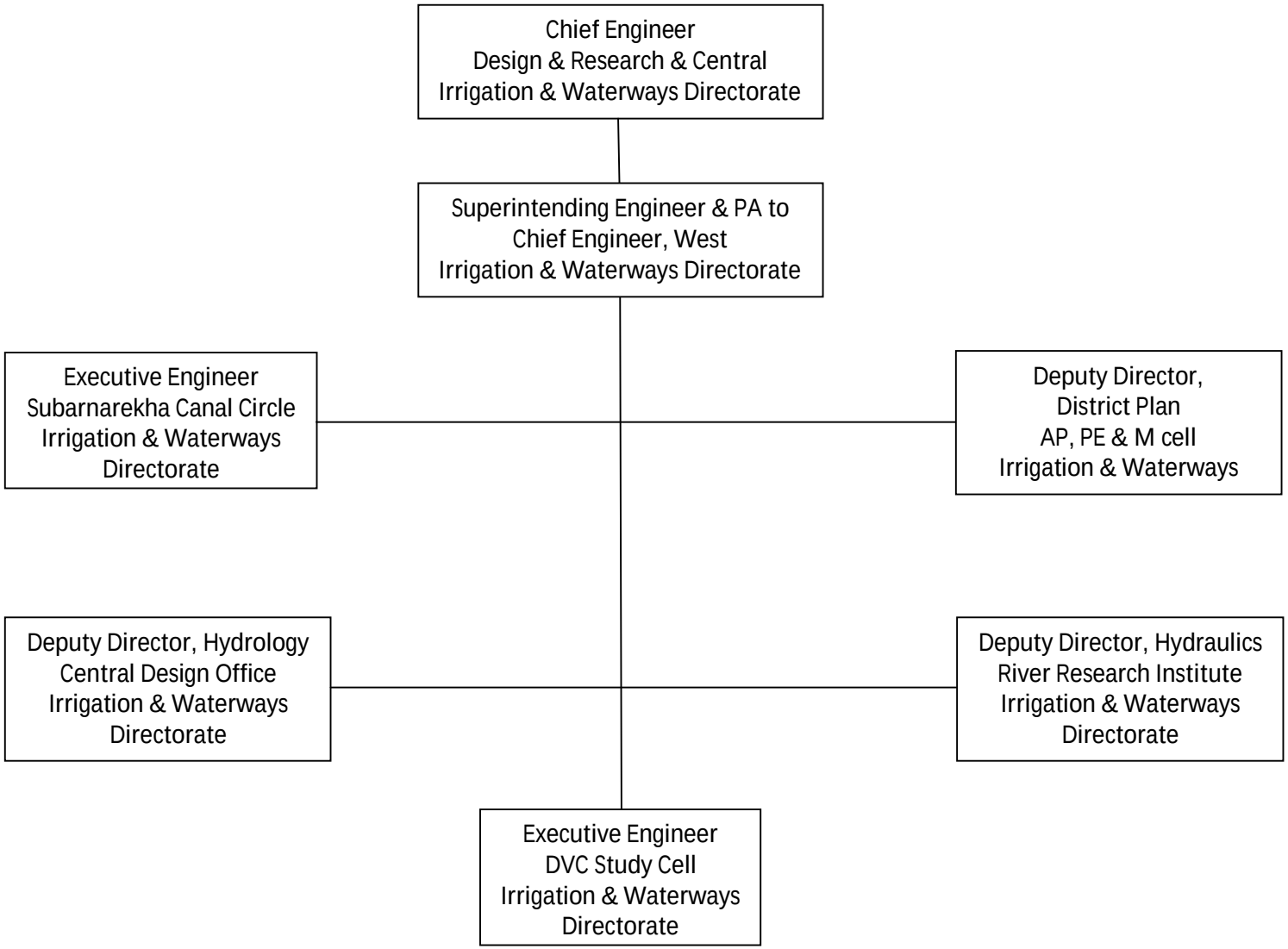
i) For HP-III, primarily a Team of Experts (ToE) has been set up for I&W Department vide Memorandum No. 304-IFC/ IW/O/IFC-4M-52/2014dated 04/12/2014 of the Dy. Secretary to the Government of West Bengal **(ANNEXURE-VI)**.This ToE would work for preparation; finalization of PIP till the approval of the Project is obtained from MoWR.

ii) For final implementation a separate Organizational Set Up would be formed as given in **ANNEXURE-II**.

