



Government of West Bengal

Irrigation & Waterways Directorate

ANNUAL FLOOD REPORT FOR THE YEAR 2015

DIRECTOR

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& Monitoring Cell
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ANNUAL FLOOD REPORT 2015

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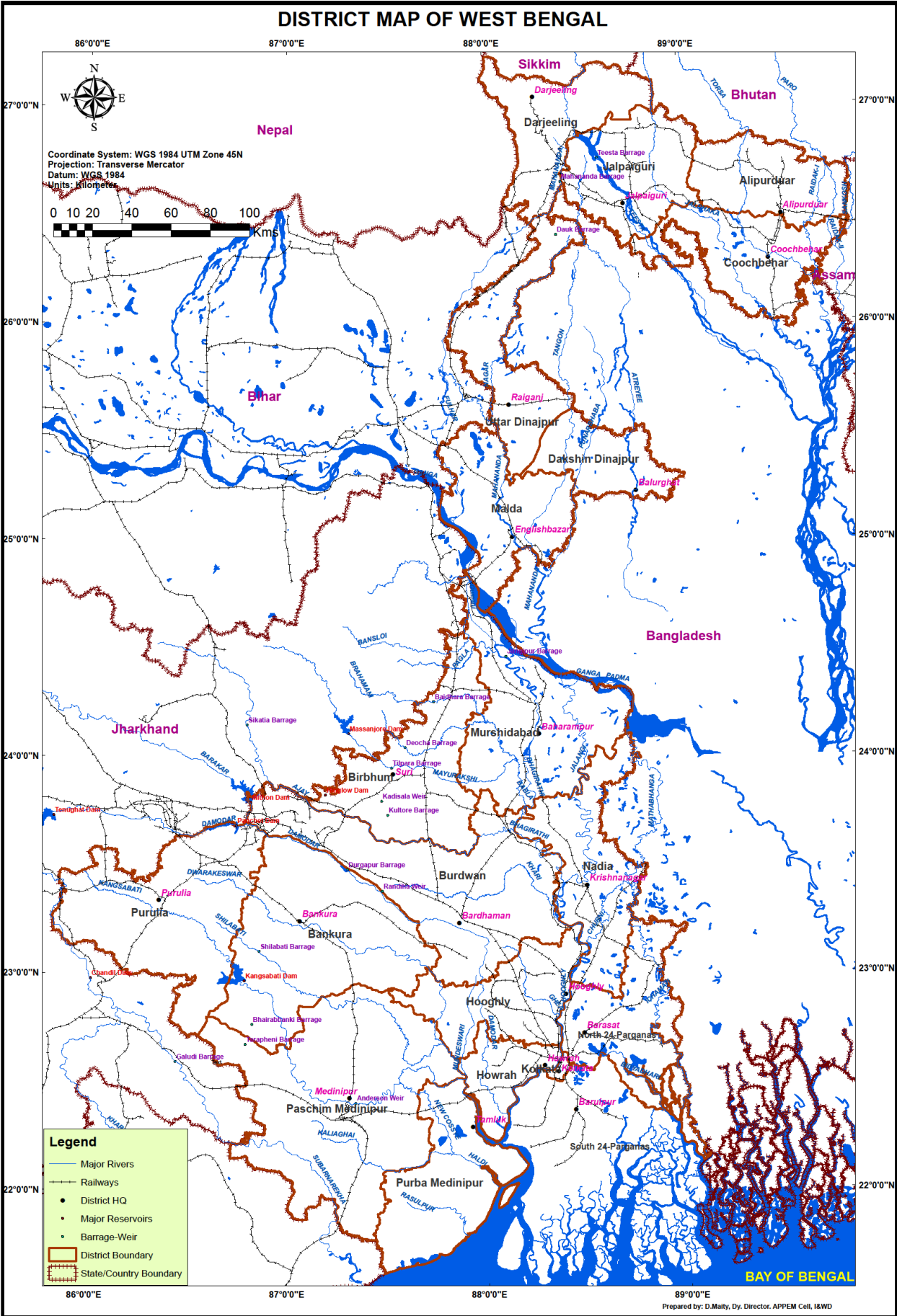
PREFACE

The State of West Bengal is the lower most riparian State in the Ganga Basin and most of the rivers in the State originate from outside the state boundary and are of inter-state/international category, The State is quite often ravaged by destructive flood, even without any appreciable rainfall within the geographical limits of the State, Along with flood, various allied problems like bank erosion, drainage congestion, and cyclonic disaster accentuate the flood situation, The State, being 42,30% of its geographical area flood prone, happens to be one of the prime flood prone States in the country.

The flood, water related disaster in the state of West Bengal has been an annual feature. Some parts of the state are victims of onslaughts offload each year resulting severe loss to standing crops, cattle and human properties. The state has all possible facets offload, drainage, bank erosion, cyclonic storm ravages and associated problems. It has been noticed that the furies due to flood have increased during the last two decades.

Embankments in various districts of the State in general and Sundarban areas in particular are used as communication link, particularly during periods of calamity for safe passage of people and carrying relief materials. Disruption of such communication links leads livelihood activities almost to a grinding halt. Moreover, embankments, constructed either decades or century ago, are functioning as lifeline to the people of Sundarban since those prevent entry of high tidal water into the countryside where average ground level is substantially lower than the normal amplitude of high tide. Due to breach as well as washout of embankments major portion of the area becomes disconnected from basic facilities of life.

Many factors such as intensity and duration of rainfall, sedimentation in river bed, natural or manmade obstruction etc. play a role in the occurrence of flood. Study of these factors and evaluation of flood hazards every year for a given basin/sub-basin are indispensable for evolution of various flood management measures. Accordingly Irrigation & Waterways Directorate, at the end of each flood season, prepare annual flood report comprising rainfall patterns, rainfall in the districts, reservoir condition and major flood events of the year.



1. INTRODUCTION

The state West Bengal crowned by the mighty snow-white Himalayas in the North and frothy sea on the South is a combination of land varying from high regions in the north and partly high in the south west to the plains in the rest areas. The state is beset with extensive network of rivers, their tributaries, rivulets, jhoras, canals, tanks beels and low lying pockets of water bodies. With the Tropic of Cancer running across it, the state is situated between 21°31' & 27°13'14" North Latitudes and 85°45'20" & 89°53' East Longitudes. The salient feature of the State is given below.

Salient Feature

Geographical area	:	88, 752 sk. km
Population (2011 census)	:	9.13 crore
Districts	:	20 nos.
Total blocks	:	341 nos.
Most vulnerable blocks	:	111 nos. (Flood & Tidal inundation)
River basins with code	:	2A. Ganga, 2B. Brahamaputra 6. Subarnarekha
Catchment area	:	1, 80, 628 sq. km
Average rainfall	:	1, 760 mm (Northern area: 2750 mm, Alluvial and Deltaic plain: 1650 mm, Western plateau: 1450 mm)
Flood prone area	:	37, 542 sq. km
Area already protected	:	35, 380 sq. km
Length of Embankment	:	10, 400 km
Lenth of Drainage Channel	:	7, 129 km
Surface water potential	:	132.90 BCM
Ground water potential	:	14.60 BCM

2. RIVER SYSTEMS AND FLOOD PROBLEMS

West Bengal, a part of Bengal Delta, has a long recorded history of flood. At present 42.3% of total area of the State is susceptible to flood. Reason is the landmass of the State was formed by the Ganga-Padma system of rivers through the delta building process of which flood being the main carrier of sediments, the bulk of fluvial deposit, in huge volumes. The highest affected area as recorded in 1978 is about 30,607 sq. km and in 2000 is about 23,971 sq. km.

Most of the rivers in the State 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** and **Sankosh** after originating in the neighbouring countries of Bhutan and Tibet and the state of Sikim, flow downwards through the districts of Darjeeling, Jalpaiguri, Alipurduar and Coochbehar to meet the Bramhaputra at different locations in Bangladesh, another neighbouring country. The combined catchment of all this system of rivers up to the international border is 37, 545 sq. km.

The rivers of the districts of Uttar Dinajpur and Dakshin Dinajpur viz. **Tangon**, **Atreyee** and **Punarbhaba** after originating at Bangladesh pass through these districts and either directly or indirectly contribute upper catchment discharges into the river **Ganga-Padma** at downstream of Farakka in Bangladesh. The combined catchment area of this river system up to the international border is 8, 873 sq. km.

The southern part of district 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. The western side of the Malda district receives floodwater mostly from neighbouring country of Nepal and state of Bihar through a network of rivers called **Mahananda** and **Fulhar**. Fulhar, after flowing straight south, joins with Ganga upstream of Farakka barrage while Mahananda turns towards south-east and after bifurcating Malda, outfalls into river Ganga-Padma at downstream of Farakka Barrage in Bangladesh. The combined catchment of Mahananda-Fulhar system is 19, 342 sq. km.

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-Brahmani**, **Mayurakshi-Babla** and **Ajoy**. These rivers together drain out flood water from an area of 18, 177 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 generated from 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 combined catchments.

On the left bank of the Bhagirathi river system the **Bhairab-Jalangi-Sealmari** group 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 2, 537 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 high stage of river Bhagirathi during high tide.

In the **Damodar-Barakar** river system, the rivers originate at Choto Nagpur plateau of Jharkhand and flows down the planes of West Bengal to outfall into the Rupnarayan-Hooghly system through two channel namely Mundeswari and Amta Channel. The catchment area up to Durgapur Barrage is 18,026 sq. km as against total catchment of 24, 341 sq. km. In this catchment area there are only 4 (four) reservoirs having a storage capacity of 1.21 BCM. The original concept of flood storage was to have an area reserved for storing a volume of 3.58 BCM. 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-Darakeswar** and **Kangsabati-Kaliaghai** river systems which have combined catchment areas of 16, 938 sq. km spread out in the districts of Purulia, Bankura, Paschim and 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

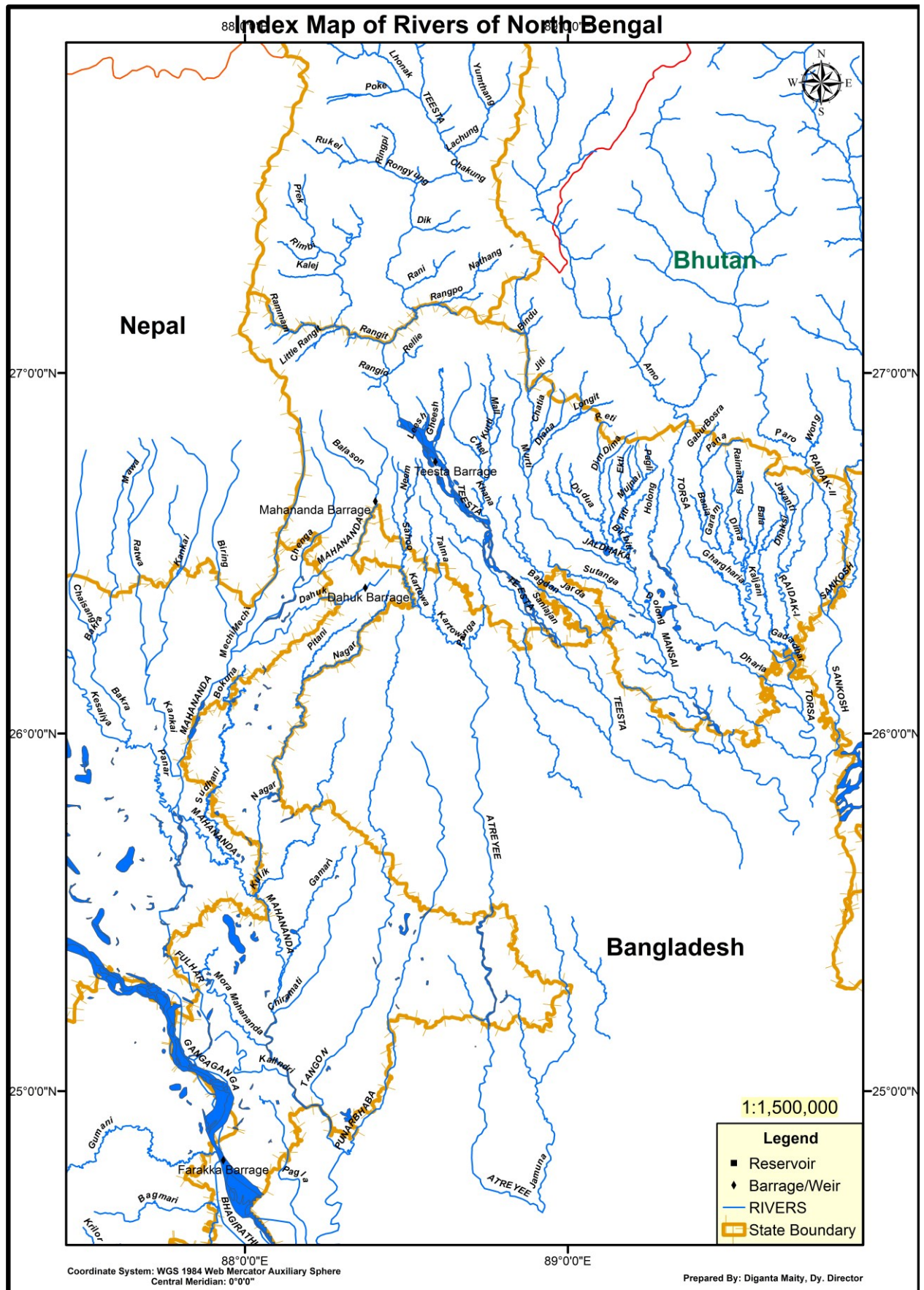
combined catchment area. In this basin spillway discharge from Kangsabati dam above 50,000 cusecs may cause flood at lower reaches downstream of Mohanpur Anicut near Midnapore Town depending on tidal condition of the outfall and rainfall in the uncontrolled catchment downstream of Kangsabati dam.

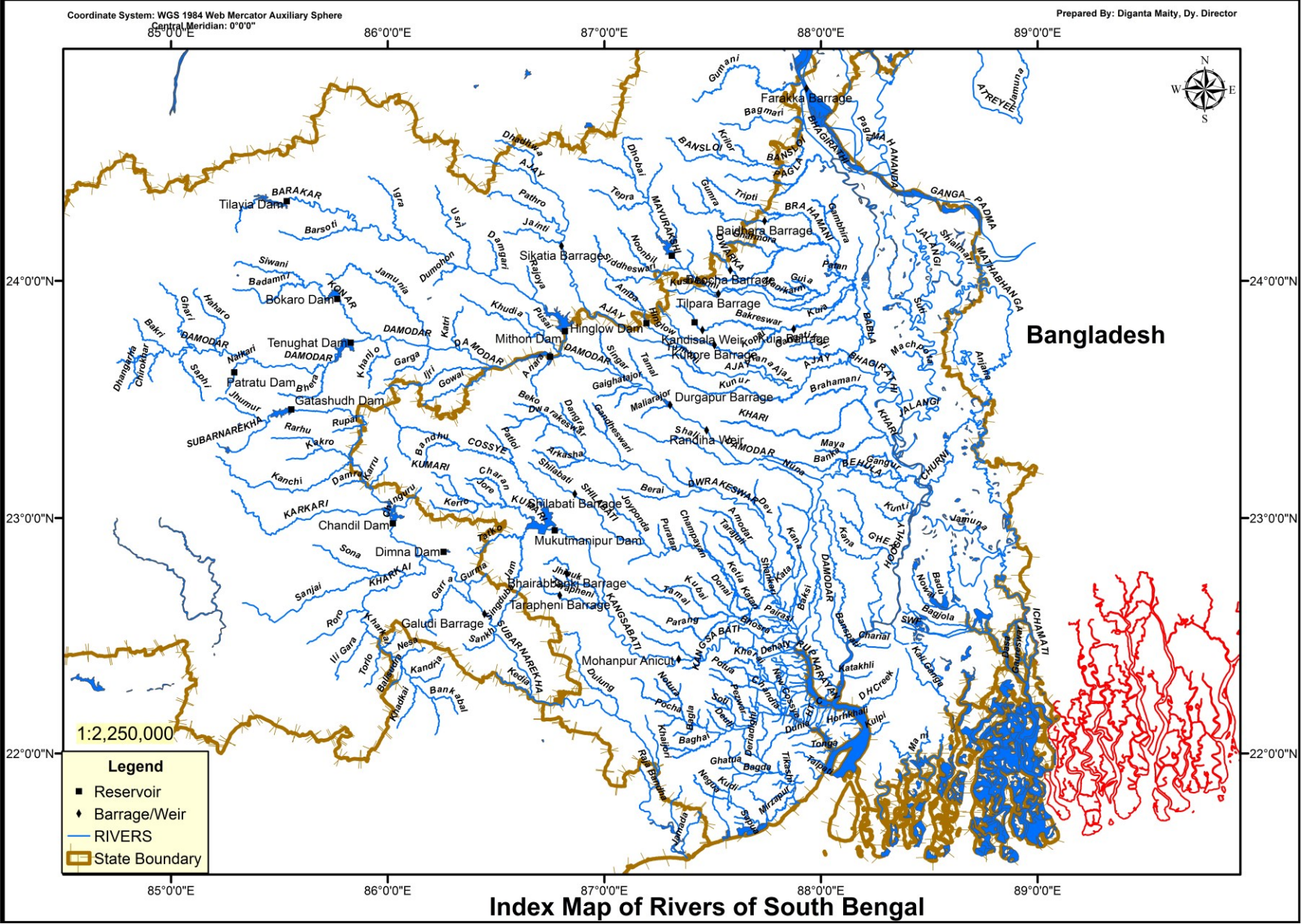
The **Mathabhanga-Churni-Ichamati** system of rivers originate at the Mathabhanga off-taking from Ganga-Padma downstream of Farakka Barrage in Bangladesh and on reaching West Bengal at Majdia in Nadia district, bifurcates in two branches (i) the Churni flowing on South-Westerly direction meeting the 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.

Historical record of flood in West Bengal is given below:

Flood affected Area (in Sq. Km)	Years during which the Flood occurred	Total No. of Years
< 500	1985,89,92,94,97,2001,2005, 2006 & 2013, 2014	10
500 - 2000	1962,63,64,65,66,72,75,96,2003,2004, 2007, 2009 & 2011	12
2000 - 5000	1960, 61, 67, 69, 70, 74, 76, 80, 81 & 82	10
5000 - 10000	1973,77,93,95,98 & 2008	6
10000 - 15000	1968, 79, 83, 90 & 99	5
15000 – 20000	1971, 86, 87 & 88	4
> 20000	1978, 84, 91 & 2000	4

Index map of rivers of South Bengal and North Bengal and the inventories have been presented below.





BASIN: BRAHAMAPUTRA			SUB-BASIN: LOWER BRAHAMAPUTRA		
Sl. No.	RIVER	Tributaries		Location	
		Primary	Secondary	STATE	District
1	2	3	4	5	6
1	Sankosh			Assam	Kokrajhar
				WB	Coochbehar
		Chhoto Sankosh		Assam	Kokrajhar
				WB	Alipurduar
		Raidak-II		WB	Alipurduar, Coochbehar
2	Torsa			WB	Alipurduar, Coochbehar
		Raidak-I	Dhakshi	WB	Alipurduar, Coochbehar
		Gadadhar	Jayanti	WB	Alipurduar
		Kaljani	Bala	WB	Alipurduar
			Nonai	WB	Alipurduar
			Dima	WB	Alipurduar
			Pana	WB	Alipurduar
			Garam	WB	Alipurduar
			Bania	WB	Alipurduar
			Ghargharia	WB	Alipurduar, Coochbehar
		Holong		WB	Alipurduar, Coochbehar
		Dharala		WB	Coochbehar
3	Jaldhaka			WB	Jalpaiguri, Coochbehar
		Mujnai	Titi	WB	Alipurduar
			Pagli	WB	Alipurduar
			Ekti	WB	Alipurduar
			Shukti	WB	Alipurduar
		Jurapani	Dudua	WB	Jalpaiguri, Alipurduar
			Gilandi	WB	Jalpaiguri
		Diana	Longit	WB	Jalpaiguri
		Khuji Diana	Chetia	WB	Jalpaiguri
		Jiti		WB	Jalpaiguri
		Murti		WB	Jalpaiguri
		Sutanga		WB	Coochbehar
4	Teesta	Jarda	Bagdan	WB	Jalpaiguri, Coochbehar
		Dolong		WB	Coochbehar
				SIKKIM	North Sikkim, South Sikkim
				WB	Darjeeling, Jalpaiguri, Coochbehar
		Lachung	Yumthang	SIKKIM	North Sikkim
		Lasha		SIKKIM	North Sikkim
		Lohnak	Poke, Gome	SIKKIM	North Sikkim
		Rangyung	Ringpi, Rukel	SIKKIM	North Sikkim
		Chakung		SIKKIM	North Sikkim
		Dick		SIKKIM	North Sikkim
		Rangit	Rimbi	SIKKIM	West Sikkim
			Kalej	SIKKIM	West Sikkim
			Rammam	SIKKIM	West Sikkim
			Little Rangit	WB	Darjeeling

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BASIN: BRAHAMAPUTRA			SUB-BASIN: LOWER BRAHAMAPUTRA		
Sl. No.	RIVER	Tributaries		Location	
		Primary	Secondary	STATE	District
1	2	3	4	5	6
4	Teesta	Rani		SIKKIM	East Sikkim
		Rangpo	Nathang	SIKKIM	East Sikkim
		Relli		WB	Darjeeling
		Rangio		WB	Darjeeling
		Leesh		WB	Darjeeling, Jalpaiguri
		Gheesh		WB	Darjeeling, Jalpaiguri
		Dharala		WB	Jalpaiguri
			Neora	WB	Darjeeling, Jalpaiguri
			Chel	WB	Darjeeling, Jalpaiguri
		Karla		WB	Jalpaiguri
BASIN: GANGA			SUB-BASIN: BHAGIRATHI LOWER & OTHERS		
1	Mahananda			WB	Darjeeling, Uttar Dinajpur, Malda
				BIHAR	Kishanganj, Purnia
		Balason	Rohini	WB	Darjeeling
		Lachka		WB	Darjeeling
		Taipu	Manjha	WB	Darjeeling
		Mechi	Biring	BIHAR	Kishanganj
		Kankai	Ratwa	BIHAR	Kishanganj, Purnia
		Panar		BIHAR	Araria, Purnia, Katihar
			Bakra	BIHAR	Araria, Purnia
			Kesaliya	BIHAR	Araria, Purnia
		Dauk		WB	Uttar Dinajpur
		Pitani	Bakuna	WB	Uttar Dinajpur
		Nagar	Sudhani	WB	Uttar Dinajpur
			Kulik	WB	Uttar Dinajpur
		Chiramati		WB	Uttar Dinajpur
		Sui		WB	Uttar Dinajpur
		Tangon		WB	Uttar & Dakshin Dinajpur, Malda
		Mora Mahananda		WB	Malda
		Kalindri		WB	Malda
2	Fulhar			BIHAR	Katihar
				WB	Malda
3	Punarbhaba			WB	Dakshin Dinajpur, Malda
4	Atreyee			WB	Dakshin Dinajpur
		Kartowa	Neem	WB	Jalpaiguri
			Sahoo	WB	Jalpaiguri
			Chauli	WB	Jalpaiguri
			Talma	WB	Jalpaiguri
		Panga		WB	Jalpaiguri
		Jamuna		WB	Dakshin Dinajpur
		Brahmani		WB	Dakshin Dinajpur