8. Financial Outlay: **ANNEXURE-VII**.

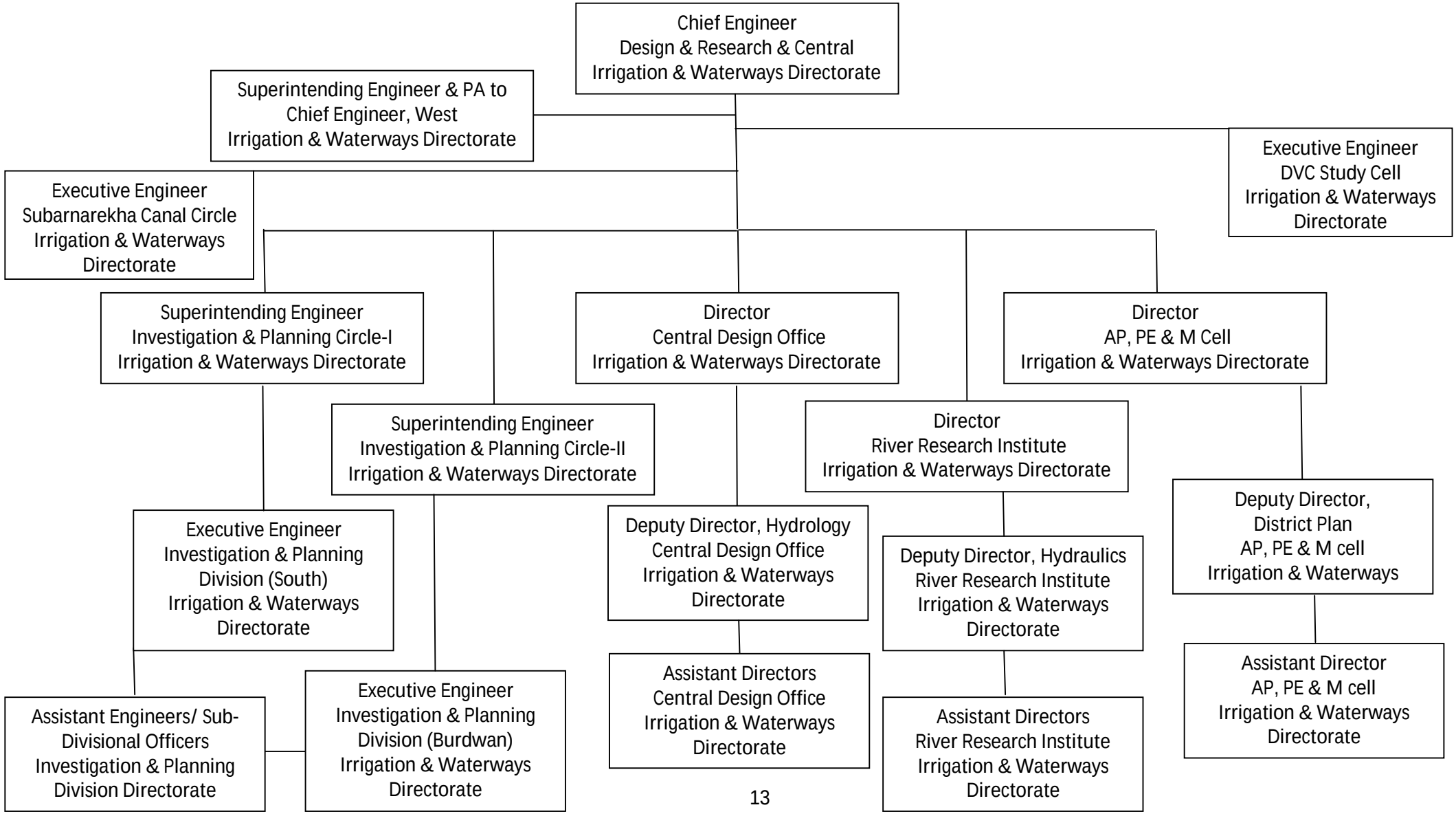
ANNEXURE –I

PROPOSED INITIAL ORGANOGRAM (ToE) FOR HYDROLOGICAL PROJECT-III UNDER IRRIGATION & WATERWAYS DEPARTMENT, WEST BENGAL



ANNEXURE –II

PROPOSED ORGANOGRAM FOR IMPLEMENTATION OF HYDROLOGICAL PROJECT-III UNDER IRRIGATION & WATERWAYS DEPARTMENT, WEST BENGAL



ANNEXURE –III

EXISTING AND PROPOSED LOCATIONS OF RAIN GAUGE STATIONS FOR IMPLEMENTATION OF HYDROLOGICAL PROJECT-III UNDER IRRIGATION & WATERWAYS DEPARTMENT, WEST BENGAL

Sl. No.	RG Station Site	District	Circle	Sl. No.	RG Station Site	District	Circle
1	Basirhat	North 24 Parganas	Eastern Circle	58	Mukutmanipur	Bankura	Kangsabati Canal Circle
2	Barasat			59	Tarapheni		
3	Tentulia			60	Bhairabbanki		
4	Kakdwip	South 24 Parganas		61	Taldangra		Damodar Irrigation Circle
5	Kachuberia			62	Sonamukhi		
6	Diamondharbour			63	Indas		
7	Kulti			64	Pakhana		
8	Chitpur			65	Patrasayar		
9	Indrapur			66	Katabandh		
10	Dakshin Surendraganj			67	Uchalan		Damodar Irrigation Circle
11	Canning			68	Lohai		
12	Raidighi			69	Bowaichandi		
13	Uttarbhag		Mechanical & Electrical Circle	70	Kantabundh		
14	Chowbaga			71	Salbundh		
15	Amta	Howrah	Western Circle - I	72	Bhorakhal/Pandua	Burdwan	
16	Domjur			73	Edilpur		
17	Nazirganj			74	Sanko		
18	Seijberia			75	Burdwan		
19	Champadanga	Hooghly		76	Galsi		
20	Harinkhola		Damodar Irrigation Circle	77	Banpas		
21	Singur			78	Belari		
22	Dhaniakhali			79	Balgona		
23	Pandua			80	Katwa		
24	Dasghara			81	Shrikhanda		
25	Jangipara			82	Mangalkote		
26	Kotulpur		Kangsabati Canal Circle	83	Majhergram		
27	Kamarpukur			84	Monteswar		
28	Arambag			85	Memari		
29	Muchighata	Paschim Medinipur		86	Randiha		
30	Amlagora			87	Jamalpur		
31	Panikotar			88	Durgapur		
32	Salboni			89	Rajbandh		
33	Pirorgari			90	Gushkara		
34	Adalia (Garhbeta)			91	Bhedia		
35	Lodhashuli			92	Seharabazar		
36	Jhargram			93	Khandaghosh		
37	Lalgarh			94	Khujutipara		
38	Kharagpur (Hijli)			95	Amgoria		
39	Chandrakona			96	Maliara		
40	Midnapur		Western Circle-II	97	Budra		
41	Lachmapur			98	Satkahania	Purulia	Officer On Special Duty
42	Gadghat			99	Purulia		
43	Sabang			100	Patloi		
44	Balichak			101	Beko		
45	Barisha			102	Bandhu		
46	Gopiballavpur			103	Kumari		
47	Makrampur			104	Tatko		
48	Keshiary			105	Barabhum		
49	Digha	Purba Medinipur		106	Baghmundi		
50	Contai			107	Jhalda		
51	Egra			108	Balarampur		
52	Amgachia			109	Jaipur		
53	Itamogra			110	Arsa		
54	Tamluk			111	Kashipur		
55	Panskura			112	Santuri		
56	Bankura	Bankura	Kangsabati Canal Circle	113	Para		
57	Onda			114	Raghunathpur		