BASIN: GANGA			SUB-BASIN: BHAGIRATHI LOWER & OTHERS		
Sl. No.	RIVER	Tributaries		Location	
		Primary	Secondary	STATE	District
1	2	3	4	5	6
5	Ganga-Padma	Pagla		WB	Malda
		Gumani	WB	Murshidabad	
			JHARKHAND	Godda, Sahebganj	
6	Bansloi		JHARKHAND	Pakur	
			WB	Birbhum, Murshidabad	
		Bagmari	JHARKHAND	Pakur	
			WB	Murshidabad	
		Krilor	WB	Murshidabad	
7	Pagla		JHARKHAND	Pakur	
			WB	Birbhum, Murshidabad	
		Buri	WB	Birbhum	
8	Dwarka	Brahamani		JHARKHAND	Dumka
				WB	Birbhum, Murshidabad
			Gumra	JHARKHAND	Dumka
			Tripti	JHARKHAND	Dumka
			WB	Birbhum	
		Gambhira	Gamri	WB	Birbhum, Murshidabad
		Chailan		JHARKHAND	Dumka
				WB	Birbhum
		Ghormora		WB	Birbhum
		Kajuli		WB	Birbhum
		Daoka	Manikarnika	WB	Birbhum, Murshidabad
Banka		WB	Murshidabad		
9	Mayurakshi		JHARKHAND	Deoghar, Dumka	
			WB	Birbhum, Murshidabad	
		Dhabai		JHARKHAND	Dumka
		Bhurbhuri		JHARKHAND	Dumka
		Tepra		JHARKHAND	Dumka
		Siddeswari		JHARKHAND	Jamtara, Deoghar, Dumka
			Noonbeel	JHARKHAND	Deoghar
		Kushkarini		JHARKHAND	Jamtara
				WB	Birbhum
		Kuia	Bakreswar	WB	Birbhum, Murshidabad
				JHARKHAND	Jamtara
	Kopai	WB	Birbhum		
10	Babla	Mayurakshi		WB	Murshidabad
		Dwarka		WB	Murshidabad

BASIN: GANGA			SUB-BASIN: BHAGIRATHI LOWER & OTHERS		
Sl. No.	RIVER	Tributaries		Location	
		Primary	Secondary	STATE	District
1	2	3	4	5	6
11	Ajay			BIHAR	Munger
				JHARKHAND	Deoghar, Jamtara
		Dudhwa		BIHAR	Munger
				JHARKHAND	Deoghar
		Pathro		JHARKHAND	Giridih, Deoghar
		Pathro		JHARKHAND	Giridih, Deoghar
		Hinglow	Amba	JHARKHAND	Jamtara
				WB	Birbhum
		Tumoni		WB	Burdwan
		Kunur		WB	Burdwan
		Kana Ajay		WB	Birbhum, Burdwan
12	Jalangi			WB	Murshidabad, Nadia
		Silamari		WB	Murshidabad
		Suti	Chhoto Bhairab	WB	Murshidabad
			Bhandardaha	WB	Murshidabad
13	Churni	Anjana		WB	Nadia
14	Ichhamati	Jamuna		WB	Nadia, North 24-Parganas
15	Bidyadhari	Nowai		WB	North 24-Parganas
16	Khari	Brahmani		WB	Burdwan
		Banka		WB	Burdwan
17	Behula	Gangur		WB	Burdwan, Hooghly
18	Kunti			WB	Hooghly
19	Ghea	Kedarmati		WB	Burdwan, Hooghly
		Kana		WB	Burdwan, Hooghly
20	Saraswati			WB	Hooghly, Howrah
21	Kana Damodar			WB	Burdwan, Hooghly, Howrah
22	Amta Channel			WB	Burdwan, Hooghly, Howrah
23	Kalindri			WB	South 24-Parganas
24	Raimangal			WB	South 24-Parganas
25	Bidya			WB	South 24-Parganas
26	Matla			WB	South 24-Parganas
27	Thakuran			WB	South 24-Parganas
28	Saptamukhi			WB	South 24-Parganas
29	Muriganga			WB	South 24-Parganas
30	Bhagirathi-Hooghly			WB	Birbhum, Murshidabad, Nadia, Burdwan, Hooghly, Howrah, South & North 24 Parganas, Purba Medinipur

BASIN: GANGA			SUB-BASIN: DAMODAR		
Sl. No.	RIVER	Tributaries		Location	
		Primary	Secondary	STATE	District
1	2	3	4	5	6
1	Damodar			JHARKHAND	Latehar, Chatra, Hazaribag, Ramgarh, Bokaro Dhanbad
				WB	Burdwan, Purulia, Bankura, Hooghly, Howrah
		Barakar		JHARKHAND	Hazaribag, Giridih, Kodarma, Dhanbad
			Igra	JHARKHAND	Giridih
			Ushri		
			Dumohon	JHARKHAND	Giridih
			Barsoti	JHARKHAND	Hazaribag
		Barki		JHARKHAND	Latehar, Chatra, Hazaribag
		Haharo		JHARKHAND	Hazaribag
		Ghari		JHARKHAND	Hazaribag
		Bokaro		JHARKHAND	Hazaribag, Bokaro
		Konar		JHARKHAND	Hazaribag, Bokaro
			Siwani	JHARKHAND	Hazaribag
		Jamunia		JHARKHAND	Hazaribag, Giridih, Bokaro, Dhanbad
		Naikari, Bhera		JHARKHAND	Ranchi, Ramgarh
		Khanjo, Garga		JHARKHAND	Bokaro
		Khadia, Katri		JHARKHAND	Dhanbad
		Gowai, Ijri		JHARKHAND	Bokaro
				WB	Purulia
		Sali		WB	Bankura
		Singar, Tamal		WB	Burdwan
		Nuna		WB	
3	Mundeswari	Harinkhola		WB	Burdwan, Hooghly
4	Darakeswar			WB	Purulia, Bankura, Burdwan, Hooghly
		Futiary, Beko, Dudhibheria		WB	Purulia
		Arkasha	Kansachor	WB	Purulia, Bankura
		Dangra		WB	Purulia, Bankura
		Gandheswari, Berai, Khukra		WB	Bankura
		Shankari		WB	Paschim Medinipur
			Amodar	WB	Bankura, Paschim Medinipur
			Tarajuli	WB	Bankura, Paschim Medinipur
5	Shilabati			WB	Purulia, Bankura, Paschim Medinipur
		Jaiponda		WB	Bankura
		Puratan, Champayan, Ketia		WB	Bankura, Paschim Medinipur
		Ruparghghra		WB	Paschim Medinipur
		Donai		WB	Paschim Medinipur
		Kubai	Tamal, Parang	WB	Paschim Medinipur
		Katan		WB	Paschim Medinipur

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BASIN: GANGA			SUB-BASIN: DAMODAR		
Sl. No.	RIVER	Tributaries		Location	
		Primary	Secondary	STATE	District
1	2	3	4	5	6
6	Kangsabati			WB	Purulia, Bankura, Paschim Medinipur
		Saharjore, Bandhu, Patloi		WB	Purulia
		Kumari	Hanumata, Kerro, Jore, Charan	WB	Purulia
		Jam		WB	Paschim Medinipur, Bankura, Purulia
			Tatko	JHARKHAND	Purba Singbhum
				WB	Purulia
		Bhairabbanki	Jhinuk	WB	Bankura, Paschim Medinipur
			Tarapheni	WB	Paschim Medinipur
Kalaichu		WB	Paschim Medinipur		
7	Old Cossye			WB	Paschim Medinipur
8	New Cossye	Kherai	Bakshi	WB	Paschim & Purba Medinipur
9	Rupnarayan	Kana Dwarakeswar		WB	Hooghly, Burdwan
		Polashpai		WB	Paschim Medinipur
		Durbachaty		WB	Purba Medinipur
10	Kaliaghai			WB	Paschim & Purba Medinipur
		Kapaleswari, Deuli		WB	Paschim Medinipur
		Chandia		WB	Paschim & Purba Medinipur
		Baghai		WB	Paschim & Purba Medinipur
11	Haldi			WB	Purba Medinipur
12	Rasulpur			WB	Purba Medinipur
13	Pichabani			WB	Purba Medinipur
14	Negua Channel			WB	Paschim & Purba Medinipur
BASIN: SUBARNAREKHA					
1	Subarnarekha			JHARKHAND	Ranchi, Seraikela-Kharswan, Purba Shingbhum
				WB	Paschim Medinipur
				ODISHA	Balasore
		Jhumur, Rupai		JHARKHAND	Ranchi
		Kakro	Rarhu	JHARKHAND	Ranchi
		Karru		JHARKHAND	Ranchi
				WB	Purulia
		Kanchi		JHARKHAND	Ranchi
		Damra		JHARKHAND	Ranchi, Seraikela-Kharswan
		Karkari		JHARKHAND	Ranchi, Seraikela-Kharswan
		Chinguru		WB	Purulia
				JHARKHAND	Seraikela-Kharswan
		Kharkai	Bankabol, Khadkari, Kandria, Nesa, Burhai	ODISHA	Mayurbhanj

BASIN: SUBARNAREKHA					
Sl. No.	RIVER	Tributaries		Location	
		Primary	Secondary	STATE	District
1	2	3	4	5	6
1	Subarnarekha	Kharkai	Bankabol, Khadkari, Kandria, Nesa, Burhai	ODISHA	Mayurbhanj
			Torlo, Illgara, Roro, Sanjai	JHARKHAND	Paschim Shingbhum
		Garra, Sankh, Kodia		JHARKHAND	Purba Shingbhum
		Gurma		JHARKHAND	Purba Shingbhum
				WB	Purulia
		Singaduba		JHARKHAND	Purba Shingbhum
				WB	Paschim Medinipur
		Dulung, Khajjori		WB	Paschim Medinipur

3. DETAILS OF RIVER BASINS AND SUB-BASINS

The state can be demarcated into three distinct drainage basins namely Ganga (CWC basin code no. 2A), Brahmaputra (CWC basin code no. 2B) and Subarnarekha (CWC basin code no. 6) basins respectively. Ganga basin has been further divided into two parts namely Bhagirathi lower & others and Damodar. These three main river basins can in turn be divided into sub-basins having individual catchment of their own. Index maps of different river sub-basins and basins are presented in Annexure I1 to I15.

BRAHAMAPUTRA BASIN

The rainfall in the northern region of the state is generally high. The ground slope is steep, particularly in the Sub-Himalayan regions of the northern districts. Most of these northern districts belong to Brahmaputra basin. This system consists of a total area of 10,584 sq.km nearly 12% of the geographical area of the state. This basin area is interspersed with a large number of drainage channels which join the main drainage arteries of the regions like the rivers Teesta, Torsa, Raidak, Jaldhaka etc. All these rivers originate from the Himalayas in Bhutan / Sikkim / Tibet and flow across the Terai region and reach the plains of West Bengal and then flow to Bangladesh joining ultimately the

Brahmaputra in Bangladesh. The catchment area distribution of this basin and sub-basins bounded within different neighbouring states and countries has been presented in the following table.

RIVER BASINS AND SUB-BASINS OF WEST BENGAL									
CWC Basin Code	River Basin	Sub- Basins	CATCHMENT AREA (Sq. Km)						TOTAL (Sq. Km)
			Assam	Sikkim	WB	Bangla- desh	Bhutan	Tibet	
2B	BRAHAMAPUTRA								
	Brahmaputra Lower	Jaldhaka		76	3916	351	959		5302
		Raidak			246		4590	16	4852
		Sankosh	175		162		9734	75	10146
		Teesta		7000	3012	12		29	10053
		Torsa			3248		2363	1581	7192
		Sub-Total	175	7076	10584	363	17646	1701	37545

Sankosh Sub-basin

The river Sankosh with its origin in Bhutan is the eastern most river of Brahmaputra river basin. It serves as the boundary between the two states West Bengal and Assam. It joins with Raidak-II and finally falls into Brahmaputra in Bangladesh by name Gangadhar. The length of Sankosh in West Bengal is 24 km. The total catchment area of this river sub-basin is 10, 146 sq. km.

Raidak Sub-basin

It originates in Mt. Akungphu at an altitude of 6,400 m. in Bhutan. The river Raidak then bifurcates into two channels namely Raidak-I and Raidak-II at Bhutanghat, close to Indo-Bangladesh border. Raidak-I joins the united stream of Torsa and Kaljani, while Raidak-II is joined by Sankosh and finally outfalls into Brahmaputra in Bangladesh by the name Gangadhar. The length of Raidak-II is around 50 km in West Bengal. The total catchment area of Raidak-II river sub-basin is 4, 852 sq. km.

Torsa Sub-basin

The river Torsa originates in Chumbi Valley of southern Tibet at an altitude of 7,065 m. It flows through Tibet, Bhutan, West Bengal and Bangladesh. Below Hasimara bridge on NH-31, it bifurcates into two channels viz. Sil-Torsa and Char-Torsa. They reunite at Patla Khowa forest. The river passes by the Coochbehar town and is joined by river Kaljani and Raidak-I. The combined flows outfalls into Brahmaputra near Nageswari at Rangpur in Bangladesh. The total length of this river is 222 km out of which 74 km is situated within West Bengal. The total catchment area of this river sub-basin is 7, 192 sq. km.

Jaldhaka Sub-basin

The river Jaldhaka has its origin at Bitang Lake in Sikkim at an altitude of 4,400 m. It flows through Sikkim, Bhutan, West Bengal and Bangladesh. After the river is joined by a number of streams and tributaries both in mountainous and sub-mountainous regions, it finally flows into river Dharala and the combined system, by the name Dharala ultimately outfalls into Brahmaputra in Bangladesh. The total length of this river is 192 km out of which 122 km is situated within West Bengal. The total catchment area of this river Sub-basin is 5, 302 sq. km.

Teesta Sub-basin

Teesta, the mighty river of North Bengal originates in the glaciers of North Sikkim at an altitude of 6,400 m and is formed by the union of two streams viz. Lachen and Lachung at Chungthung in Sikkim. It enters West Bengal at Rangpo and upto Mechi, it forms the boundary between West Bengal and Sikkim. Two of its tributaries, Great-Rangeet and Rammam also serve as the natural boundary between the two states. The river finally outfalls into Brahmaputra in Rangpur district of Bangladesh. The total length of this river is 309 km out of which 103 km is situated within Sikkim and 121 km in West Bengal. The total catchment area of this river Sub-basin is 10, 053 sq. km. Under Teesta Barrage Project a barrage has been constructed at Gazoldoba under Jalpaiguri district.

GANGA BASIN

The two holy rivers - Bhagirathi and Alakananda originating from the glaciers of the Himalayas at an altitude of 7,000 m join at Devprayag and the combined stream is known as the Ganga. It emerges into the plains at Rishikesh in Uttaranchal. After flowing exclusively through Uttaranchal and Uttar Pradesh it receives the flow of Yamuna, one of its major tributaries near Allahabad. The other major tributaries of Ganga are Ton, Gomti, Gharghara, Son, Gandak, Kosi and Fulhar. The Ganga forms the boundary between Uttar Pradesh and Bihar for a length of about 110 km and the river then enters Bihar and flows more or less through the middle of the state. After its confluence with the Kosi, the Ganga continues its eastward flows in Bihar for about 40 km.

At Bhagalpur of Bihar, the river begins to flow south-southeast and as it enters West Bengal, the river swings round the Rajmahal hill range and it begins its attrition with the branching away of its first distributary, the Bhagirathi-Hooghly, which goes on to become the Hooghly River after meeting with Jalangi near Nabadwip and ultimately outfalls into the Bay of Bengal near Sagar Island. Just before the border with Bangladesh the Farakka Barrage controls the flow of the Ganges, diverting some of the water into a feeder canal linked to the Hooghly for the purpose of keeping it relatively silt-free.

The North-Central, South-Central, Western, South-Western and Southern parts of West Bengal constitute the Ganga Basin. This basin is largely divided into two major sub-basins namely Bhagirathi lower and Damodar. The total length of the river Ganga from its point of origin to the point where it falls into sea is about 2, 575 km (measured along Bhagirathi and the Hooghly) of which 1, 450 km lies in Uttaranchal and Uttar Pradesh, 110 km along Uttar Pradesh and Bihar border, 445 km in Bihar and 570 km in West Bengal.

The Ganga system comprises a total area of 74, 575 sq. km within the state of West Bengal. The catchment area distribution of this basin and sub-basins bounded within different neighbouring states and countries has been presented in the following table.

RIVER BASINS AND SUB-BASINS OF WEST BENGAL										
CWC Basin Code	River Basin	Sub-Basins	CATCHMENT AREA (Sq. Km)							TOTAL (Sq. Km)
			Bihar	J'khand	Orissa	Sikkim	WB	B'desh	Nepal	
2A	GANGA									
	Bhagirathi and Others (Ganga Lower)	Atreyee					1627	2262		3889
		Fulhar	2940				325		2684	5949
		Mahananda	2739				6040	1319	3295	13393
		Punarbhaba					1125	1809		2934
		Tangon					1244	806		2050
		Ajay	386	3204			2503			6093
		Amta Channel-Kana Damodar					1490			1490
		Bansloi		1794			119			1913
		Behula					549			549
		Bhagirathi-Hooghly		1292			4160			5452
		Bidyadhari					2014			2014
		Brahamani		985			154			1139
		Churni					975	1304		2279
		Dwarka		329			2649			2978
		Ganga-Padma					1673			1673
		Ghea					1167			1167
		Ichamati					2313	1063		3376
		Jalangi					2537			2537
		Khari					2268			2268
		Mayurakshi		2949			2529			5478
		Pagla		239			337			576
		Sundarban					6747			6747
		Rivers & Creeks					3462			3462
	Damodar	Damodar		17087			4325			21412
		Dwarakeswar					4292			4292
		Haldi					614			614
		Kaliaghai					1913			1913
		Kangsabati		321			6324			6645
		Mundeswari					1439			1439
		Pichabani			17		791			808
		Rasulpur					1556			1556
		Rupnarayan					1226			1226
		Shilabati					4088			4088
Sub-Total		6065	28200	17		74575	8563	5979	123399	

Mahananda-Fulhar Sub-basin

The river Mahananda originates from Ghoom near Darjeeling town in the district of Darjeeling. It is bounded on the north by the Himalayas, in the east by the ridges

separating it from Teesta river system, the river Ganga on the South and the Kosi river system in the east. The river bifurcates into two channels at Barsoi in Bihar. Out of the two branches one flows through Bihar by the name Fulhar and the other flows through West Bengal as Mahananda. The river Mahananda carrying the flow of four tributaries namely, Nagar, Kalindri, Tangon and Punarbhaba, drains into the river Ganga from the North-Western side at Godogarighat just downstream of the point where Ganga leaves the boundary of West Bengal. The combined catchment area of these two Sub-basins is 19,342 sq. km. Under Teesta Barrage Project a barrage has been constructed over Mahananda near Siliguri and another pick-up barrage has been constructed over river Dahuk near Chopra of North Dinajpur district which is a tributary of Mahananda.

Atreyee Sub-basin

Some rivers like Sahu, Neem, Talma, Chaoai, Panga originating from the high lands in districts of Jalpaiguri and meet together to form Kartowa which then enters into Bangladesh by the name Atreyee. The river Atreyee then bifurcates into two channels namely Dheepa and Atreyee. The Western Channel named Atreyee re-enters into West Bengal in South Dinajpur district covering a length of 40 km in the State. It again enters into Bangladesh and ultimately outfalls into river Jamuna after passing through Chalan beel. The total catchment area of this river sub-basin is 3,889 sq. km at the point of leaving West Bengal boundary.

Punarbhaba Sub-basin

The river Dheepa after emerging out from Atreyee in Bangladesh, has taken a South - Western course to enter into South Dinajpur district assuming the name Punarbhaba. Covering a length of about 40 km. in the district it touches the eastern boundary of Maldah district and finally enters into Bangladesh. Further down, Punarbhaba meets the river Mahananda in Bangladesh. The catchment area of this sub-basin is 2,934 sq. km.

Nagar-Kulick, Gamari-Chiramati, Tangon Sub-basins

All these rivers flow through the districts Malda and North Dinajpur and outfall into the

river Mahananda. In course of their flow, somewhere they form the boundary either between West Bengal and Bihar or between West Bengal and Bangladesh. Nagar, originating in Bangladesh flows along the boundary of West Bengal and taking a South-eastern course, receives a spill channel of Mahananda and is joined by Kulick, which has also its origin in Bangladesh.

Gamari and Chiramati are two small rivers that flow through North Dinajpur district before they are united. This combined streams finally outfalls into the river Mahananda. Tangon is a tributary of river Mahananda. It rises in Bangladesh. It flows through the district of North Dinajpur and Malda and meets Mahananda on the boundary of Malda and Bangladesh. The catchment area of Tangon is 2, 050 sq. km.

Bhagirathi-Hooghly Sub-basin

Farakka Barrage diverts water from river Ganga into Bhagirathi through a channel known as Feeder canal near Tildanga town of Murshidabad district in order to ensure minimum flow in Bhagirathi specially during dry season. This canal flowing parallel to Ganga passes Dhulian and ends just above Jangipur where Bhagirathi takes its own course. Two right bank tributaries namely Pagla and Bansloi outfall into the Feeder canal before it turns into actual Bhagirathi. It has been renamed as river Hooghly as it passes on the eastern side of Hooghly district until it outfalls into the Bay of Bengal near Sagar island.

During its entire course from origin to outfall, Bhagirathi has formed boundaries between the districts of Burdwan & Nadia, Hooghly & North 24-Parganas, Howrah & Kolkata, Purba Medinipur & South 24-Parganas. River Ajay, Mayurakshi, Damodar (Amta Channel), Rupnarayan and Haldi are the major tributaries on its right bank while river Jalangi and Churni are the major tributaries on its left bank. Some other minor tributaries on its right bank are Khari, Behula, Ghea and Rasulpur. Moreover there are so many small drainage channels and khals which directly outfall into this river from its both banks thus forming local catchment areas of 5, 452 sq. km. The Tolly's Nullah or the Adi Ganga, as it is sometimes called is a small but important tidal creek draining into the river Hooghly from the left in the vicinity of the city of Kolkata.