Sl. No.	RG Station Site	District	Circle	Sl. No.	RG Station Site	District	Circle
115	Massanjore Dam	Dumka / Jharkhand	Mayurakshi Canal Circle				
116	Tilpara Barrage	Birbhum					
117	Suri						
118	Kandisala						
119	Shyambati						
120	Bahari						
121	Hinglow Dam						
122	Khairasole						
123	Paikar						
124	Lohapur						
125	Nalhati						
126	Bonta						
127	Rampurhat						
128	Deocha						
129	Baidhara						
130	Mayureswar						
131	Mallarpur						
132	Mahammadbazar						
133	Baraturigram						
134	Sainthia						
135	Kuli						
136	Bolpur						
137	Nanoor						
138	Kirnahar						
139	Salar	Murshidabad					
140	Eroali						
141	Bharatpur		North Irrigation Circle-II				
142	Kandi						
143	Berhampore						
144	Swarupganj	Nadia					
145	Englishbazar	Malda	North Irrigation Circle-I				
146	Raiganj	Uttar Dinajpur					
147	Chopra						
148	Islampur						
149	Balurghat	Dakshin Dinajpur					
150	Gangarampur						
151	Tapan						
152	Patiram						
153	Siliguri	Darjeeling	North East Irrigation Circle-II				
154	Kharibari						
155	Naxalbari						
156	Jalpaiguri	Jalpaiguri	North East Irrigation Circle-I				
157	Domohani						
158	Malbazar						
159	Banarhat	Alipuduar					
160	Alipurduar						

ANNEXURE –IV (SOUTH BENGAL)

EXISTING AND PROPOSED LOCATIONS OF RIVER GAUGE STATIONS FOR IMPLEMENTATION OF HYDROLOGICAL PROJECT-III UNDER IRRIGATION & WATERWAYS DEPARTMENT, WEST BENGAL

BASIN: GANGA-PADMA

Sl. No.	SUB BASIN	River	Tributaries		STATION		LOCATION	
			Major	Minor	River Gauge	Gauge-Discharge	Block	District
1	2	3	4	5	6	7	8	9
BASIN: GANGA-PADMA								
1	**Ganga-Padma**	**Padma**			Nimtita		Suti-II	Murshidabad
2					Akhriganj		Bhagwangola-II	
BASIN: GANGA								
3	**Bhagirathi-Hooghly**	Bhagirathi			Jangipur		Raghunathganj-II	Murshidabad
4						Berhampore	Berhampore	
5						Katwa	Katwa-II	Burdwan
6					Kalna		Kalna-I	
7		Hooghly				Chinsura	Mogra	Hooghly
8						Nazirganj	Howrah	Howrah
9						Noorpur	Diamond Harbour-III	South 24 Parganas
10	**Pagla-Bansloi**	Bansloi			Bahutuli		Suti-I	Murshidabad
11						Railway Bridge	Murarai-I	Birbhum
12		Pagla				Paikar	Murarai-II	
13	**Brahamani-Dwarka**	Brahamani			ADB Road Crossing		Nalhati-I	
14						Sankoghat	Nabagram	Murshidabad
15		Dwarka				Ranagram	Kandi	
16	**Mayurakshi-Babla**		Siddheswari			Tantloi	Ramgarh	Dumka
17		Mayurakshi				Narayanpur	Burwan	Murshidabad
18			Kuia			Tarapur	Bharatpur-I	
19		Babla				Maugram	Ketugram-II	Burdwan
20	**Ajay**	Ajay				Amuliaghat	Barabani	Burdwan
21					Budra		Ausgram-II	
22						Katwa	Katwa-II	
23			Harkia			Enayetpur	Ketugram-II	
24			Kunur			Nutanhat	Mangalkot	
25	**Khari**	Khari	Banka			Nandai	Kalna-I	Burdwan
26	**Behula**	Behula	Gangur			Guptipara	Balagarh	Hooghly
27	**Kunti**	Kunti	Ghea			Ramnagar	Mogra	
28	**Damodar-Mundeswari**	Damodar				Dishergarh	Kulti	Burdwan
29					Idilpur		Burdwan-I	
30					Jamalpur		Jamalpur	
31			Shali			Belut	Galsi-II	
32		Mundeswari				Harinkhola	Arambag	Hooghly
33		Amta Channel				Champadanga	Tarakeswar	
34	**Dwarakeswar**	Dwarakeswar				Rangamatya	Bankura-I	Bankura
35						Joykrishnapur	Bishnupur	
36						Arambag	Arambag	Hooghly
37					Sekhpur			
38						Shrirampur	Khanakul-II	
39			Gandheswari	Jore		Bankura	Bankura-I	Bankura
40			Sankari	Amodar, Tarajuli		Barkatipur	Ghatal	Paschim Medinipur

Sl. No.	SUB BASIN	River	Tributaries		STATION		LOCATION	
			Major	Minor	River Gauge	Gauge-Discharge	Block	District
1	2	3	4	5	6	7	8	9
BASIN: GANGA								
41	**Shilabati**	Shilabati				Simlapal	Simlapal	Bankura
42						Garhbeta	Garhbeta	
43						Banka	Chanrdrakona-I	Paschim Medinipur
44						Gadghat	Ghatal	
45			Jayponda			Kusmi	Taldangra	Bankura
46			Kubai	Betal		Keshpur	Keshpur	Paschim Medinipur
47			Parang			Rasidpur		
48			Ketia			Khirpai	Ghatal	
49	**Kangsabati-Rupnarayan**	Kangsabati				Simulia	Purulia-I	Purulia
50						Maheshpur	Puncha	
51						Lalgarh	Binpur-I	
52						Mohanpur	Medinipur	
53						Kapastikri	Debra	
54		Kumari				Dabra	Manbazar-II	Purulia
55			Tatko			Phulberia		
56		Old Cossye				Kalmijole	Daspur-I	Paschim Medinipur
57			Kanki			Ramdebpur		
58			Polashpai			Goura		
59			Durbachati			Sribora	Daspur-I	
60					Khaniadihi		Panskura-II	Purba Medinipur
61		New Cossye				Panskura		
62						Dobandy	Moyna	
63			Kherai-Baksi			Basantachak		
64		Rupnarayan				Bandar	Ghatal	Paschim Medinipur
65						Kaijuri	Daspur-II	
66					Gopiganj			
67						Denan	Kolaghat	Purba Medinipur
68					Tamluk		Tamluk	
69						Geonkhali	Mahisadal	
70	**Kaliaghi-Haldi**	Kaliaghai				Bakhrabad	Narayangarh	Paschim Medinipur
71					Dehaty			
72					Amgachia		Potashpur-I	Purba Medinipur
73						Langalkata		
74					Kalimandap		Bhagwanpur-I	
75						Uttarbar		
76						Dheubhanga	Nandakumar	
77			Kapaleswari			Narayanbar	Sabang	Paschim Medinipur
78			Deuli			Koptipur	Narayangarh	
79			Chandia		Barisha		Pingla	
80						Asnanghat	Moyna	Purba Medinipur
81			Baghai			Bolakipur	Potashpur-I	
82		Haldi				Itamogra	Mahisadal	
83	**Rasulpur-Pichabani**	Rasulpur				Kalinagar	Contai-III	
84		Pichabani				Pichabani	Ramnagar-II	
85		Champa				Ramnagar	Ramnagar-I	

Sl. No.	SUB BASIN	River	Tributaries		STATION		LOCATION	
			Major	Minor	River Gauge	Gauge-Discharge	Block	District
1	2	3	4	5	6	7	8	9
BASIN: GANGA								
86	**Jalangi**	Jalangi				Swarupganj	Nabadwip	Nadia
87	**Churni**	Churni			Hanskhali		Hanskhali	
88	**Ichamati**	Ichamati			Majdia		Krishnaganj	
89						Tentulia	Basirhat-I	North 24-Parganas
90			Jamuna		Gaighata		Gaighata	
91					Gobardanga		Habra	
92	**Bidyadhari**	Bidyadhari				Malancha	Bhangar-I	South 24-Parganas
93	**Matla**	Matla				Canning	Canning-I	
BASIN: SUBARNAREKHA								
94	**Subarnarekha**	Subarnarekha				Gopiballavpur	Gopiballavpur	Paschim Medinipur
95						Sonakonia	Dantan-I	
96			Dulung			Rohini	Keshiary	

ANNEXURE –IV (NORTH BENGAL)

EXISTING AND PROPOSED LOCATIONS OF RIVER GAUGE STATIONS FOR IMPLEMENTATION OF HYDROLOGICAL PROJECT-III UNDER IRRIGATION & WATERWAYS DEPARTMENT, WEST BENGAL