One important factor which affects the drainage potential of river Hooghly is the effect of tides. The tide runs rapidly on Hooghly and produces a remarkable example of the fluvial phenomenon known as a 'tidal bore'. This consists of the head-wave of the advancing tide, hemmed in where the estuary narrows suddenly into the river, and often exceeds 2.1 m in height. The difference from the lowest point of low-water in the dry season to the highest point of high-water in the rainy season is reported to be more than 6 m. It has been observed that the incident of flood devastation in the districts of Purba & Paschim Medinipur, Howrah and Hooghly occurs mostly when high flood discharges from Jharkhand districts alongwith those from Bankura, Birbhum, Burdwan and Purulia districts of West Bengal synchronizes with high tides in river Hooghly specially during the month of August and September.

Jalangi-Bhairab Sub-basin

The river Jalangi originates from the right bank of the river Padma in Murshidabad district, 165 km. downstream of Farakka. Jalangi is dead for all purposes except during the periods of heavy rain, when it receives water from Padma. The river ends its journey by finally outfalling into the river Bhagirathi near Nabadwip town of Nadia district. The major tributary of Jalangi is river Bhairab which starts its journey from the river Ganga near Lalbag of Murshidabad district. It is now almost a dead channel but during rainy season it receives water from Padma. Catchment area of Jalangi Sub-basin is 2, 537 sq. km.

Mathabhanga-Churni Sub-basin

River Mathabhanga originates from the right bank of the Padma, at Munshiganj in Kushtia district of Bangladesh. It bifurcates near Majdia of Nadia in India, creating two channels. The western course, Churni runs a few km through Nadia in a south-west direction to meet Bhagirathi and the other course Ichamati, after traversing a length of 20 km in India, enters into Bangladesh near Mubarakpur. The length of Churni is almost 56 km. Catchment area of Mathabhanga-Churni Sub-basin is 2, 279 sq. km.

Ichamati- Bidyadhari Sub-basins

After entering into Bangladesh near Mubarakpur, river Ichamati flows for 35 km in Bangladesh and again re-enters into India at Duttaphulia of Nadia. It forms the international border between India and Bangladesh for 21 km and finally outfalls into river Kalindi of Sundarban area. The length of Ichamati is 208 km with the catchment area of 2, 313 sq. km within West Bengal and 1, 063 sq. km within Bangladesh.

Bidyadhari originates near Haringhata in Nadia district and then flows through Deganga, Habra and Barasat areas of North 24 Parganas before joining the Raimangal River in the Sundarbans. It has been the major drainage system of North 24-Parganas and Kolkata having catchment area of 2, 014 sq. km.

Pagla-Bansloi Sub-basins

These rivers originate from the Rajmahal hills in the Sahebganj district of Jharkhand. Flowing eastern across Birbhum district, they entered Murshidabad district as the tributaries of the river Bhagirathi. The combined catchment area of these sub-basins is 2, 489 sq. km.

Brahamani-Dwarka Sub-basin

Dwaraka originating in Dumka district of Jharkhand, flows through Birbhum and Murshidabad districts where it joins with Mayurakshi to form Babla which finally outfalls into the river Bhagirathi. Brahamani is the main tributary of Dwarka. It also originates in Dumka district of Jharkhand and flows through Birbhum and Murshidabad districts to meet with Dwarka. There are Baidhara and Deocha barrages across the river Brahamani and Dwarka respectively under the 'Mayurakshi Reservoir Project'. The total catchment area of this sub-basin is 4, 117 sq. km.

Mayurakshi-Babla Sub-basin

River Mayurakshi or Mor, the major river in Birbhum district, has a long history of devastating floods. It has its source on Trikut hill, about 16 km from Deoghar in Jharkhand

state. Several spill channels - the Manikarnika, Kana Mor etc. take off from the Mayurakshi in its lower reaches. All these rivers including river Dwarka flow into the lower pocket of Hijal beel in the district of Murshidabad. The combined flow when starts journey from the beel named as river Babla which finally drains into the river Bhagirathi. The drainage and flood level in the Hijal Beel is considerably influenced by the ruling level of Bhagirathi.

Massanjore dam and Tilpara barrage have been constructed across this river as a part of 'Mayurakshi Reservoir Project' which is the first major irrigation project in West Bengal after independence. Other important structures of this project situated in Birbhum are Kopai barrage on river Kopai, Bakreswar dam and Kandisala weir over river Bakreswar. The combined flows of Kopai and Bakreswar are called river Kuia which outfalls into Mayurakhshi near Kandi of Murshidabad. Mayurakshi is about 250 km long out of which nearly 100 km passes through West Bengal. The total catchment area of this sub-basin is 5, 478 sq. km. River Siddheswari and Noonbeel are two major tributaries of Mayurakshi outfalling into it at 8 km downstream of Massanjore dam and largely contribute the high volume of uncontrolled flood discharge during monsoon.

Ajay Sub-basin

River Ajay originates on a small hill about 300 m high, southwest of Munger in Bihar. It then flows through Jharkhand and enters West Bengal at Simjuri, near Chittaranjan. It forms the border between Burdwan and Birbhum districts and finally joins the Bhagirathi River near Katwa town of Burdwan. Total length of the Ajay is 288 km out of which 152 km lays in West Bengal. The important tributaries of Ajay are Pathro and Jayanti in Jharkhand, Hinglow in Birbhum and Kunur in Burdwan district of West Bengal. There is a barrage across river Ajay constructed by Govt. of Jharkhand at Sikatia. The floods of this river are flashy and of short duration. There are some pockets in the Ajay-Kunur catchment which suffer from frequent inundation. Large areas of Burdwan, Birbhum and Murshidabad districts experience inundation due to drainage congestion whenever flood of the Ajay coincides with those of the Mayurakshi and Dwarka. A dam has been constructed over the tributary Hinglow for the purpose of irrigation in some parts of Birbhum district. The total catchment area of this Sub-basin is 6, 093 sq.km.

Khari-Behula-Ghea Sub-basins

Khari river a minor right bank tributary of river Bhagirathi originates from the swampy field of Kanksa-Panagarh region of Burdwan district and flows mainly eastward and later south-eastward to outfall into river Bhagirathi upstream of Kalna town. Its main tributary is Banka river which acts as a spill channel of river Damodar and after flowing almost parallel to Khari it meets with Khari just before its outfall into Bhagirathi. The catchment area of this sub-basin is 2, 268 sq. km.

Behula, also a spill channel of river Damodar originates near Palla village of Burdwan district and after flowing eastward it outfalls into river Bhagirathi upstream of Balagarh town of Hooghly district. Its main tributary is Gangur river. The catchment area of this sub-basin is 549 sq. km.

Ghea is another spill channel of river Damodar, originating in the Burdwan district and after flowing southward and south-eastward through Hooghly district it outfalls into Hooghly river near Champdani town. The main tributaries of this river are Kana and Kunti having a catchment area of 1, 167 sq. km.

Damodar-Mundeswari Sub-basins

River Damodar originating from Palamau hills in Jharkhand and flowing through a length of 541 km between several districts of Jharkhand and West Bengal bifurcates into two channels at Beguahana of Burdwan district near Jamalpur. One channel carrying dominant flood discharge has been named as river Mundeswari which drains into Rupnarayan at Bakshi of Howrah district. The other channel after passing through Hooghly and Howrah districts as Amta channel carries its discharge and outfalls into the river Hooghly through an outfall sluice near Uluberia.

The river causes floods in its lower reaches in the districts of Burdwan, Hooghly and Howrah, mainly on the right bank of the river below Beguahana. Earlier known as the 'Sorrow of Bengal' because of its ravaging floods in the plains of West Bengal, the Damodar and its tributaries have been somewhat tamed with the construction of four dams (Mithon, Panchet, Konar and Tilayia) under the control of 'Damodar Valley Corporation (DVC)'. There is another dam at Tenughat across Damodar under the direct control of Government of Jharkhand and

in the lower catchment there are one barrage at Durgapur and one weir at Randiha under the direct control of Irrigation & Waterways Department, Government of West Bengal.

Barakar and Bokaro are two major tributaries of Damodar in Jharkhand which meet Damodar from its left bank whereas river Shali in Bankura district of West Bengal is other major tributary situated on its right bank. Harinkhola, Short-Cut channel, Kana Dwarakeswar, Hurhura khal are other important drainage arteries of this catchment which play important role in draining out flood discharge into river Rupnarayan, having tidal influence. The total catchment area of Damodar sub-basin in Jharkhand is 17, 087 sq. km and in West Bengal is 4, 325 sq. km upto Beguahana point. The local catchment area of Mundeswari sub-basin is 1, 439 sq. km and that The of Amta Channel-Kana Damodar sub-basin is 1, 490 sq.km.

Dwarakeswar Sub-basin

Darakeswar river (also known as Dhalkishore) is a major river in the western part of West Bengal. It originates from Tilboni hill of Chhota Nagpur Plateau in Purulia district and enters Bankura district near Chatna. It mainly flows south-eastward and after entering into Hooghly district it turns south near Arambag town. Its main tributary Gandheswari rising from Bankura district meets Darakeswar near Bankura town. After receiving contributions from other minor tributaries like Arkasha, Bera, Shankari etc. Darakeswar finally joins with Shilabati at Bandar near Ghatal town of Paschim Medinipur district to form river Rupnarayan. There is proposal of "Darakeswar-Gandheswari Reservoir Project" within this sub-basin. The catchment area of this sub-basin is 4, 292 sq. km.

Shilabati Sub-basin

Like Darakeswar, river Shilabati (also known as Shilai) emerging from hilly terrain of Chhota Nagpur Plateau in the Purulia district, traverses south-eastward through the districts of Bankura and Paschim Medinipur to meet with Darakeswar to form Rupnarayan. River Joyponda, Ketia, Donai, Kubai and Parang are major tributaries of Shilabati. There is a small barrage constructed across the river at Kadamdeuli in Bankura district as a part of 'Kangsabati Reservoir Project'. The catchment area of this sub-basin is 4, 088 sq. km.

Kangsabati Sub-basin

The river Kangsabati (also variously known as the Kasai and Cossye) originating from Chhota Nagpur Plateau in the Purulia district and flowing south-eastward, joins with its main tributary Kumari river at Mukutmanipur of Bankura district where a reservoir popularly known as Mukutmanipur dam has been constructed under the 'Kangsabati Reservoir Project' for the purpose of both irrigation and flood control. An Anicut dam built on this river near Midnapore town in 1872 was also added to the operations of the project.

Further down, after entering into the district of Paschim Medinipur it joins with combined streams of Bhairab Banki and Tarafeni rivers. Both the rivers have barrages over them under the 'Kangsabati Reservoir Project'. After travelling further east in a tortuous course it bifurcates into two rivers at Kapastikri of Paschim Medinipur. Northern branch, known as Old Cossye after flowing through certain distance, further bifurcates into two courses at Daspur of Paschim Medinipur. One course, named as Palaspai khal flow further east to outfall into the Rupnarayan and the main course, known as Durbachati flows south-easterly along the border of both Medinipur districts to outfall into river Rupnarayan. Old Cossye is also connected with river Shilabati through a small channel known as Kanki khal.

The southern course, known as New Cossye, flows further south-easterly direction to meet with river Kaliaghai at Dheubhanga of Purba Medinipur district and forms river Haldi which flows eastwardly into the river Hooghly at Haldia. Kherai and Bakshi khal is the main tributary of river New Cossye. The total length of Kangsabati is around 465 km. The catchment area of this sub-basin is 6, 645 sq. km. Very often lower portion of this sub-basin specially Ghatal area of Paschim Medinipur and Panskura area of Purba Medinipur districts suffer from inundation due to high flood discharge from its uncontrolled catchment downstream of the Mukutmanipur dam synchronizing with high tide in river Rupnarayan.

Kaliaghai

The river Kaliaghai trickles out from Dudhkundi of Jhargram in Paschim Medinipur district and flows south-easterly through Purba Medinipur to meet the other arm of Kangsabati i.e. New Cossye to form Haldi. During the course of its journey, it is fed by the

flow of its tributaries namely Kapaleswari, Baghai and Chandia. The length of this river is 121 km and catchment area is 1, 913 sq. km. This river is mainly responsible for flood in Sabang area of Paschim Medinipur district.

Rupnarayan Sub-basin

River Rupnarayan is the major drainage artery of south-western districts of South Bengal. Being the main tributary of Hooghly river, it receives tidal discharge of Bay of Bengal throughout the year and plays an important role in draining flood water from vast catchment area. Irrespective of discharges from its major tributaries like Mundeswari, Darakeswar, Shilabati and Kangsabati, it also receives flood water from many local drainage channels like Kata khal of Hooghly, Bakshi khal of Howrah, Chandreswar khal of Paschim Medinipur, Denan-Dehaty-Soadighi-Gangakhali-Pratapkhali-Shankrara khals of Purba Medinipur which directly outfall into Rupnarayan from its both banks. The length of this river is 80 km having local catchment area of 1, 226 sq. km.

Haldi Sub-basin

Two rivers New Cossye and Kaliaghai join at Dheubhanga of Purba Medinipur to form river Haldi which after traversing south-eastward outfalls into river Hooghly near Haldia town. It divides the Purba Medinipur district into two parts, the Northern part can be categorized as drainage area of Tamluk and the southern part can be categorized as Rasulpur-Nandigram drainage area. Except upper catchment discharges from Kaliaghai-New Cossye sub-basins, river Haldi drains out water from parts of both the above mentioned drainage areas. The lower portion of the river Haldi is affected by over bank spills and drainage problem during the monsoon as entire stretch of 42 km of the river falls under the tidal influence of river Hooghly. The local catchment area of this sub-basin is 614 sq. km.

Rasulpur Sub-basin

The river Rasulpur is formed by union of two drainage channels namely Bagda and Sadar khals. It is the main drainage channel in Contai sub-division of Purba Medinipur district. The river having length 19 km drains out flood water of 1, 556 sq. km into the river Hooghly.

Pichabani-Negua Channel Sub-basin

River Pichabani and Negua Diversion channel systems are used to discharge rain water out from Dubda basin of Purba Medinipur district. The two channels outfall into Bay of Bengal. Catchment area of this sub-basin is 808 sq. km.

Sundarban Drainage Sub-basin

Apart from the rivers described earlier within the Ganga basin, there is a group of rivers in Southern part of the State which falls in the deltaic zone. These tidal rivers, estuaries and creeks are situated on the eastern side of Hooghly river popularly known as Sundarbans which is nothing but an intricate network of number of deltaic islands of the district of South 24-Parganas. These rivers drain off whatsoever fresh discharge comes from country sides, thus ultimately draining into Bay of Bengal. Some important rivers in Sundarban are Muriganga, Mridangabhang, Saptamukhi, Raimangal, Matla, Bidya, Thakuran, Malancha, Kalindi, Gomar etc. The total land area of Sundarban sub-basin is 6, 747 sq. km.

SUBARNAREKHA BASIN

The river Subarnarekha (also called Swarnarekha) though it has small catchment within this state, has got separate entity as it directly falls into the Bay of Bengal. Originating in the Chhotonagpur Range at an elevation of 609 m near Ranchi, it traverses through three states viz. Jharkhand, West Bengal and Orissa. It drains out rain water from a total area of 19, 684 sq. km out of which only 3, 593 sq. km falls within Purulia and Paschim Medinipur districts of West Bengal.

One major dam at Chandil and one barrage at Galudi have been constructed across Subarnarekha in Jharkhand. The important tributaries on the right bank of this river are Kanchi and Karkari which meet Subarnarekha above Chandil dam and another right bank main tributary named as Kharkai meets this river near Jamshedpur upstream of Galudi barrage. Dulung is the main tributary which joins Subarnarekha from its left in the Paschim Medinipur district of West Bengal. The total length of this river is 395 km out of which 83 km falls within West Bengal.

4. RIVER AND RAIN GAUGES

Irrigation and Waterways Department (IWD), Govt. of West Bengal is responsible for maintenance, collection, compilation and dissemination of hydrological and meteorological data for the purpose of monitoring of flood situation for almost all river sub-basins of the State during monsoon. For this purpose network of river gauges and rain gauges have been established at the important locations and during monsoon flood control rooms in each district are set up including the Central Flood Control Room at Jalasampad Bhawan, Salt Lake, Kolkata-700091.

Apart from IWD, other organizations like Central Water Commission (CWC), Indian Meteorological Department (IMD), State Agricultural Department, Kolkata Port Trust (KoPT), Damodar Valley Corporation (DVC) have set up network of river gauges and rain gauges at different locations for the purpose of monitoring hydrological and meteorological status of the State. These field data mainly includes daily rainfall, water level of river and reservoir, river discharge and inflow-outflow from reservoir. In addition to that other information like inflow forecast, meteorological forecast and flood damage are also collected.

Existing Hydro-Met Monitoring System in the State

Sl. No.	Type	IWD			CWC			IMD			Others		
		P	S	T	P	S	T	P	S	T	P	S	T
1	Ordinary Rain Gauge	75	51	126	23	23		7	7		3	3	
	ARG/AWS/FCS	0		0	0	0		58	58				
2	River Gauge	75		75	14	14					1	1	
3	HOS	10	3	13	2	2							
P = Perennial													
S = Seasonal													
T = Total													
HOS = Hydrological Observation Station													

The present flood monitoring and management system in the State comprises with the preparation of Daily Flood Report by Central Flood Control Room of IWD and transmission of the same to the State Disaster Management Department with the Head Quarter at Kolkata. This report is also shared with other organisation like Railway Authority, Defence, KoPT etc. on regularly.

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 generally contains rainfall, river gauge and discharge, reservoir level / inflow /outflow data of different Stations within and outside the State. Sometimes the location and extent of major damages, the status of affected areas under inundation etc. are also included. These data are collected from different district control rooms under IWD along with other agencies like IMD, CWC and DVC by telephone, email or fax. Daily flood report is also uploaded in the departmental web site www.wbiwd.gov.in.

A comprehensive list of existing Hydro-Met network within the State under the jurisdiction of Irrigation & Waterways Department, Central Water Commission, India Meteorological Department, and other State Govt. Departments is given in the following tables.

Sub-basin wise List of Hydro-Met Monitoring Stations in North Bengal

<i>SUB-BASIN SANKOSH</i>						
L.R.P. Crossing	Sankosh	Rain / River	Alipurduar	IMD / CWC	48.50	49.40
<i>SUB-BASIN RAIDAK</i>						
L.R.P. Crossing	Raidak-II	River	Alipurduar	IWD / CWC	48.40	49.30
L.R.P. Crossing	Raidak-I	River	Alipurduar	IWD / CWC	47.00	47.90
Tufanganj	Raidak-I	Rain / River	Coochbehar	AGRI / CWC	35.30	35.90
<i>SUB-BASIN TORSA</i>						
Mahua Tea Garden	Torsa	Rain	Alipurduar	IMD	44.10	45.70
Jayanti	Gadadhar	Rain	Alipurduar	IMD		
Alipurduar	Kaljani	Rain / River	Alipurduar	IMD / IWD	44.10	45.70
Hasimara	Torsa	Rain / River	Alipurduar	IWD / CWC	116.30	117.50
Banarhat	Dudua	Rain	Jalpaiguri	IWD		
Coochbehar	Torsa	Rain / River	Coochbehar	IMD / IWD	42.07	42.68
Pundibari	Torsa	Rain	Coochbehar	IMD		
Dinhata	Torsa	Rain	Coochbehar	IMD	42.07	42.68
<i>SUB-BASIN JALDHAKA</i>						
Chengmari Tea Garden	Diana	Rain / River	Jalpaiguri	IMD / CWC	200.50	201.40
Nagrakata	Jaldhaka	River	Jalpaiguri	CWC	160.70	161.80
NH-31 Crossing	Jaldhaka	River	Jalpaiguri	CWC	80.10	80.90
Mainaguri	Jarda	Rain	Jalpaiguri	IMD		
Mathabhanga	Mansai	Rain / River	Coochbehar	CWC	47.70	48.20
<i>SUB-BASIN TEESTA</i>						
Gangtok	Teesta	Rain	Darjeeling	IMD		
Darjeeling	Teesta	Rain	Darjeeling	IMD		
Kalimpong	Teesta	Rain	Darjeeling	IMD		
Pedong	Teesta	Rain	Darjeeling	IMD		
Malbazar	Mal	Rain	Jalpaiguri	IWD		
Jalapiguri	Teesta	Rain	Jalpaiguri	IWD		
Teestabazar	Teesta	River	Darjeeling	CWC	211.00	213.00
Coronation Bridge	Teesta	River	Darjeeling	CWC	150.00	153.60
Domohani	Teesta	River	Jalpaiguri	CWC	85.95	86.30
Mekhliganj	Teesta	Rain / River	Jalpaiguri	IMD / CWC		

Sub-basin wise List of Hydro-Met Monitoring Stations in North Bengal

Gauge Station	River	Type of Gauge	District	Maintained by	DL (m)	EDL (m)
<i>SUB-BASIN MAHANANDA-FULHAR</i>						
Hill Cart Road	Mahananda	River	Darjeeling	IWD	115.98	116.59
Siliguri	Mahananda	Rain	Darjeeling	IWD		
Kharibari	Mahananda	Rain	Darjeeling	IMD		
Naxalbari	Mechi	Rain	Darjeeling	IWD		
Sonapur	Mahananda	River	North Dinajpur	IWD	75.77	76.38
Chopra	Dauk	River	North Dinajpur	IWD	69.46	70.07
Islampur	Dauk	Rain	North Dinajpur	AGRI		
Makdampur	Nagar	River	North Dinajpur	IWD	31.54	31.86
Raiganj	Kulik	Rain / River	North Dinajpur	AGRI / IWD	31.20	32.69
Pajol	Sui	River	North Dinajpur	IWD	27.43	28.00
Kachua	Sui	River	North Dinajpur	IWD	25.49	26.09
Radhikapur	Tangon	River	North Dinajpur	IWD	33.45	34.05
Itahar	Gamari	Rain / River	North Dinajpur	IMD / IWD	26.82	27.41
Bangshihari	Tangon	River	South Dinajpur	IWD	25.60	26.21
Teljana	Fulhar	River	Malda	IWD	27.43	28.35
Ratua	Fulhar	Rain	Malda	IMD		
Englishbazar	Mahananda	Rain / River	Malda	IMD / IWD	22.75	23.50
<i>SUB-BASIN PUNARBHABA</i>						
Gangarampur	Punarbhaba	Rain / River	South Dinajpur	IWD	25.82	26.42
Tapan	Punarbhaba	Rain	South Dinajpur	IWD		
<i>SUB-BASIN ATREYEE</i>						
Balurghat	Atreyee	Rain / River	South Dinajpur	IWD	23.15	23.76
Majhian	Atreyee	Rain	South Dinajpur	IWD		
<i>SUB-BASIN GANGA</i>						
Manikchakghat	Ganga	River	Malda	IWD	24.69	25.30
Farakka	Ganga	River	Malda	CWC	22.25	22.85

Sub-basin wise List of Hydro-Met Monitoring Stations in South Bengal

Name of Gauge Station	River	Type of Gauge	District	Maintained by	DL (m)	EDL (m)
<i>SUB-BASIN GANGA-PADMA</i>						
Nimtita	Ganga-Padma	River	Murshidabad	IWD	21.90	21.64
Nurpur	Ganga-Padma	River	Murshidabad	IWD	21.03	21.64
Geria	Ganga-Padma	River	Murshidabad	IWD	20.94	21.55
Chakghat	Ganga-Padma	River	Murshidabad	CWC	20.88	21.49
Akheriganj	Ganga-Padma	River	Murshidabad	CWC	18.44	19.05
<i>SUB-BASIN BHAGIRATHI-HOOGHLY</i>						
Jangipur	Bhagirathi	River	Murshidabad	IWD	20.27	20.88
Berhampore	Bhagirathi	Rain / River	Murshidabad	IMD / IWD	17.22	17.83
Chakdah	Bhagirathi	Rain	Nadia	IMD		
Kalyani	Bhagirathi	Rain	Nadia	IMD		
Katwa	Hooghly	Rain	Burdwan	IWD	13.71	14.32
Kalna	Hooghly	River	Burdwan	IWD	13.71	14.32
Chinsurah	Hooghly	Rain	Hooghly	IMD		
Najirganj	Hooghly	Rain	Howrah	IWD		
Siejberia	Hooghly	Rain	Howrah	IWD		
Chitpur	Hooghly	Rain	Kolkata	IWD		
Alipur	Hooghly	Rain	Kolkata	IMD		
Charial	Hooghly	Rain	South 24 Parganas	IWD		
Diamond Harbour	Hooghly	Rain	South 24 Parganas	IMD		
<i>SUB-BASIN JALANGI-CHURNI</i>						
Debogram	Jalangi	Rain	Nadia	IMD		
Krishnanagar	Jalangi	Rain	Nadia	IMD		
Swarupganj	Jalangi	River	Nadia	IWD	8.44	9.05
Hanskali	Churni	River	Nadia	IWD	7.53	8.14

Sub-basin wise List of Hydro-Met Monitoring Stations in South Bengal

Name of Gauge Station	River	Type of Gauge	District	Maintained by	DL (m)	EDL (m)
<i>SUB-BASIN PAGLA-BANSLOI</i>						
Pakur	Bagmari	Rain	Jharkhand	IMD		
Maheshpur	Bansloi	Rain	Jharkhand	IMD		
Bansloi Railway Bridge	Bansloi	River	Birbhum	IWD	31.85	32.76
Bahutuli	Bansloi	River	Murshidabad	IWD		
Paikar	Pagla	Rain	Birbhum	IWD		
<i>SUB-BASIN BRAHAMANI-DWARKA</i>						
Shikaripara	Dwarka	Rain	Jharkhand	IMD		
Nalhati	Brahmani	Rain	Birbhum	IWD		
Jagdhari Road Bridge	Brahmani	River	Birbhum	IWD	33.00	33.40
Lohapur	Dwarka	Rain	Birbhum	IWD		
Bonta	Dwarka	Rain	Birbhum	IWD		
Rampurhat	Dwarka	Rain	Birbhum	IWD		
Mallarpur	Dwarka	Rain	Birbhum	IWD		
Md. Bazar	Dwarka	Rain	Birbhum	IWD		
Deocha Bararge	Dwarka	Rain	Birbhum	IWD		
Mayureswar	Dwarka	Rain	Birbhum	IWD		
Baraturigram	Dwarka	Rain	Birbhum	IWD		
Kuli	Manikarni	Rain	Murshidabad	IWD		
Eroali	Manikarni	Rain	Murshidabad	IWD		
Sankoghat	Dwarka	River	Murshidabad	IWD	20.40	21.30
Ranagram	Dwarka	River	Murshidabad	IWD	17.36	17.86
<i>SUB-BASIN MAYURAKSHI-BABLA</i>						
Haripur	Mayurakshi	Rain	Jharkhand	CWC		
Khushiary	Mayurakshi	Rain	Jharkhand	CWC		
Jama	Mayurakshi	Rain	Jharkhand	IMD		
Maharo	Mayurakshi	Rain	Jharkhand	CWC		
Dumka	Mayurakshi	Rain	Jharkhand	IMD		
Massanjore	Mayurakshi	Rain	Jharkhand	CWC / IWD		

Name of Gauge Station	River	Type of Gauge	District	Maintained by	DL (m)	EDL (m)
Kundahit	Siddheswari	Rain	Jharkhand	IWD		
Tatloi	Siddheswari	Rain	Jharkhand	IMD		
Kushkarini	Kushkarini	Rain	Birbhum	IWD		
Tilpara Barrage	Mayurakshi	Rain	Birbhum	CWC		
Suri	Mayurakshi	Rain	Birbhum	IMD		
Sainthia	Mayurakshi	Rain	Birbhum	IWD		
Ahmedpur	Bakreswar	Rain	Birbhum	IWD		
Kadisala	Bakreswar	Rain	Birbhum	IWD		
Kultore Barrage	Kopai	Rain	Birbhum	IWD		
Shyambati	Kopai	Rain	Birbhum	IWD		
Albanda	Kopai	Rain	Birbhum	IWD		
Bipratikuri	Kopai	Rain	Birbhum	IWD		
Shekhampur	Bakreswar	Rain	Birbhum	IWD		
Labhpur	Kuia	Rain	Birbhum	IWD		
Kirnahar	Kuia	Rain	Birbhum	IWD		
Tarapur	Kuia	River	Murshidabad	IWD	22.71	23.35
Narayanpur	Mayurakshi	Rain / River	Murshidabad	CWC	27.988	28.79
Kandi	Mayurakshi	Rain	Murshidabad	IWD		
Salar	Babla	Rain	Murshidabad	IWD		
Bharatpur	Babla	Rain	Murshidabad	IWD		
<i>SUB-BASIN AJAY-HINGLOW</i>						
Deoghar	Ajay	Rain	Jharkhand	IMD		
Jamtara	Ajay	Rain	Jharkhand	IMD		
Sikatia Barrage	Ajay	Rain	Jharkhand	CWC		
Hinglow Dam	Hinglow	Rain	Birbhum	IWD		
Khayrashole	Hinglow	Rain	Birbhum	IWD		
Bahari	Ajay	Rain	Birbhum	IWD		
Debagram	Ajay	Rain	Birbhum	IWD		
Nanur	Ajay	Rain	Birbhum	IWD		
Gheropara	Ajay	Rain / River	Birbhum	CWC	39.42	40.42
Khujutipara	Ajay	Rain	Birbhum	IWD		

Name of Gauge Station	River	Type of Gauge	District	Maintained by	DL (m)	EDL (m)
Bahiri	Kana Ajay	Rain	Birbhum	IWD		
Amuliaghata	Ajay	Discharge	Burdwan	IWD		
Satkahania	Ajay	Rain	Burdwan	IWD		
Budra	Ajay	River	Burdwan	IWD	39.42	40.34
Amgoria	Ajay	Rain	Burdwan	IWD		
Bhedia	Ajay	Rain	Burdwan	CWC		
Katwa	Ajay	Rain / River	Burdwan	IWD	14.48	15.04
Gushkara	Kunur	Rain	Burdwan	IWD		
Mangalkote	Kunur	Rain	Burdwan	IWD		
<i>SUB-BASIN DAMODAR-MUNDESWARI</i>						
Tilayia	Barakar	Rain	Jharkhand	IMD		
Koderma	Barakar	Rain	Jharkhand	IMD		
Birni	Barakar	Rain	Jharkhand	IMD		
Giridih	Barakar	Rain	Jharkhand	IMD		
Tundi	Barakar	Rain	Jharkhand	IMD		
Ichak	Konar	Rain	Jharkhand	IMD		
Hazaribag	Konar	Rain	Jharkhand	IMD		
Bokaro	Konar	Rain	Jharkhand	IMD		
Topchanchi	Damodar	Rain	Jharkhand	IMD		
Dhanbad	Damodar	Rain	Jharkhand	IMD		
Tenughat	Damodar	Rain	Jharkhand	CWC		
Maithon	Damodar	Rain	Jharkhand	CWC		
Panchet	Damodar	Rain	Jharkhand	CWC		
Asansol	Damodar	Rain	Burdwan	IWD		
Durgapur Barrage	Damodar	Rain	Burdwan	CWC		
Rajbandh	Damodar	Rain	Burdwan	IWD		
Rondia	Damodar	Rain / River	Burdwan	IWD	52.13	52.89
Edilpur	Damodar	Rain / River	Burdwan	IWD	32.79	32.95
Burdwan	Damodar	Rain	Burdwan	IWD / IMD		
Jamalpur	Damodar	Rain / River	Burdwan	IWD	23.24	23.54

Name of Gauge Station	River	Type of Gauge	District	Maintained by	DL (m)	EDL (m)
Khandaghosh	Damodar	Rain	Burdwan	IWD		
Seherabazar	Damodar	Rain	Burdwan	IWD		
Lohai (Raina)	Damodar	Rain	Burdwan	IWD		
Uchalan	Damodar	Rain	Burdwan	IWD		
Maliara	Damodar	Rain	Bankura	IWD		
Pakhana	Damodar	Rain	Bankura	IWD		
Galsi	Damodar	Rain	Burdwan	IWD		
Para	Damodar	Rain	Purulia	IWD		
Raghunathpur	Damodar	Rain	Purulia	IWD		
Parga Dam	Damodar	Rain	Purulia	IWD		
Golamarajore Dam	Damodar	Rain	Purulia	IWD		
Ramchandrapur Dam	Damodar	Rain	Purulia	IWD		
Champadanga	Damodar	Rain / River	Hooghly	IWD	12.90	13.50
Harinkhola	Mundeswari	Rain / River	Hooghly	CWC / IWD	12.80	13.41
Muchighata	Hur Hura	Rain / River	Hooghly	IWD	6.16	6.77
Dasghara	Kana Damodar	Rain	Hooghly	IWD		
Jangipara	Damodar	Rain	Hooghly	IWD		
Amta	Damodar	Rain / River	Howrah	IWD	5.64	6.24
Domjur	Saraswati	Rain	Howrah	IWD		
Jagatballavpur	Kana Damodar	Rain	Howrah	IMD		
Uluberia	Kana Damodar	Rain	Howrah	IMD		
<i>SUB-BASIN KHARI-BEHULA-GHEA</i>						
Belari	Khari	Rain	Burdwan	IWD		
Banpas	Khari	Rain	Burdwan	IWD		
Kurhmun	Khari	Rain	Burdwan	IWD		
Srikhanda	Khari	Rain	Burdwan	IWD		
Manteswar	Khari	Rain	Burdwan	IWD		
Majhergram	Khari	Rain	Burdwan	IWD		

Name of Gauge Station	River	Type of Gauge	District	Maintained by	DL (m)	EDL (m)
Shrikhanda	Khari	Rain	Burdwan	IWD		
Sanko	Banka	Rain	Burdwan	IWD		
Balgona	Banka	Rain	Burdwan	IWD		
Memari	Behula	Rain	Burdwan	IWD		
Dhaniakhali	Ghea	Rain	Hooghly	IMD		
Singur	Ghea	Rain	Hooghly	IWD		
Rudrani	Ghea	Rain	Hooghly	IWD		
<i>SUB-BASIN DWARAKESWAR</i>						
Kashipur	Dwarakeswar	Rain	Purulia	IWD		
Beko Dam	Dwarakeswar	Rain	Purulia	IWD		
Patrasayar	Dwarakeswar	Rain	Bankura	IWD		
Indus	Dwarakeswar	Rain	Bankura	IWD		
Salbandh	Dwarakeswar	Rain	Bankura	IWD		
Bhorakhal (Pandua)	Dwarakeswar	Rain	Bankura	IWD		
Bowaichandi	Dwarakeswar	Rain	Burdwan	IWD		
Kantabandh	Shali	Rain	Bankura	IWD		
Sonamukhi	Shali	Rain	Bankura	IWD		
Onda	Berai	Rain	Bankura	IWD		
Bankura	Dwarakeswar	Rain / River	Bankura	CWC / IWD		
Kotulpur	Dwarakeswar	Rain	Bankura	IWD		
Kamarpukur	Dwarakeswar	Rain	Hooghly	IWD		
Arambag	Dwarakeswar	Rain / River	Hooghly	IWD	17.22	17.83
Shakepue	Dwarakeswar	River	Hooghly	IWD	11.75	12.35
<i>SUB-BASIN SHILABATI</i>						
Kadamdeuli	Shilabati	Rain	Bankura	IMD		
Taldangra	Jayponda	Rain	Bankura	IMD		
Amlagora	Shilabati	Rain	Pachim Medinipur	IWD		
Panikotar	Shilabati	Rain	Pachim Medinipur	IWD		
Adalia	Kubai	Rain	Pachim Medinipur	IWD		

Name of Gauge Station	River	Type of Gauge	District	Maintained by	DL (m)	EDL (m)
Salboni	Tamal	Rain	Pachim Medinipur	IWD		
Chandrakona	Donai	Rain	Pachim Medinipur	IWD		
Banka	Shilabati	River	Pachim Medinipur	IWD	15.08	15.69
Gadghat	Shilabati	River	Pachim Medinipur	IWD	8.99	9.60
<i>SUB-BASIN RUPNARAYAN</i>						
Ghatal	Rupnarayan	Rain	Pachim Medinipur	IWD		
Bandar	Rupnarayan	River	Pachim Medinipur	IWD	6.85	7.46
Ranichak	Rupnarayan	River	Pachim Medinipur	IWD	5.33	5.94
Gopiganj	Rupnarayan	River	Pachim Medinipur	IWD	5.03	5.65
Denan	Rupnarayan	River	Purba Medinipur	IWD	4.42	5.02
Kolaghat	Rupnarayan	Rain	Purba Medinipur	IWD		
Tamluk	Rupnarayan	Rain	Purba Medinipur	IMD		
Geonkhali	Rupnarayan	River	Purba Medinipur	KOPT		
<i>SUB-BASIN KANGSABATI</i>						
Kotsila	Cossye	Rain	Purulia	IMD		
Jaipur	Cossye	Rain	Purulia	IWD		
Bandhu Dam	Cossye	Rain	Purulia	IWD		
Arsa	Cossye	Rain	Purulia	IWD		
Purulia	Cossye	Rain	Purulia	IWD / IMD		
Patloi Dam	Cossye	Rain	Purulia	IWD		
Simulia	Cossye	Rain	Purulia	CWC		
Tusuma	Cossye	Rain	Purulia	CWC		
Balrampur	Kumari	Rain	Purulia	IWD		
Barabhum Dam	Kumari	Rain	Purulia	IWD		
Hanumata Dam	Kumari	Rain	Purulia	IWD		

Name of Gauge Station	River	Type of Gauge	District	Maintained by	DL (m)	EDL (m)
Kumari Dam	Kumari	Rain	Purulia	IWD		
Phulberia	Kumari	Rain	Purulia	CWC		
Purihansa	Kumari	Rain	Purulia	CWC		
Kharidwar	Kumari	Rain	Purulia	CWC		
Tetla	Kumari	Rain	Purulia	IWD		
Kangsabati Dam	Kangsabati	Rain	Bankura	CWC / IWD		
Bhairabbanki Barrage	Bhairabbanki	Rain	Bankura	IWD		
Lalgarh	Kangsabati	Rain	Pachim Medinipur	IWD		
Jhargram	Kangsabati	Rain	Pachim Medinipur	IMD		
Tarapheni Barrage	Tarapheni	Rain	Pachim Medinipur	IWD		
Midnapore	Kangsabati	Rain	Pachim Medinipur	IMD		
Mohanpur	Kangsabati	Rain / River	Pachim Medinipur	CWC / IWD	25.75	26.36
Lachhmapur	Kangsabati	Rain	Pachim Medinipur	IWD		
Kapastikri	Kangsabati	River	Pachim Medinipur	IWD	16.00	16.60
Kalmijole	Old Cossye	River	Pachim Medinipur	IWD	9.29	9.90
Balichak	New Cossye	Rain	Pachim Medinipur	IWD		
Khanyadihi	Durbachati	River	Purba Medinipur	IWD	5.03	5.65
Panskura	New Cossye	Rain / River	Purba Medinipur	IWD	9.29	9.90
Dobandy	New Cossye	River	Purba Medinipur	IWD	5.02	5.63
<i>SUB-BASIN KALIAGHAI-HALDI</i>						
Hijli	Kaliaghai	Rain	Pachim Medinipur	IWD		
Makrampur	Kaliaghai	Rain	Pachim Medinipur	IWD		
Bakhrabad	Kaliaghai	River	Pachim Medinipur	IWD	8.40	8.85

Name of Gauge Station	River	Type of Gauge	District	Maintained by	DL (m)	EDL (m)
Dehati	Kaliaghai	River	Pachim Medinipur	IWD	6.55	7.00
Kalimondop	Kaliaghai	River	Pachim Medinipur	IWD	5.03	5.65
Sabang	Kapaleswari	Rain	Pachim Medinipur	IWD		
Narayanbar	Kapaleswari	River	Pachim Medinipur	IWD	5.33	5.94
Barisha	Chandia	Rain / River	Pachim Medinipur	IWD	4.55	5.00
Amgachia	Kaliaghai	Rain / River	Purba Medinipur	IWD	5.79	6.40
Itamogra	Haldi	Rain	Purba Medinipur	IWD		
Haldia	Haldi	Rain	Purba Medinipur	IMD		
<i>SUB-BASIN RASULPUR-PICHABANI</i>						
Contai	Rasulpur	Rain	Purba Medinipur	IWD		
Egra	Pichabani	Rain	Purba Medinipur	IWD		
<i>BASIN SUBARNAREKHA</i>						
Jhalda	Subarnarekha	Rain	Purulia	IWD		
Baghmundi	Subarnarekha	Rain	Purulia	IWD		
Kestobazar Dam	Subarnarekha	Rain	Purulia	IWD		
Khairabera Dam	Subarnarekha	Rain	Purulia	IWD		
Rupai Dam	Subarnarekha	Rain	Purulia	IWD		
Dimu Dam	Subarnarekha	Rain	Purulia	IWD		
Karrior Dam	Subarnarekha	Rain	Purulia	IWD		
Lodhashuli	Dulung	Rain	Pachim Medinipur	IWD		
Kesiapara (Sankrail)	Subarnarekha	Rain	Pachim Medinipur	IWD		
Gopiballavpur	Subarnarekha	Rain / River	Pachim Medinipur	IWD	46.87	47.40
Sonakonia	Subarnarekha	River	Purba Medinipur	IWD	16.15	16.75
Digha	Subarnarekha	Rain		IWD		

Name of Gauge Station	River	Type of Gauge	District	Maintained by	DL (m)	EDL (m)
<i>SUB-BASIN ICHAMATI-BIDYADHARI</i>						
Majdia	Mathabhanga	River	Nadia	IWD	7.82	8.43
Bararckpore	Nowai	Rain	North 24 Parganas	IMD		
Dumdum	Nowai	Rain	North 24 Parganas	IMD		
Deganga	Bidyadhari	Rain	North 24 Parganas	IMD		
Barasat	Bidyadhari	Rain	North 24 Parganas	IWD		
Gaighata	Jamuna	River	North 24 Parganas	IWD	3.90	4.50
Gobardanga	Jamuna	River	North 24 Parganas	IWD	3.77	4.37
Tentulia	Ichamati	Rain / River	North 24 Parganas	IWD		5.10
Bangaon	Ichamati	Rain / River	North 24 Parganas	AGRI / IWD	5.08	5.28
Basirhat	Ichamati	Rain	North 24 Parganas	IMD		
Chowbaga	Bidyadhari	Rain	South 24 Parganas	IWD		
<i>SUB-BASIN SUNDARBAN</i>						
Uttarbhag	Adi Ganga	Rain	South 24 Parganas	IWD		
Baruipur	Adi Ganga	Rain	South 24 Parganas	IMD		
Canning	Matla	Rain	South 24 Parganas	IMD		
Nimpith	Mani	Rain	South 24 Parganas	IMD		
Raidighi	Sapatamukhi	Rain	South 24 Parganas	IMD		
Kakdwip	Muriganga	Rain	South 24 Parganas	IMD		
Sagar Island	Bay of Bengal	Rain	South 24 Parganas	IMD		
Dakshin Surendrananj	Bay of Bengal	Rain	South 24 Parganas	IWD		

5. RAINFALL IN 2015

Due to its physical and geographical position, the State of West Bengal has climatological variations as well. The average rainfall in the state is 1750 mm, of which more than 75% occurs during the monsoon period while the hilly regions at the foot hills of Himalaya receive the heaviest rainfall ranging from 2500 mm to 4000 mm. The southern districts in the plains receive average of 1125 mm to 1875 mm.

The main rainfall season in this state is the South-West monsoon season during which the entire land (excepting the extreme north, the extreme north-east and extreme south) gets 75% of the annual rainfall. The gangetic plains of West Bengal get 78% of its annual rainfall during the monsoon period distributed normally between 1st week of June up to the end of September. But during last few years, some parts of West Bengal have experienced premature heavy rainfall in the last week of May causing flood. However the late withdrawal of monsoon even after second week of October has also been observed during these years.

Normal Rainfall Pattern

The river Ganga divides the state into two parts, which are by and large homogeneous from the meteorological point of view. The northern half is designated as 'Sub-Himalayan West Bengal' and the southern half as 'Gangetic West Bengal'. Sub-Himalayan West Bengal is more susceptible to heavy rains both in respect of amount as well as in frequency of occurrence.

Very heavy rain is more frequent in first two months (June and July) than in subsequent, in the Sub-Himalayan West Bengal. In Gangetic West Bengal the frequency is maximum in August followed by June, July and September in that order. On the basis of rainfall distribution, the state can be divided into two broad zones - (i) The Himalayan and Sub-Himalayan Region (ii) The Gangetic Plains

i) Himalayan and Sub-Himalayan Region

The Himalayan and Sub-Himalayan Region comprising the districts- Darjeeling, Jalpaiguri, Coochbehar and Northern part of Islampur Sub-Division of Uttar Dinajpur district of high

intensity of rainfall from 2000 mm. to over 4000 mm. about 80% of which is found to occur during monsoon season. On the average Darjeeling, Coochbehar and Jalpaiguri get 114,112,110 rainy days respectively in a year.