Sl. No.	SUB BASIN	River	Tributaries		STATION		LOCATION	
			Major	Minor	River Gauge	Gauge-Discharge	Block	District
1	2	3	4	5	6	7	8	9
BASIN: BRAHMAPUTRA								
1	**Sankosh**	Sankosh				NH 31 Crossing	Kumargram	Alipurduar
2			Raidak-II					
3	**Torsa**		Raidak-I				Alipurduar-II	
4			Raidak-I	Dharsi		Kohinur Tea Garden	Kalchini	
5			Gadadhar			NH 31 Crossing	Alipurduar-II	
6				Bala			Kalchini	
7			Kaljani		Alipurduar		Alipurduar-II	
8				Dima		Rajabhat Khawa	Kalchini	
9		Torsa				Hasimara		
10			Holong			Khairbari	Madarihat	
11	**Jaldhaka**		Mujnai			Birpara		
12			Dudua			DimDima		
13		Jaldhaka				Nagrakata	Nagrakata	Jalpaiguri
14			Diana			Chengmari		
15			Murti			Chalsa		
16		Mansai				Mathabhanga	Mathabhanga	CoochBehar
17	**Teesta**	Teesta				TeestaBazar	Rangli	Darjeeling
18			Dharala			Dharala Bridge	Mal	Jalpaiguri
	BASIN: GANGA-PADMA							
19	**Mahananda**	Mahananda			Hill Cart Road		Siliguri	Darjeeling
20						BidhanNagar	Phansidewa	
21			Dahuk			Chopra	Chopra	Uttar Dinajpur
22			Sudhani			Domohona	Karandighi	
23			Nagore			Makdampur	Raiganj	
24				Kulik	Raiganj	Bindole		
25		Mahananda				Pajol	Itahar	
26			Sui		Katchua			
27				Gamari	Itahar			
28			Kalindri			Jot Gopal	Englishbazar	Malda
29		Mahananda				Englishbazar		
30			Tangon			Radhikapur	Kaliaganj	Uttar Dinajpur
31					Banshihri		Banshihri	Dakshin Dinajpur
32	**Fulhar**	Fulhar			Teljana	Bhaluka	Harish Chandrapur-II	Malda
33	**Ganga**	Ganga				Manikchak	Manikchak	Malda
34	**Atreyee**	Atreyee				Patiram	Kumarganj	Dakshin Dinajpur
35		Atreyee			Balurghat		Balurghat	
36	**Punabhaba**					Gangarampur	Gangarampur	
37	**Jamuna**					Hili	Hili	

ANNEXURE –V

PROPOSED LOCATIONS OF DATA CENTRES FOR IMPLEMENTATION OF HYDROLOGICAL PROJECT-III UNDER IRRIGATION & WATERWAYS DEPARTMENT, WEST BENGAL

Sl. No.	Name of the zonal centres	District	Circles	Relevant Rivers	Remark
1	2	3	4	5	6
1	Siliguri	Darjeeling	Northe East Irrigation Circle II	Teesta, Torsa etc.	
2	Malda	Malda	Northe Irrigation Circle I	Ganga, Mahananda, Fulhar etc.	
3	Suri	Birbhum	Mayurakshi Canal Circle	Mayurakshi, Drarka, Brahmani etc.	
4	Berhampur	Murshidabad	Northe Irrigation Circle II	Ganga, Bhagirathi etc.	
5	Bankura	Bankura	Kangsabati Circle	Kangsabati, Silabti etc.	
6	Midnapur	Paschim Midnapur	Western Circle II	Subarnarekha, Keliaghai, Kapaleswari etc.	
7	Durgapur	Burdwan	Damodar Irrigation Circle	U/S of Damodar Valley	
8	Burdwan	Burdwan	Investigatio & Planning Circle II	Damodar, Ajoy etc.	
9	Haringhata	Nadia	River Research Institute (RRI)	Bhagirathi, Jalngi etc.	Laboratory & technical centre
10	Salt Lake	Kolkata	Advance Planning Project Evaluation & Monitoring Cell & Central Design Office (CDO)	Ichhamati, Bidyadhari etc.	Administrative centres: CDO, IPC-I, IPC-II, Adv. Pln., PRCell

ANNEXURE-VI

Government of West Bengal
Irrigation & Waterways Department
Jalasampad Bhavan, 3rd Floor, Western Block
Bidhannagar, Salt Lake City, Kolkata 700 091