The monsoon generally follows a northern track to ultimately break up against Eastern Himalaya causing very heavy rainfall and thereafter trough of low pressure under break monsoon conditions. It then shifts northward to the Himalayan foothills. It has been found that a precipitation between 200 to 300 mm in two hours is not unusual here. For more than 40 occasions, rainfall of 250 mm and above has been registered during 1891-1965.

ii) Gangetic Plains

The gangetic plains which constitute the major portion of the state, can be further subdivided into the following three sectors on the basis of average rainfall –

Sector - I: Bankura, Burdwan, Hooghly, Nadia and Purulia districts which receive an average rainfall - between 1140 mm and 1400 mm.

Sector - II: Birbhum, Midnapore, Murshidabad and North 24-Parganas having an average annual rainfall between 1400 mm and 1650 mm.

Sector - III: Kolkata, Howrah and South 24-Parganas having an average annual rainfall - between 1650 mm and 1900 mm.

Such regional variations in the precipitation pattern causes flood conditions from time to time.

Monsoon, 2015

For the country as a whole, the rainfall for the season (June-September) was 86% of its long period average (LPA) and the same was 92% of its LPA over North-East (NE) India.

Although West Bengal received an overall 2.20% excess rainfall than its average monthly rainfall during monsoon, 2015 i.e. during the month from June to September, 2015 but rainfall

distribution between North Bengal and South Bengal varied largely. While North Bengal (Himalayan and Sub-Himalayan region) has received **14.30% less** rainfall than its average monthly rainfall, South Bengal (Gangetic Plains) received **15.01% excess** rainfall during this period. The Sectoral variations of monthly rainfall in West Bengal during monsoon months have been given below.

Variation of monthly rainfall in Himalayan and Sub-Himalayan West Bengal
during monsoon, 2015

RAINFALL (mm)	JUNE			JULY			AUGUST			SEPTEMBER		
SECTOR	Actual	Normal	Dep	Actual	Normal	Dep	Actual	Normal	Dep	Actual	Normal	Dep
NORTH BENGAL	2405.5	2692.7	-10.67	2178.2	3622.0	-39.86	3431.8	2890.3	18.74	1954.9	2428.5	-19.50

*Dep = Departure

*Source: IMD

Variation of monthly rainfall in Gangetic Plains during monsoon, 2015

RAINFALL (mm)	JUNE			JULY			AUGUST			SEPTEMBER		
SECTOR	Actual	Normal	Dep (%)	Actual	Normal	Dep (%)	Actual	Normal	Dep (%)	Actual	Normal	Dep (%)
SECTOR-I	1279.8	1112.8	15.01	2806.3	1482.9	89.24	1031.2	1384.1	-25.50	681.8	1217.5	-44.00
SECTOR-II	1336.0	1273.2	4.93	3377.6	1720.5	96.32	1447.1	1626.6	-11.04	873.3	1504.0	-41.93
SECTOR-III	716.0	783.4	-8.60	2180.3	1021.4	113.46	894.8	968.9	-7.65	611.7	891.6	-31.39

*Dep = Departure

*Source: IMD

From the above tables it is clear that the entire South Bengal received huge amount of rainfall during the month of July most of which occurred only during last week of July due to a severe depression formed over Bay of Bengal causing flood and inundation in South Bengal. The reverse has happened in case of North Bengal having rainfall departure of -39.86% in July. During August this scenario has changed where North Bengal received excess rainfall of 18.74% against South Bengal receiving less rainfall than normal.

It is pertinent to be mentioned here that from August onwards the rainfall has decreased considerably during the rest of the year. In the following tables, the pre-monsoon, monsoon and post-monsoon rainfall for both the regions of West Bengal have been presented.

Zone wise distribution of average rainfall during 2015

PRE MONSOON RAINFALL (mm)			
ZONE	Actual	Normal	% Dep
North Bengal	2553.9	2276.9	12.17
South Bengal	2474.3	2629.4	-5.90

MONSOON RAINFALL (mm)			
ZONE	Actual	Normal	% Dep
North Bengal	9970.4	11633.5	-14.30
South Bengal	17235.9	14986.9	15.01

POST MONSOON RAINFALL (mm)			
ZONE	Actual	Normal	% Dep
North Bengal	276.3	852.0	-67.57
South Bengal	572.8	2019.4	-71.64

*Source: IMD

Districtwise monthly rainfall in West Bengal has been given in Annexure RF1 to RF3.

6. FLOOD SEASON 2015

Flood frequency curves of **Sankosh-Raidak-II** system have been presented in Annexure G1 of this report. As such this system has not experienced any noticable flood during entire monsoon as the water levels remained well below the PDLs (Preliminary Danger Level) for both the rivers at respective gauge stations of L.R.P. crossings. On the other hand the adjacent Torsa river sub-basin has received two flood spells, first one of which occurred in the 2nd week of June and the other occurred during the 2nd quarter of August where water levels in river Raidak-II and Kaljani, the two major distributaries of Torsa, crossed corresponding DLs (Danger Level) at the stations Tufanganj and Alipurduar respectively (Annexure G2).

River **Jaldhaka-Mansai** system received a high flood discharge at the fag end of August where water level nearly reached the corresponding EDL (Extreme Danger Level) marks at NH-31 Crossing and Mathabhanga gauge stations (Annexure G4).

The catchment area of river **Teesta** upstream of Teesta barrage is mainly distributed over the entire Sikkim and the eastern part of Darjeeling district. Several Hydel projects have been come up upstream of Teesta barrage and the flow in the river is significantly controlled by the time to time discharges from these Hydel dams. Flood frequency curves of river Teesta at Coronation Bridge and at Domohani have been given in Annexure G5. Variation of water levels at these two stations reveals that the flood frequency and intensity are much less in the upper reach of Teesta with respect to its lower reach. During the months of June to August, most of the time water level at Domohani remained significantly high indicating high volume of catchment discharges mainly due to the contribution from the tributaries like Leesh, Gheesh, Chel and Neora.

Frequency of flood in **Mahananda-Fulhar** system is depicted in Annexure G-6. The water level of river Mahananda at Englishbazar remained considerably below its PDL throughout the season except one moderate flood spell which occurred during last week of August and continued till middle of September when water level just touched DL once. On the other hand river Fulhar ruled high throughout the season except the month of June. It has been observed that water level at Teljana gauge station on Fulhar remained between DL and EDL for a considerable period of time from last week of August to first week of September. This indicates that dominant flood discharge of Mahananda flows mainly through Fulhar to

outfall into river Ganga near Manickchak upstream of Farakka barrage while the bifurcated Mahananda receiving much less flow from its main course. Due to this reason the left embankment of river Fulhar near Harischandrapur of Malda district has become more vulnerable for either overtopping or breaching when Fulhar rules at HFL (High Flood Level).

Annexure G7 represents the flood frequency curves of river **Punarbhaba** and **Atreyee**. Both the rivers received one flood spell from last week of August to 1st week of September. One moderate flood spell in river **Ganga** and **Ganga-Padma** was observed during last week of August as given in Annexure G8.

The flood frequency curves of different river systems of South Bengal have been presented in Annexure G9 to G21. As stated earlier that during the month of July, entire South Bengal received almost 100% excess rainfall over its monthly average. As a consequence most of the rivers received huge amount of catchment discharges and the duration of this flood spell continued for the period from last week to 1st week of August. Flood water was also released from different dams and barrages and due to tidal lockage in Hooghly and Rupnarayan, situation became severe. The major rivers as well as their tributaries ruled high during this period when water levels crossed corresponding DL / EDL marks.

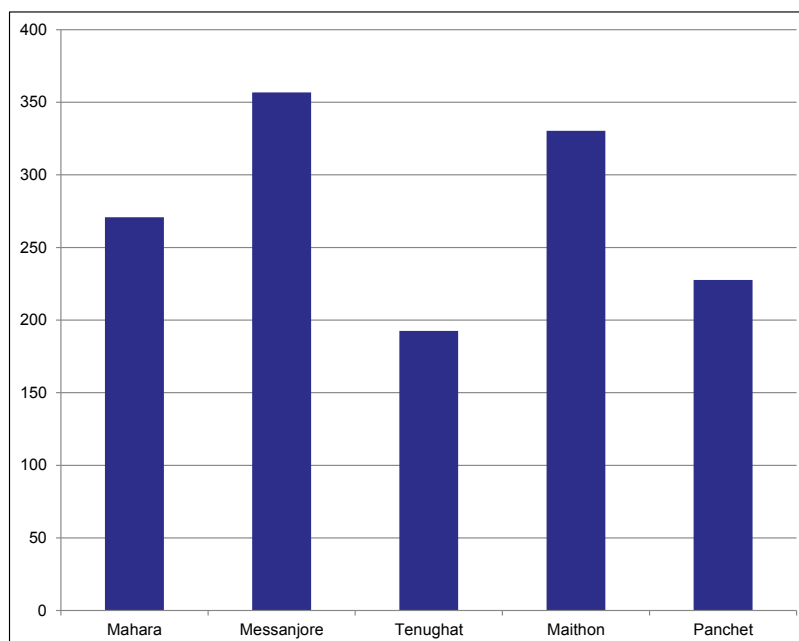
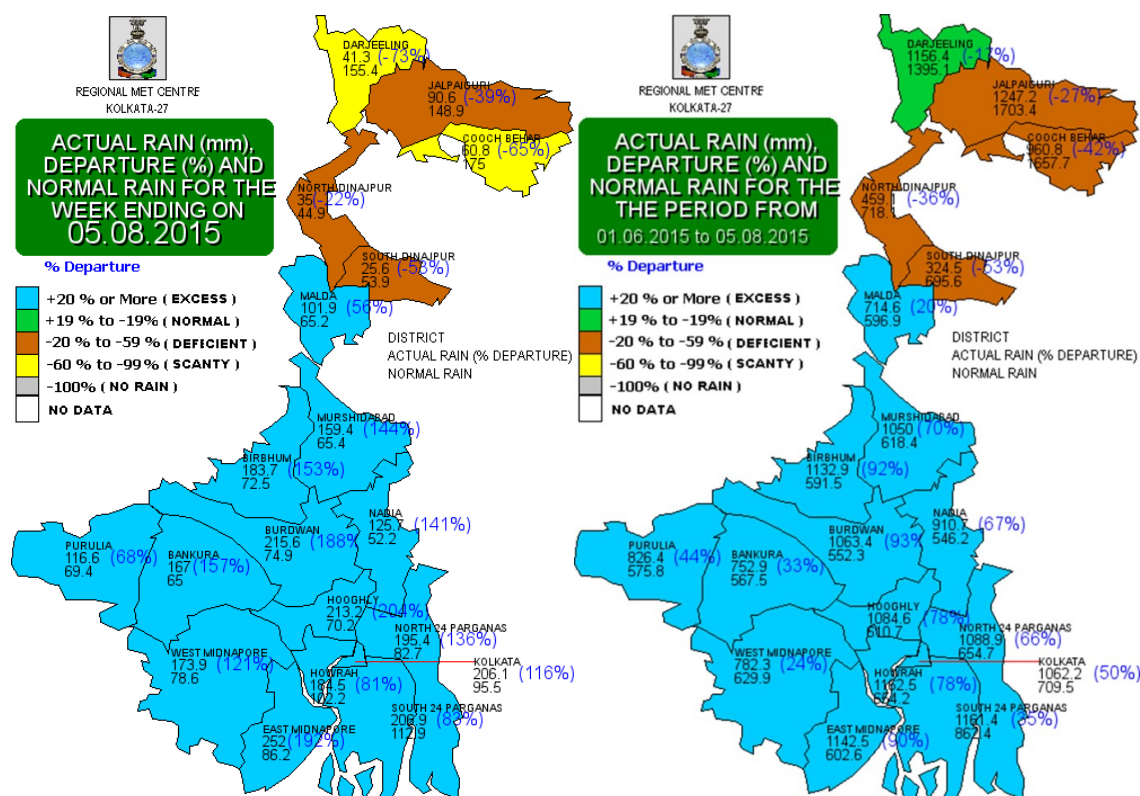
The instantaneous Inflow-Outflow and Reservoir level data during this flood season for dams and barrages under the control of Irrigation & Waterways Department have been compiled in Annexure D1 to D4. On 4th August a release of 1, 17, 175 cusecs from Durgapur barrage and on 31st July that of 52, 232 cusecs from Tilpara barrage have been recorded as maximum instantaneous discharges at 8.00 AM. The corresponding value for Massanjore dam was 25, 000 cusecs on 3rd August and that for Mukutmanipur dam was 30, 151 cusecs on 30th July.

July, 2015 Flood – A Brief Description

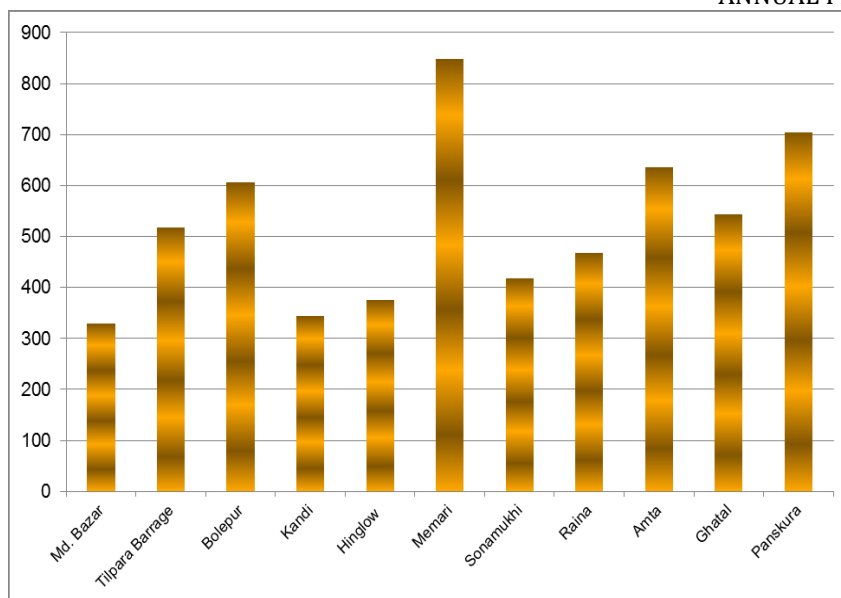
A low level circulation was developed over Gangetic West Bengal & adjoining Jharkhand from 24th July onwards. After transforming into a cyclonic storm 'Komen', it landed on Bangladesh and finally passed over West Bengal and Jharkhand during 30th July 2015 to 2nd August 2015. As a result all the South Bengal Districts received widespread heavy to very heavy rainfall during the period.

All the major rivers viz. Bansloi, Dwarka, Mayurakshi, Ajoy and Damodar having origin at Jharkhand were in spate. Rivers carrying heavy to very heavy discharge attained

unprecedented levels and flowed above EDL for prolonged period, extending for consecutive days.



Cumulative Rainfall at few rain gauge stations in Jharkhand due to effect of 'Komen'
(25th July to 02nd August-2015)



Cumulative Rainfall at few rain gauge stations in West Bengal due to effect of 'Komen'
(25th July to 02nd August-2015)

Water Level of rivers at various Gauge Stations flowing above Extreme Danger Level (EDL) during floods from 27.07.2015 to 07.08.2015

#	District	River	Gauge Station	EDL (in m)	Duration of flow above EDL					
					From		To		Total (in Hrs.)	Peak Level attained (in m)
					Date	Time	Date	Time		
1.	Murshidabad	Dwarka	Ranagram	17.86	27.07.15	09.00 Hrs	Still above EDL		273	18.67
		Kuye	Angarpur	20.05	03.08.15	08.00 Hrs	03.08.15	22.00 Hrs	14	20.46
		Babla	Bazarshow	15.63	27.07.15	07.00 Hrs	Still above EDL		275	16.56
2.	Nadia	Bhagirathi/Hooghly	Swarupganj	9.05	30.07.15	08.00 Hrs	Still above EDL		202	9.97
		Bhagirathi/Hooghly	Katwa	14.32	04.08.15	06.00 Hrs	05.08.15	06.00 Hrs	24	14.85
3.	Burdwan	Ajoy	Katwa	15.09	03.08.15	04.00 Hrs	04.08.15	17.00 Hrs	37	15.50
		Hurhura (Mundeswari)	Muchighata	6.76	03.08.15	06.00 Hrs	Still above EDL		108	8.15
4.	Hooghly	Lower Damodar	Champadanga	13.50	04.08.15	21.00 Hrs	06.08.15	09.00 Hrs	36	14.11
		Amta Chanel (Lower Damodar)	Amta	6.24	30.07.15	17.00 Hrs	Still above EDL		191	6.75
6.	Paschim Medinipur	Rupnarayan	Bandar	7.46	02.08.15	06.00 Hrs	Still above EDL		132	8.29
		Old Cossye	Kalmijole	9.90	03.08.15	06.00 Hrs	04.08.15	09.00 Hrs	27	10.24
7.	Purba Medinipur	New Cossye	Panskura	9.90	31.08.15	09.00 Hrs	03.08.15	09.00 Hrs	72	9.97

Situation became more serious due to severe lockage at outfall locations on Bhagirathi-Hooghly due to synchronization with spring tide period from 29th July to 4th August, with passage of heavy discharge, impeded flow in the major rivers causing severe downstream congestion and flooding. As a result, widespread damage to embankments and other irrigation infrastructures (Major, Medium and Minor) occurred in as many as 11 districts.

Highest Tide levels at river Hooghly/Baghirathi during the Spring Tide period from 31/07/15 to 03/08/15 at critical locations

All Levels are in M (GTS)

Location	31/07/2015 (Full Moon)				08/01/15				02/08/15				03/08/16			
	Highest		Lowest		Highest		Lowest		Highest		Lowest		Highest		Lowest	
	Predicted	Observed	Predicted	Observed	Predicted	Observed	Predicted	Observed	Predicted	Observed	Predicted	Observed	Predicted	Observed	Predicted	Observed
Chitpur Lock	4.155	5.39	-0.465	1.37	4.425	5.03	-0.515	0.98	4.535	5.85	-0.505	1.22	4.455	5.2	-0.405	1.98
Nurpur (Opp of Geonkali)	3.55	3.88	-1.755	-1.92	3.815	4.18	-1.92	-1.97	3.89	4.33	-1.98	-2.02	3.76	4.28	-1.93	-1.82
Swarupganj (Nadia)		9.43		9.37		9.52		9.46		9.63		9.59		9.77		9.69

From Chitpur to Nurpur= 59.04 KM

Highest High Water Level at Chitpur= 5.485 M(GTS)

From Swarupganj to Chitpur= 147.6 KM

Highest High Water Level at Nurpur= 4.45 M(GTS)

Conclusion:-

1. The water level of river Hooghly near the confluences of Damodar and Rupnarayan was 0.44 M above the predicted highest level, leading to drainage congestion
2. The tidal lockge period was more critical near Kolkata in Hooghly as the Lowest Level of Hooghly remained almost 1.725 M higher than that predicted.
3. The water level of Hooghly remained almost stand still at Swarupganj, Katwa and Kandi, leading to drainage congestion in Ajoy, Mayurakshi, Dwarka

RESERVOIRS INFLOW-OUTFLOW DATA (23/07/15 to 05/08/2015)

Sl. No.	Sub-Basin	Name of Reservoir	Reservoir Data	
			Total Inflow (Acre-ft)	Total Outflow (Acre-ft)
1	MAYURAKSHI	Massanjore	305046	231470
2		Tilpara Barrage	449530	498338
3	DAMODAR	Mithon	740386	459448
4		Panchet	850518	696274
5		Durgapur Barrage	1531949	1544416

A list of most affected blocks is given in the following table.

Most Affected Blocks

District	Blocks
Birbhum	Labhpur, Nanoor
Burdwan	Jamalpur, Memari
Hooghly	Khanakul I & II, Pursurah, Haripal, Singur, Arambag, Jangipara & Tarakeswar
Howrah	Udaynarayanpur, Jagatballavpur, Amta I & II, Domjur, Sankrail, Howrah Municipal Area
Murshidabad	Kandi, Bharatpur-I & II, Khargram, Burwan
Nadia	Nabadwip, Nakashipara
N-24 Parganas	Gaighata, Swarupnagar, Habra I & II
Paschim Medinipur	Kharagpur, Debra, Ghatal
Purba Medinipur	Panskura, Kolaghat
S-24 Parganas	Canning, Baruipur and Sonarpur Municipal Area
Kolkata	Kolkata Municipal Area

Some of photographs of damages and temporary restoration taken up are given below.



**Breach at left bank of river Kuya & right bank of river Bele, GP- Hijol,
Block- Kandi, Dist : Murshidabad**



**Initial closing of breach at left bank of river Brahmani, Village : Dangapara, Block :
Nabagram, Dist : Murshidabad**



**Restoration of subsidence of right bank of river Damodar at Nabagram,
Block – Khandaghosh, District : Burdwan**



Damaged embankment at Uttarbandh Bottala in Block –Domjur, District : Howrah



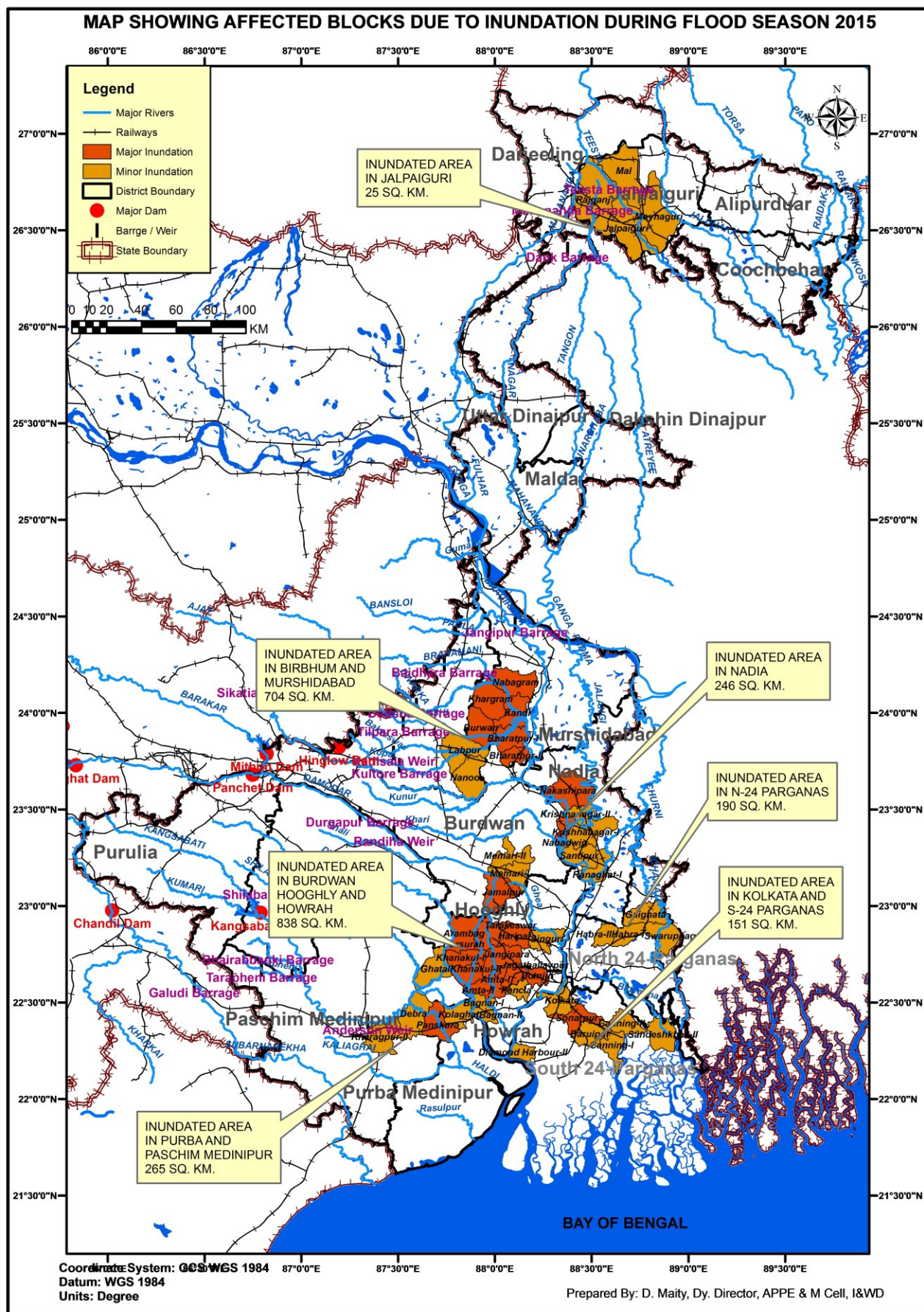
Post flood restoration at Uttarbandh Bottala in Block –Domjur, Dist : Howrah



Damaged condition of Anicut structure after floods at Paschim Medinipur

Approximate cost of restoration of flood damages to different infrastructures and assets under Irrigation & Waterways Department has been given in the table below.

The approximate area of inundation during flood season 2015 for different districts of West Bengal is presented in the following Map.



Districtwise Damage Report during Flood Season 2015							
Sl. No.	District	Nature of Damage	Affected Length of the Embankment & Protective Works (Km)	Breach of the Embankment (Nos.)	Damage to Hydraulic Structures (Nos.)	Damage to Bridges / Culverts (Nos.)	Estimated Cost of Restoration (Rs. In Lakh)
1	Alipurduar	Slip, Susidence, Erosion, Scour, Rain Cut, Ghog, Overtopping, Breach, Damage to Hydraulic Structures, Bridges and Culverts, Morrum Inspection Path etc.	10.885	0	0	0	695.11
2	Bankura		4.250	0	4	0	1122.00
3	Birbhum		27.579	1	0	0	1172.09
4	Burdwan		15.175	0	113	7	1509.22
5	Coochbehar		4.930	0	0	0	346.50
6	Hooghly		26.81	0	14	11	214.38
7	Howrah		110.35	9	44	6	1675.85
8	Jalpaiguri		9.200	0	0	0	1023.00
9	Kolkata		0.030	0	3	0	51.00
10	Murshidabad		40.728	4	1	0	2410.23
11	Nadia		0.860	0	5	0	284.05
12	North 24 Parganas		10.612	1	9	1	2559.96
13	Paschim Medinipur		67.735	0	9	0	3340.00
14	Purba Medinipur		25.040	0	46	0	1339.00
15	South 24 Parganas		41.016	0	72	0	1339.33
		TOTAL	395.200	15	320	25	19081.72

7. CONCLUSION

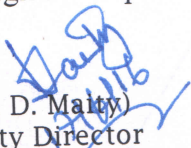
The West Bengal is basically receipt of run-off generated outside the state. The state has typical basin characteristics. In the north the rainfall is high and the ground slope is steep mainly in the Sub-Himalayan region. The rivers in the Terai region are wide with shallow depth. Due to continuous denudation of forest cover and dolomite mining in the hills, the silt loads are continuously deposited in the river beds, reducing the carrying capacity of the rivers causing the flood. In the South & Central Region heavy rainfall and run-off coming from the upper catchment cause drainage congestion and inundation due to very flat ground slope of the regions.


Main structural measures of flood control in West Bengal are embankments measuring 10, 400 km (approx.) spread over different river systems, constructed over the years. There are major dams across the river Kangsabati, Mayurakshi and Damodar river system. But only in the Damodar system, moderation of the dams during the peak flood is possible to some extent. The other structural measures like catchment area treatment and afforestation in upper catchment require intervention at Government of India level as they are outside the state.

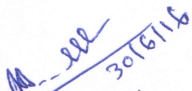
In North Bengal, an elaborate flood warning system maintained by the department warns the people about the trend of rise of the rivers and thus alarms them to take necessary safety measures. In Central & South Bengal the water level of different rivers together with their danger & extreme danger levels and releases from different dams and reservoirs are intimated to different authorities from time to time during rainy season.

Besides, the department also continuously maintains close liaison with the Regional Meteorological Centre (RMC), Kolkata and follows Indian Meteorological Department (IMD) web-site in order to collect information on adverse weather condition during the monsoon period and accordingly adopt suitable flood fighting measures. Central Water Commission (CWC) also extends their co-operation by providing the different river gauge as well as rain gauge data under their jurisdiction.

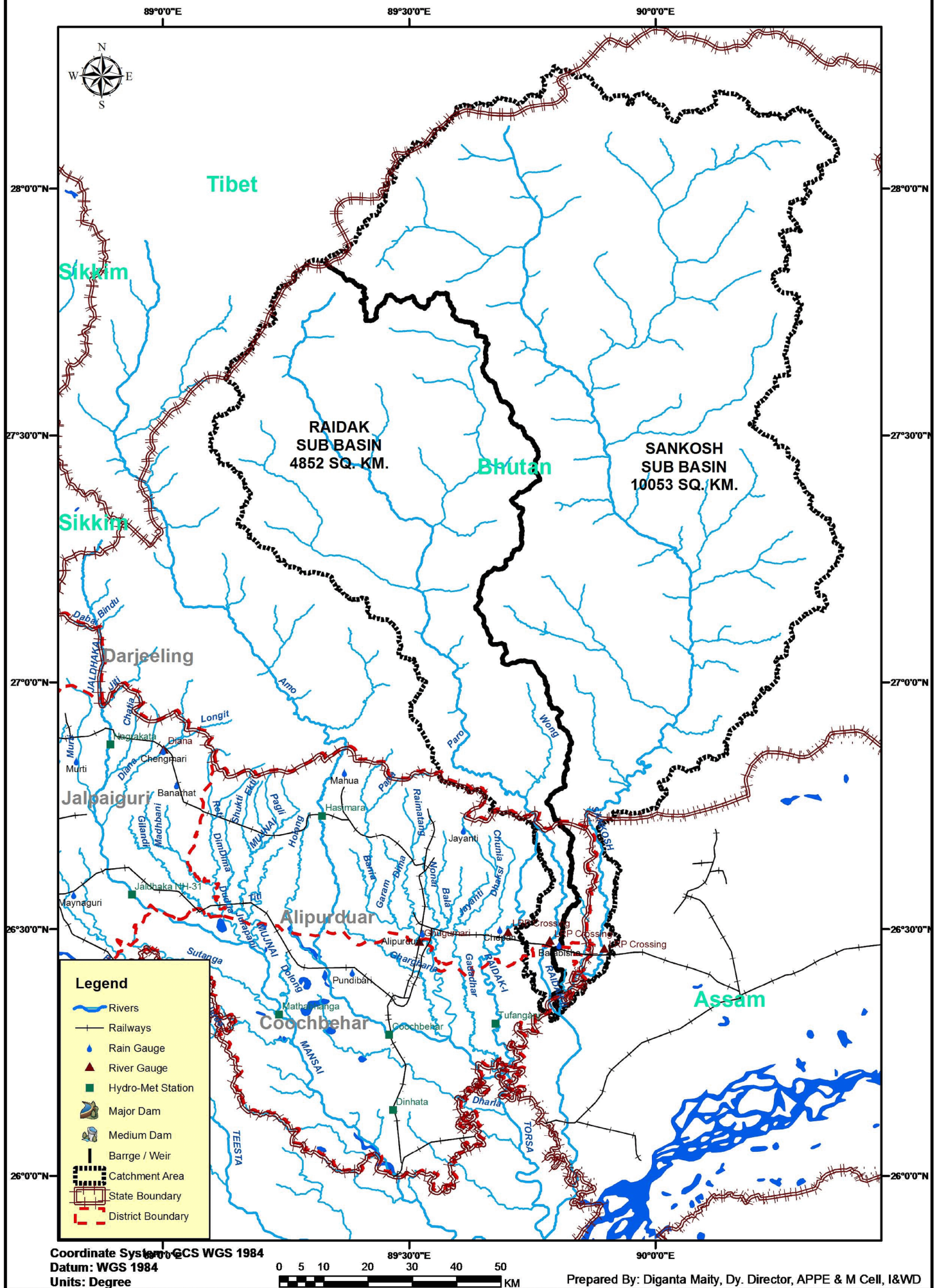
In addition to above, the department has already undertaken initiative to make available the daily flood data during entire monsoon period every year in public domain through the departmental website www.wbiwd.gov.in.


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ANNEXURE I 1-INDEX MAP OF RAIDAK-SANKOSH SUB BASINS



ANNEXURE I 2-INDEX MAP OF JALDHAKA SUB BASINS

Legend

- Rivers
- Railways
- Rain Gauge
- River Gauge
- Hydro-Met Station
- Major Dam
- Medium Dam
- Barrge / Weir
- Catchment Area
- State Boundary
- District Boundary

Torsa Sub Basin
7192 SQ. KM.

Jaldhaka Sub Basin
5302 SQ. KM.

Regions: Tibet, Bhutan, Assam, Bangladesh, Darjeeling, Jalpaiguri, Alipurduar, Coochbehar.

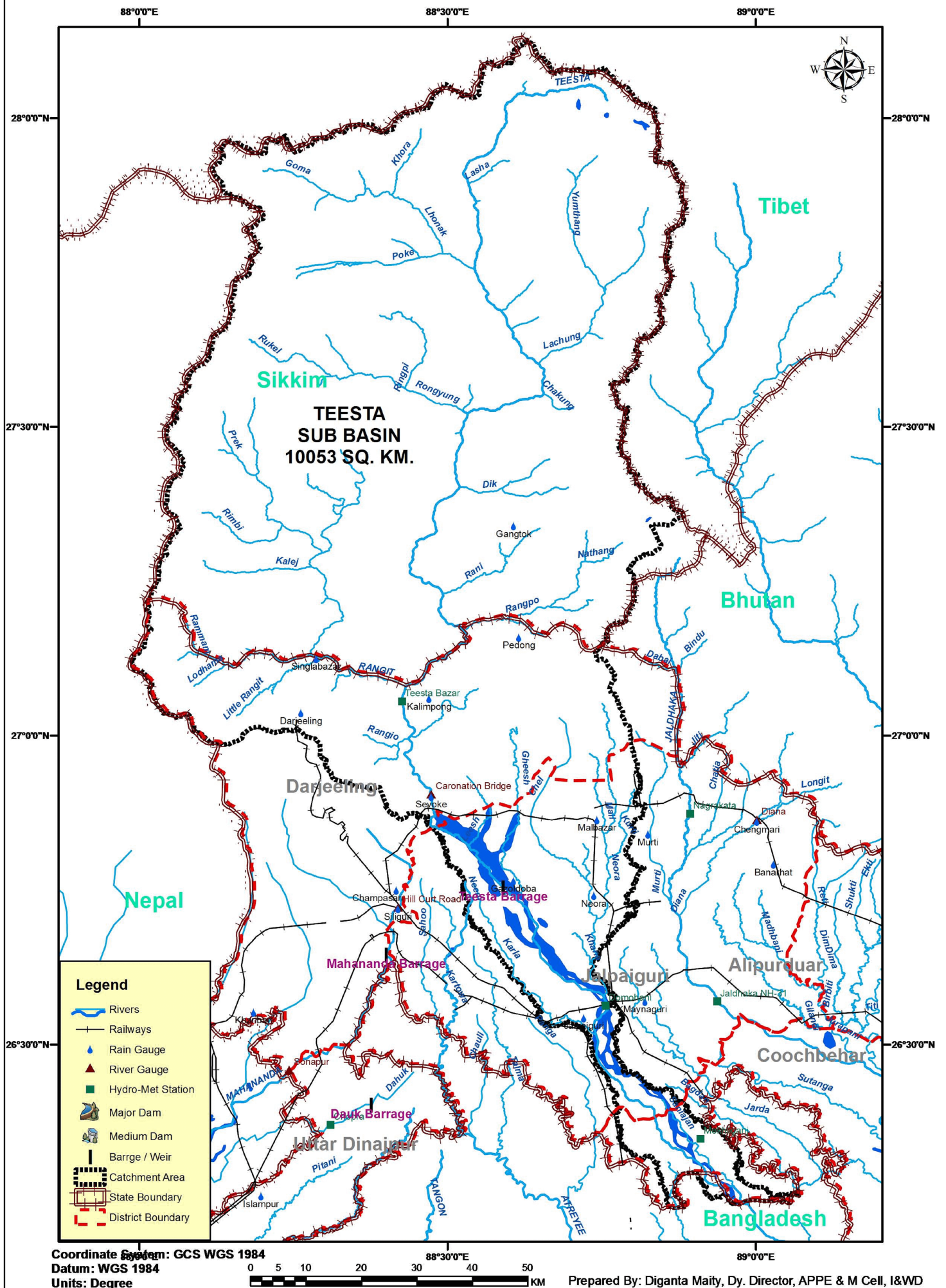
Coordinates: 88°30'0"E, 89°0'0"E, 89°30'0"E, 90°0'0"E; 26°0'0"N, 26°30'0"N, 27°0'0"N, 27°30'0"N, 28°0'0"N.

Scale: 0 5 10 20 30 40 50 KM

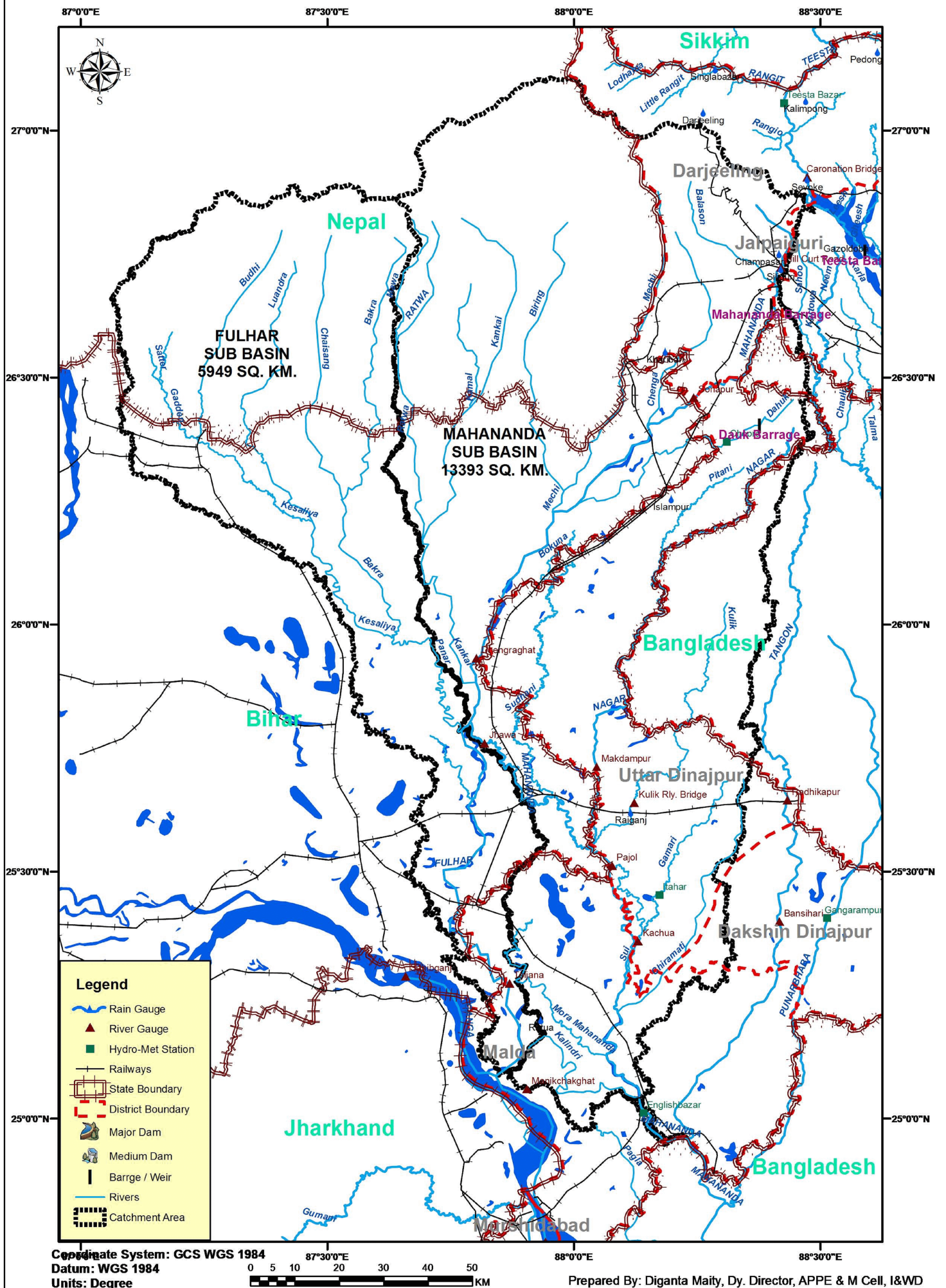
Prepared By: Diganta Maity, Dy. Director, APPE & M Cell, I&WD

Prepared By: Diganta Maity, Dy. Director, APPE & M Cell, I&WD

ANNEXURE I3-INDEX MAP OF TEESTA SUB BASIN

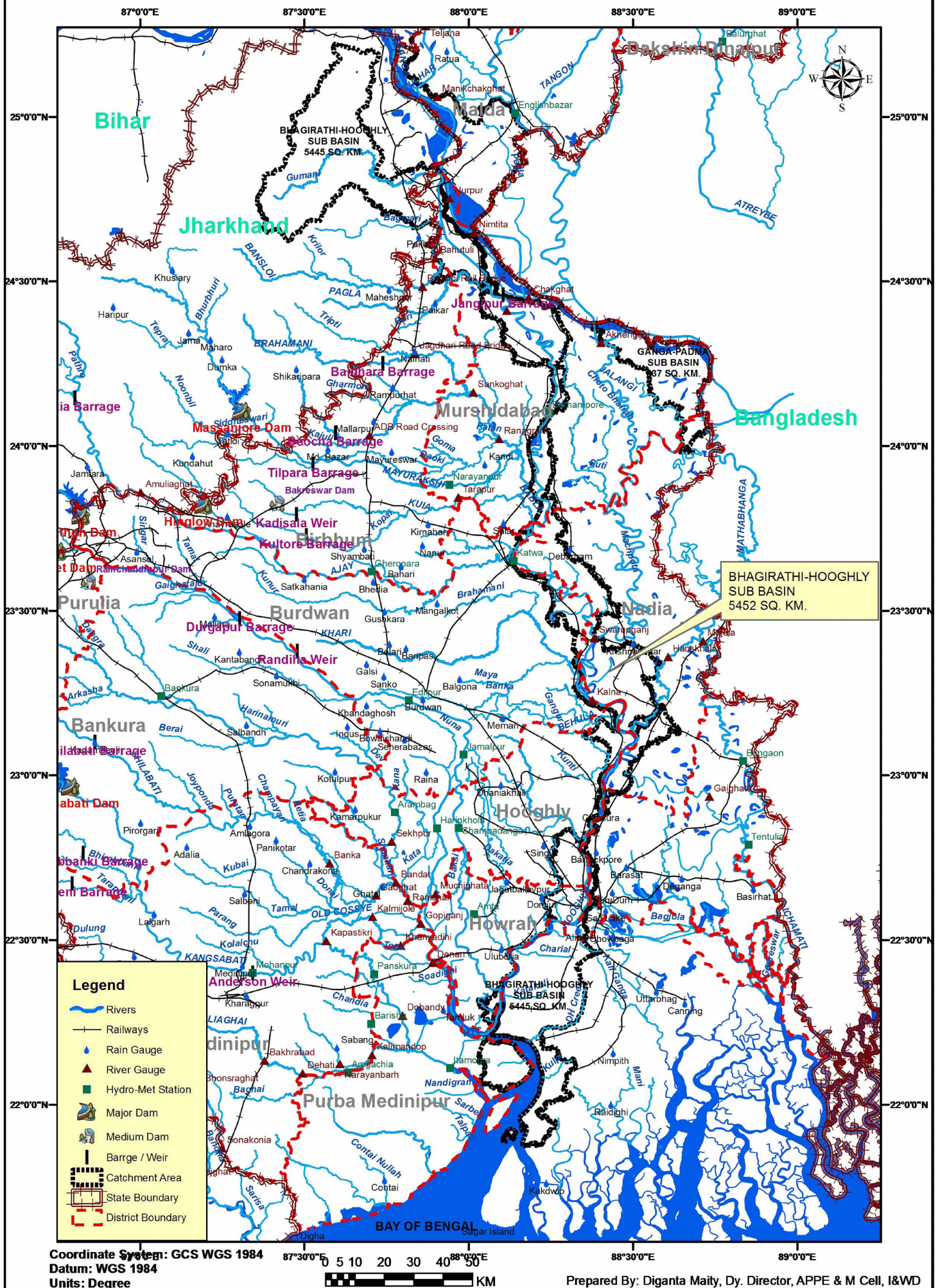


ANNEXURE I4-INDEX MAP OF MAHANANDA-FULHAR SUB BASINS



Prepared By: Diganta Maity, Dy. Director, APPE & M Cell, I&WD


ANNEXURE I6-BHAGIRATHI-HOOGHLY DRAINAGE SUB BASIN



88°0'0"E 88°30'0"E



0 2.5 5 10 15 20 25 88°30'0"E



A scale bar in kilometers, with markings at 0, 2.5, 5, 10, 15, 20, and 25. The bar is divided into segments of alternating black and white colors. The unit 'KM' is written at the end of the bar.