Memo No. 304-IFC
IW/O/IFC-4M-52/2014

Dated, 04/12/14

MEMORANDUM

The Ministry of Water Resources, Government of India, is co-ordinating the implementation of Hydrology Projects with World Bank assistance. In continuation to already implemented Hydrology Project-I & Hydrology Project-II, now the Ministry of Water Resources has conceptualised the implementation of Hydrology Project-III, with special emphasis on implementing it in the states under Ganga and Brahmaputra basins, here to not cover under previous phases of Hydrology Projects. The Department of Economic Affairs, Ministry of Finance, Government of India, has supported the proposal for Hydrology Project-III, titled "Hydrology Project Phase-III, approach towards Integrated Water Resources Management". In response to the endeavour of MoWR, Irrigation & Waterways Department of Govt. of West Bengal has taken part in the workshops organised by MoWR, both in Delhi in September-14 and at Kolkata in November-14, wherein the objectives of the project, H.P-III, were explained at length to the participants with request to submit a preliminary Project Report by each state, both in the fields of surface and ground water.

Now taking up a holistic approach towards establishing a real time flood forecasting system in the flood prone areas of the state and an effective and sound hydro-meteorological data base, has been felt necessary.

Accordingly, it has been decided by the Government in this department to set up a team of expert with the following composition and assigned tasks against each of them.

Name	Assigned task
a. **Sri S Dutta** Chief Engineer (Design & Research & Central) Irrigation & Waterways Directorate (GoWB)	**Chairman**
b. **Sri Tridib Ranjan Barua** Superintending Engineer & P.A. to Chief Engineer (West), Irrigation & Waterways Directorate (GoWB)	**Member** For all over monitoring and coordination of various parallel activities
c. **Sri R.K. Sharma** Executive Engineer, DVC Study Cell. Irrigation & Waterways Directorate (GoWB)	**Member** For identification of new hydro-meteorological observation stations and selection of modern equipments to be installed at existing and new stations as well as at head quarter.
d. **Sri Diganta Maity** Deputy Director, Advance Planning Cell Irrigation & Waterways Directorate (GoWB)	**Member** For identification of new hydro-meteorological observation stations and selection of modern equipments to be installed at existing and new stations as well as at head quarter.

	Name	Assigned task
e.	**Sri Bibhas Barman** *Deputy Director, River Research Institute* Irrigation & Waterways Department (GoWB)	For conducting Geo-technical investigations like soil and silt analysis and executing the base work to establish a hydro-dynamic model of the river system in the flood prone area.
f.	**Sri Avijit Saha** Deputy Director, Hydrology Central Design Office, Irrigation & Waterways Directorate (GoWB)	For conducting related study of hydrology and executing the base work to establish a hydro-dynamic model of the river system in the flood prone area.
g.	**Sri Dipankar Roy Chowdhury** *Executive Engineer, Subarnareka Canal Circle* Irrigation & Waterways Directorate (GoWB)	For conducting related study of hydrology and executing the base work to establish a hydro-dynamic model of the river system in the flood prone area.

The committee may undertake site visits in Maharastra, who have already established their real time flood forecasting system in HP-II. The journey outside the state may be done following existing norms. The Chairman may co-opt any other officer(s) of this department as invitee member. Assignment of any further task to the committee members would be decided by the chairman.

Terms of Reference (ToR) of the Team of Expert (TOE) would be as under:-

a. To identify the existing rain gauge and river gauge/discharge stations which needs automation.
b. To identify new rain gauge, river gauge/discharge stations to be established besides the existing stations.
c. To collect historical hydro-meteorological data, that would be required for establish a hydro-dynamic model.
d. To identify the flood prone areas across the state, for which model study needs to be conducted to forecast likely inundation at different conditions of rivers.
e. To identify the automation of barrage and dam operations.
f. To prepare a preliminary project report under HP-III, for submission to World Bank by 15.12.14, based on the study mentioned at (a) to (e). Such report should contain, the kind of modern tools to be procured and installed, year wise phasing of execution, objectives of the project, and cost of estimate.

(B.Mukherjee)
Deputy Secretary to the
Government of West Bengal

Memo No. 304/1(1)-IFC
IW/O/IFC-4M-52/2014

Dated, 04/12/14

Copy submitted to :

The P.S. to the Hon'ble Minister-In-Charge
Irrigation & Waterways Department
Government of West Bengal
1st floor, Jalasampad Bhavan, Salt lake, Kol-91. for kind information

(B.Mukherjee)
Deputy Secretary to the
Government of West Bengal