Prepared By: Diganta Maity, Dy. Director, APPE & M Cell, I&WD

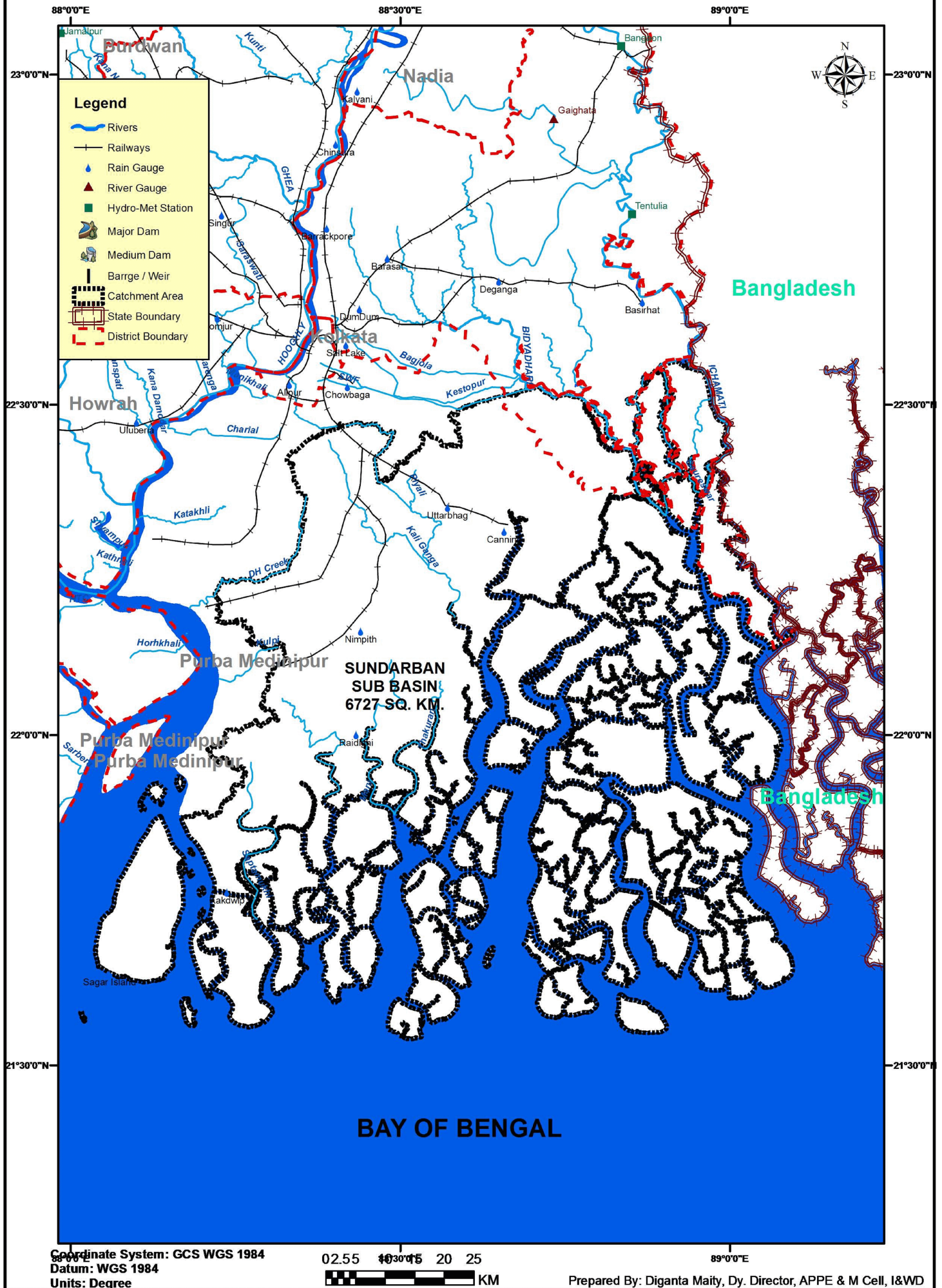
89°0'0"E



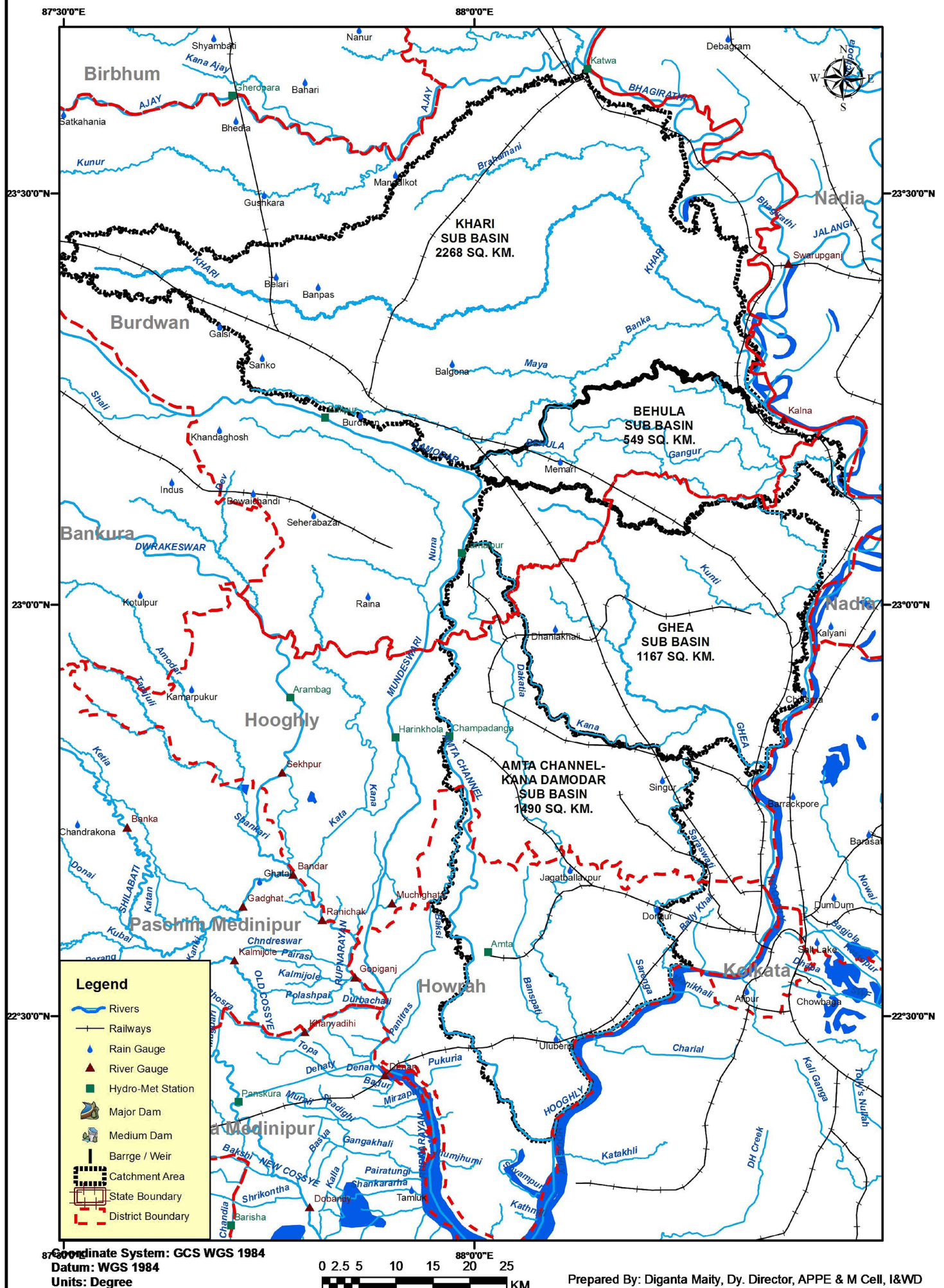
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

Prepared By: Diganta Maity, Dy. Director, APPE & M Cell, I&WD

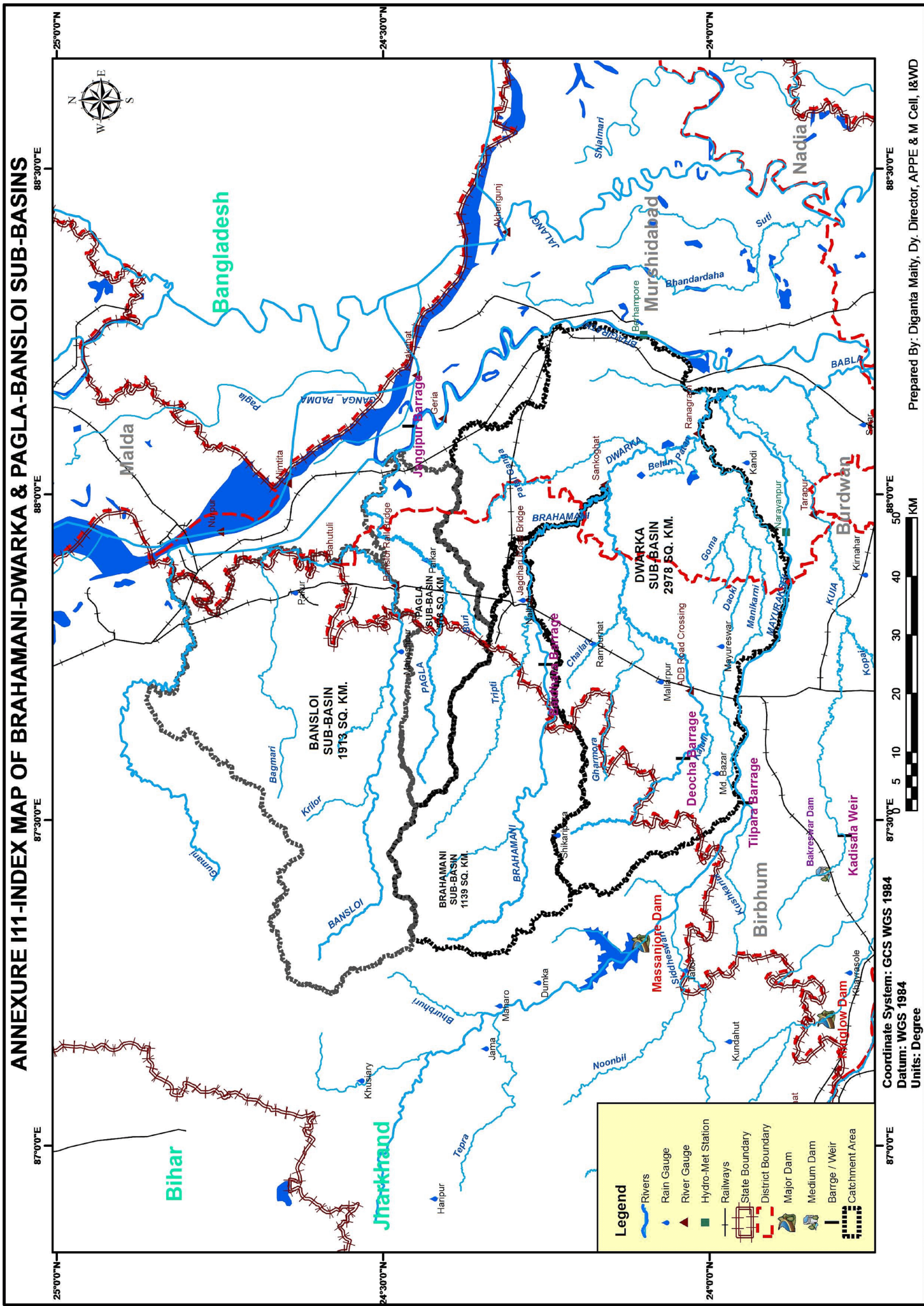
ANNEXURE I9-INDEX MAP OF SUNDARBAN SUB BASIN



ANNEXURE I10-INDEX MAP OF KHARI-BEHULA-GHEA SUB BASINS

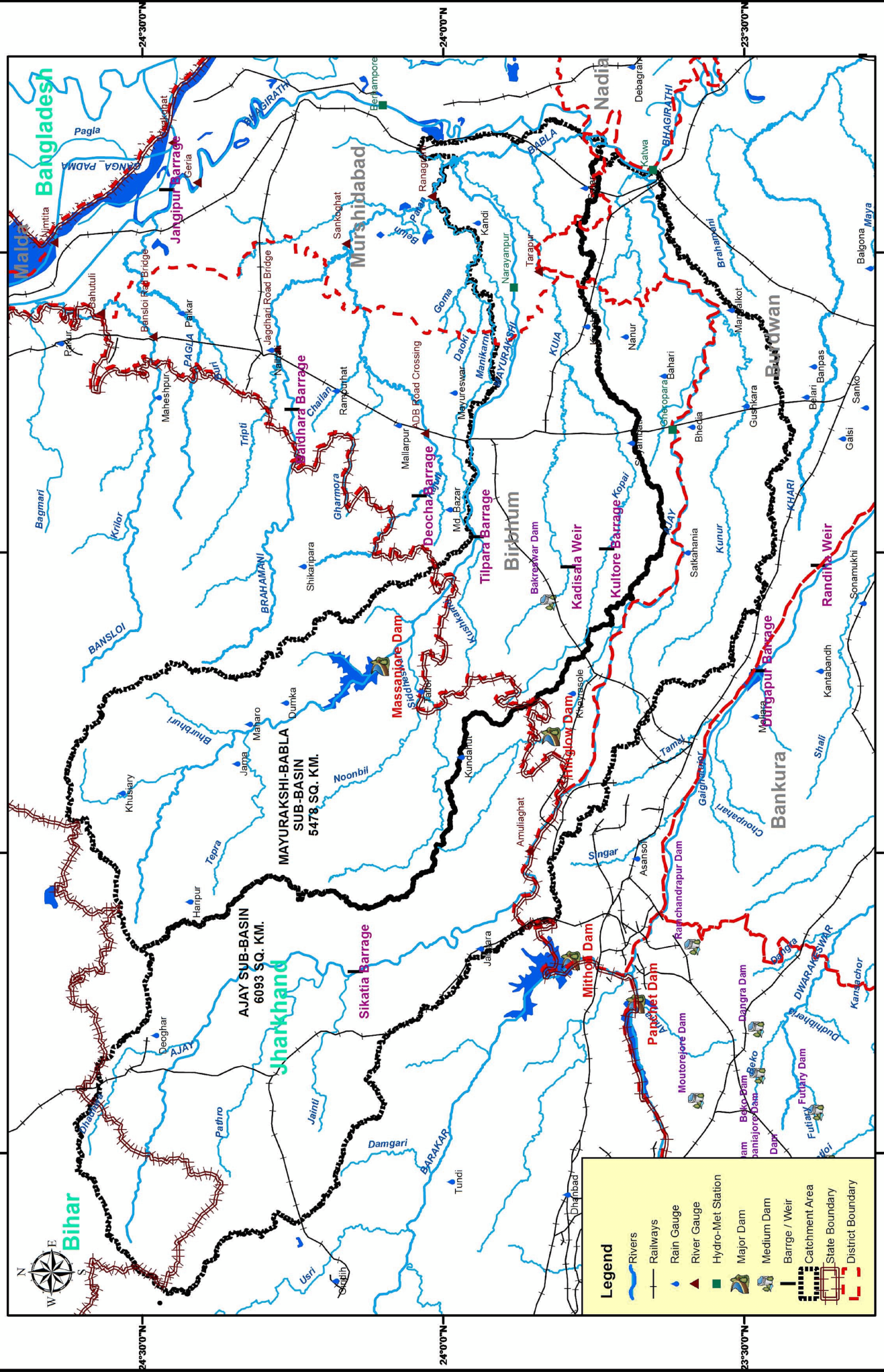


ANNEXURE I11-INDEX MAP OF BRAHAMANI-DWARKA & PAGLA-BANSLOI SUB-BASINS

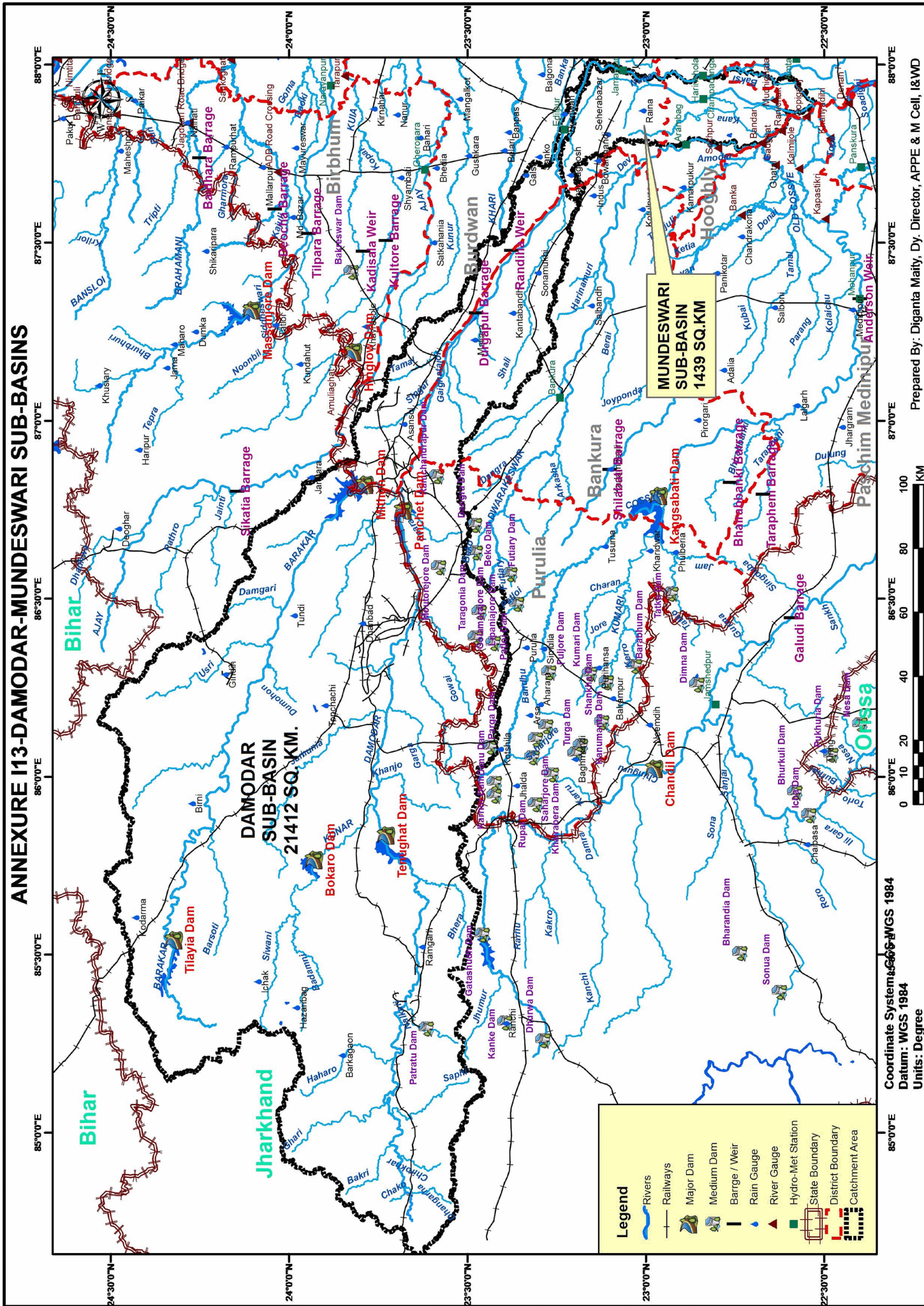


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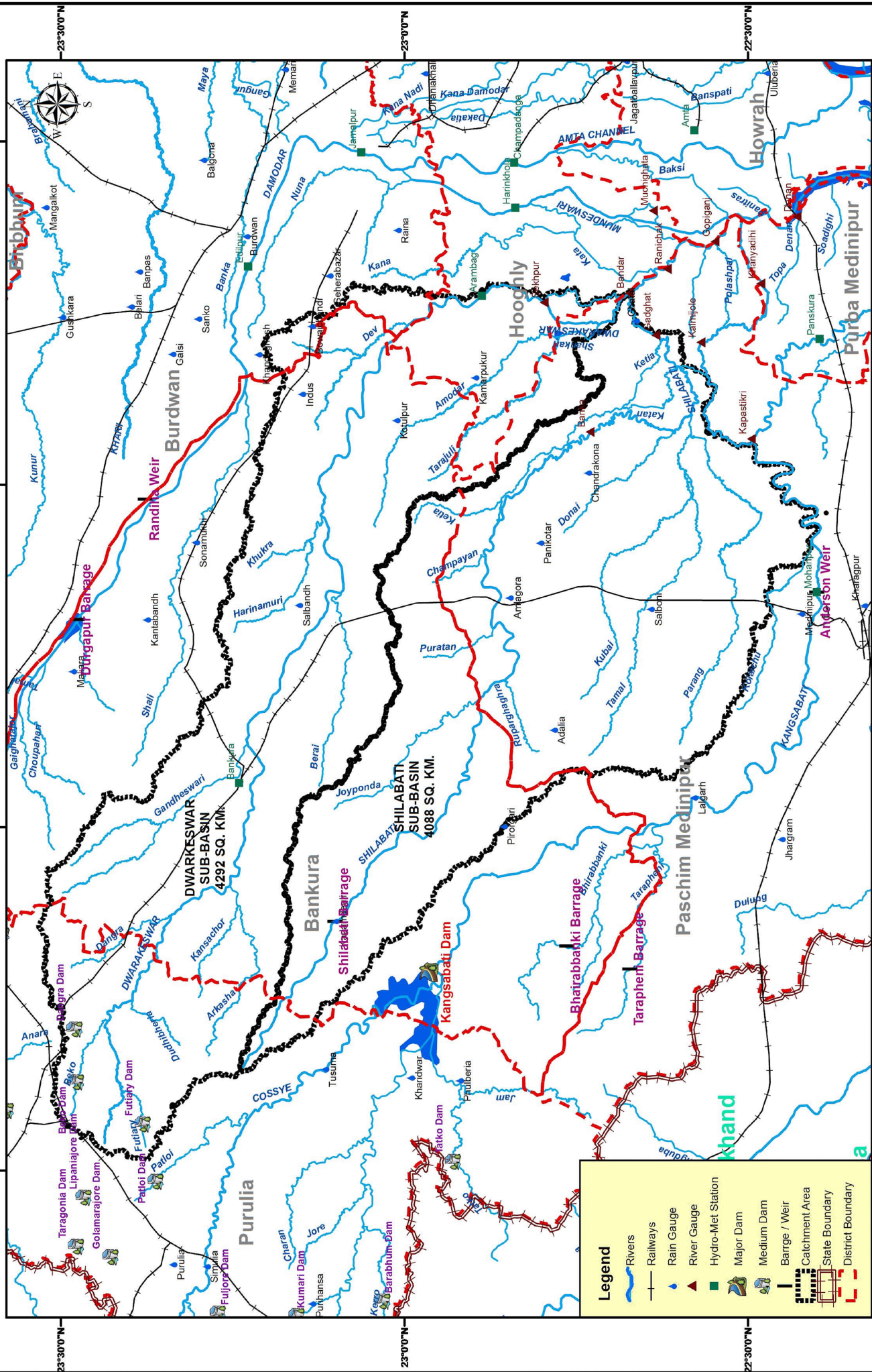
ANNEXURE I12-INDEX MAP OF AJAY & MAYURAKSHI SUB-BASINS



ANNEXURE I13-DAMODAR-MUNDESWARI SUB-BASINS



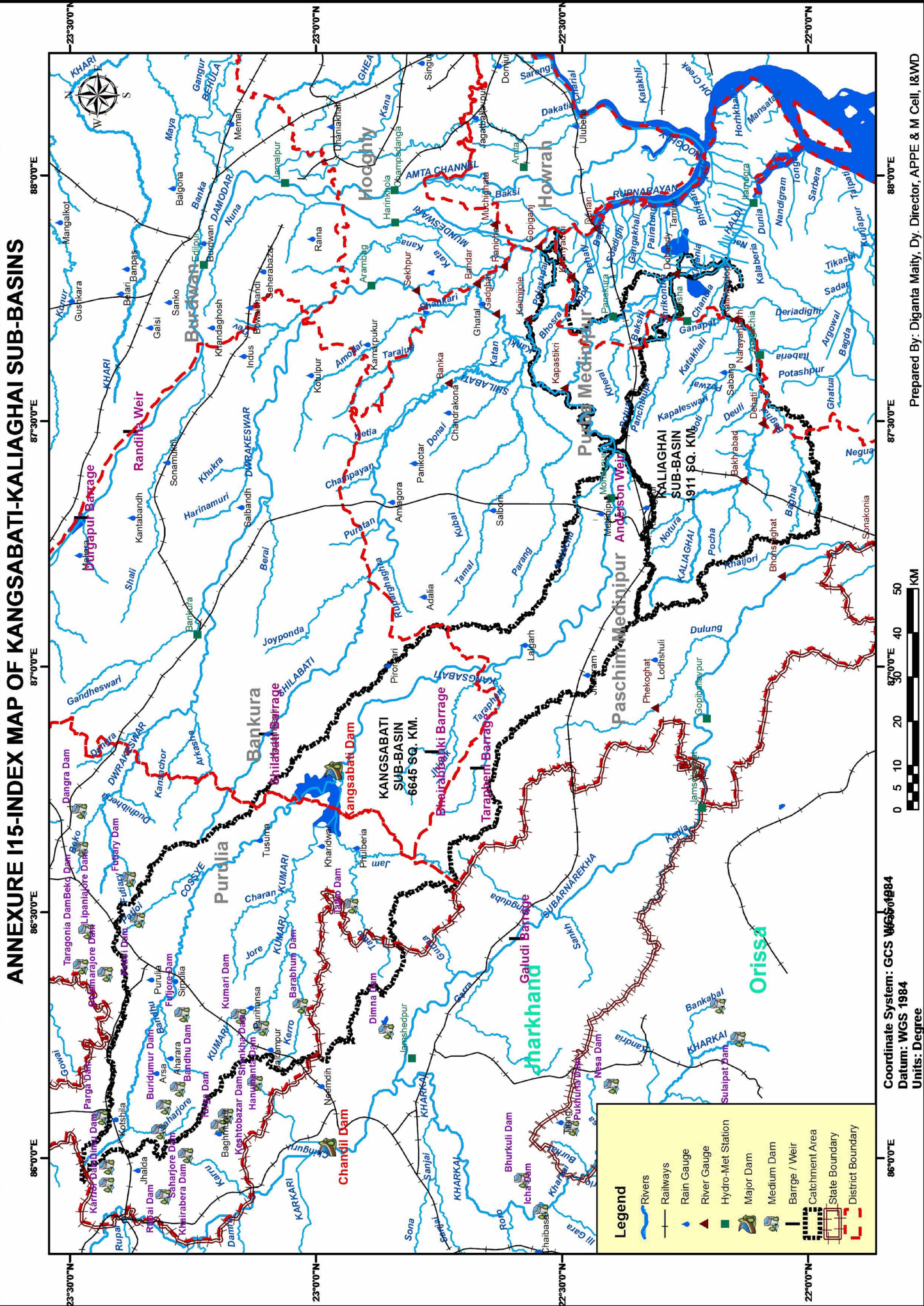
ANNEXURE I14-INDEX MAP OF DWARAKESWAR-SHILABATI SUB-BASINS



86°30'0"E Coordinate System: GCS WGS 1984
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 Units: Degree

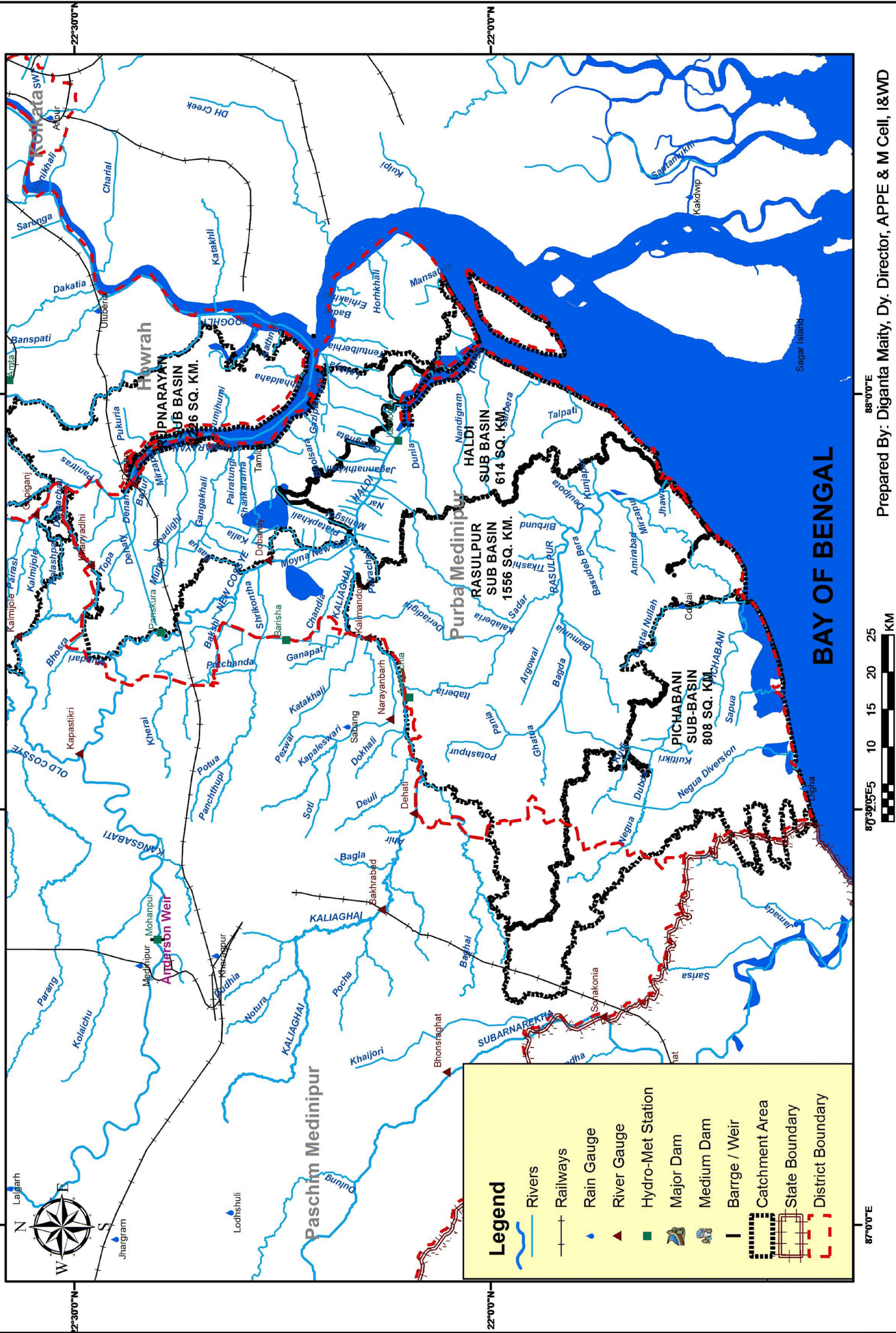
Prepared By: Diganta Maiti, Dy. Director, APPE & M Cell, I&WD

ANNEXURE I15-INDEX MAP OF KANGSABATI-KALIAGHAI SUB-BASINS

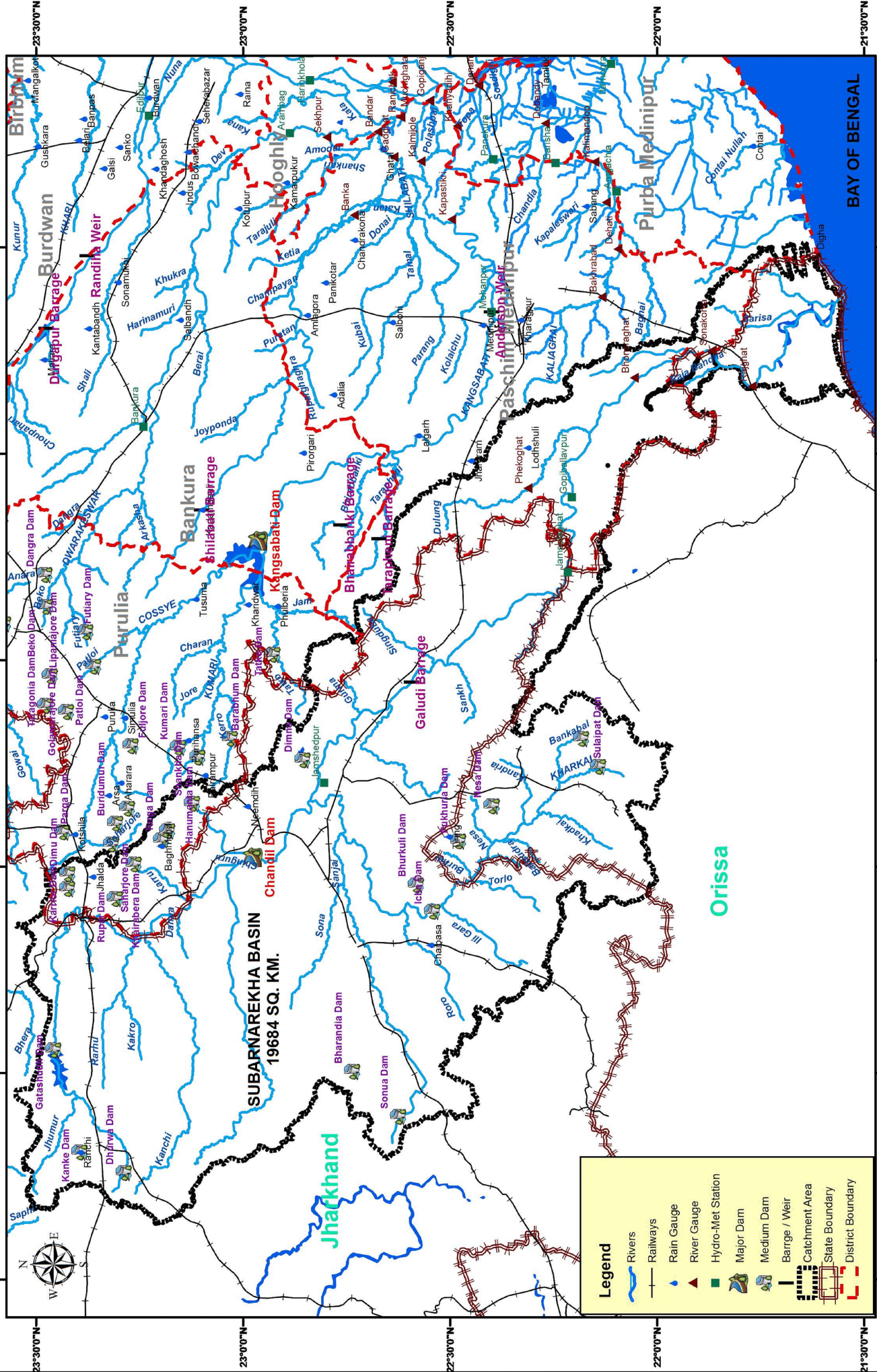


Coordinate System: GCS WGS 1984
 Datum: WGS 1984
 Units: Degree

ANNEXURE I'6-INDEX MAP OF RUPNARAYAN-HALDI-RASULPUR-PICHABANI SUB BASINS



ANNEXURE I17-INDEX MAP OF SUBARNAREKHA BASIN



Coordinate System: GCS WGS 1984

Datum: WGS 1984

Units: Degree

Prepared By: Diganta Maity, Dy. Director, APPE & M Cell, I&WD

Annexure RF

Districtwise Monthly Rainfall Statistics of West Bengal for the Year 2015

Month	January			February			March			April			May		
Rainfall in mm	Actual	Normal	% Dep	Actual	Normal	% Dep	Actual	Normal	% Dep	Actual	Normal	% Dep	Actual	Normal	% Dep
District															
Coochbehar	24.2	8.9	171	21.5	16	34	53.4	32.2	66	140.1	138.9	1	383.1	345.4	11
Darjeeling	5.0	48.3	-90	10.4	33.8	-69	41.5	57.7	-28	146.4	130.5	12	296.1	262.3	13
Jalpaiguri	12.4	9.2	35	16.1	17.8	-10	35.6	39.7	-10	179.6	119.3	51	374.9	339.3	10
Malda	18.8	13.6	38	8.8	10.5	-16	24.1	14.5	66	103.7	34.8	198	154.2	106.2	45
North Dinajpur	25.4	21.5	18	7.1	2	255	44.7	8	458	66.2	35.7	85	172.5	162.9	6
South Dinajpur	9.3	8.9	4	25.6	13.3	92	11	19	-42	62.2	58.9	6	80	167.8	-52
Bankura	17.4	12.0	45	2.8	18	-85	7.1	22	-68	85.6	36.3	136	55.9	66.9	-16
Birbhum	9.1	13.4	-32	3.4	16.1	-79	35.5	21.2	68	69.4	30.9	124	54.4	78.7	-31
Burdwan	8.5	10.7	-20	12.9	22.2	-42	28.5	19.8	44	76.2	37.8	102	64.2	78.8	-19
East Midnapore	10.9	15.9	-31	1.3	18.6	-93	23.5	31.8	-26	133.9	34.7	286	31.9	108.1	-70
Hooghly	9.1	11.9	-24	7.6	26.6	-71	16	28.2	-43	61.9	50.6	22	54	108.5	-50
Howrah	9.8	12.2	-20	14.1	24.9	-44	10	32	-69	101.1	52.6	92	68.3	126.4	-46
Kolkata	3.2	14.4	-78	6.8	24.7	-72	53.5	33.5	60	112	53.1	111	78.9	113.4	-30
Murshidabad	7.1	16.8	-58	1.8	11.2	-84	12	19	-37	50	34	47	88	87	1
Nadia	5.5	12.2	-55	14.5	17.6	-17	18.5	21.1	-12	99	42.1	135	56.5	95.2	-41
North 24 Parganas	26.3	15.6	69	6.1	17.8	-66	36.7	30.3	21	131	51.5	154	33.2	113.4	-71
Purulia	28.9	14.3	102	1.4	20.7	-93	3.1	24.6	-87	71	36.1	97	86.7	57.3	51
North 24 Parganas	10.9	13.6	-20	2.9	26.7	-89	15.5	37.9	-59	69.1	41.7	66	35.9	125.1	-71
West Midnapore	12.8	12.2	5	7.9	24.1	-67	16.6	39	-57	124	56.8	118	62.7	107.6	-42

Annexure RF

Districtwise Monthly Rainfall Statistics of West Bengal for the Year 2015

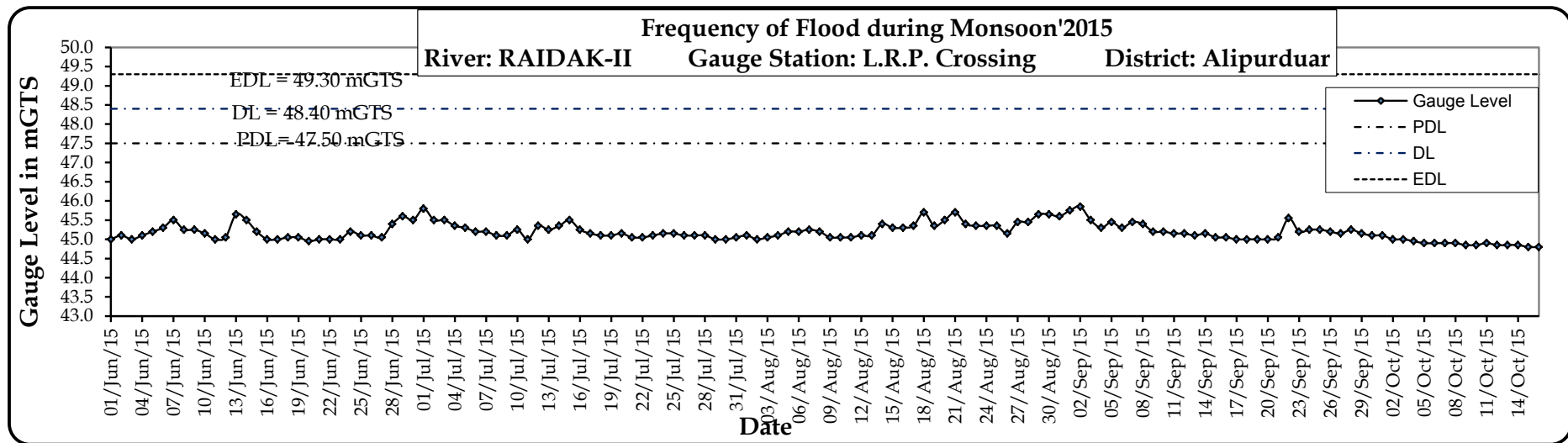
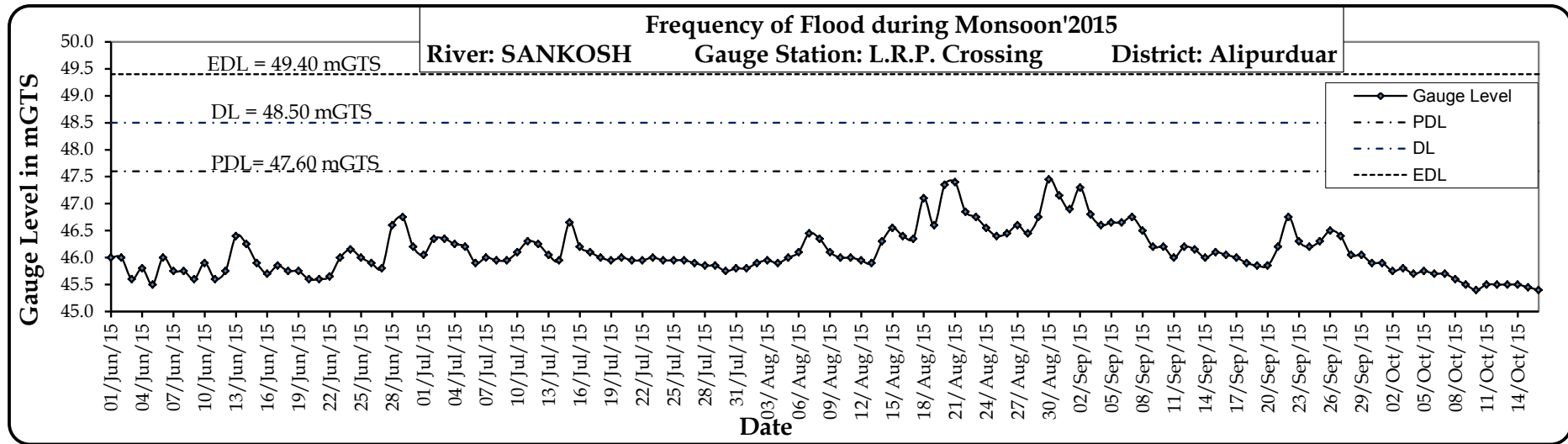
Month	June			July			August			September		
Rainfall in mm	Actual	Normal	% Dep	Actual	Normal	% Dep	Actual	Normal	% Dep	Actual	Normal	% Dep
District												
Coochbehar	603.7	668.8	-10	296.4	864.9	-66	724.9	733	-1	399.8	470.9	-15
Darjeeling	537.8	534.7	1	581.3	756.9	-23	691.7	645.9	7	556.2	502.8	11
Jalpaiguri	717.1	667.3	7	440.1	931.4	-53	1012.1	670.9	51	477.2	488.3	-2
Malda	257.3	216.6	19	419.1	332.9	26	330	284.8	16	193.6	283	-32
North Dinajpur	178.5	316	-44	247.3	367	-33	425.8	307.7	38	162.9	403.8	-60
South Dinajpur	111.1	289.3	-62	194	368.9	-47	247.3	248	0	165.2	279.7	-41
Bankura	152.2	215	-29	467.5	303.2	54	230.6	290.7	-21	96.5	242.3	-60
Birbhum	321.5	222.3	45	698.5	313.9	123	296.8	298.8	-1	144.2	271	-47
Burdwan	338.1	198.2	71	587.3	294.1	100	285.8	285.3	0	111.8	251.1	-55
East Midnapore	270.6	253.5	7	757.3	284.9	166	286	338.7	-16	162.4	343.2	-53
Hooghly	299.5	243.4	23	671.6	316.1	112	188	265.1	-29	215.3	243.3	-11
Howrah	227.9	233.2	-2	854.4	343.2	149	180.8	329.4	-45	202.2	305.6	-34
Kolkata	226.2	278.3	-19	663.8	361	84	389.9	335.2	16	229.3	306.6	-25
Murshidabad	341.5	237.6	44	640.4	328.6	95	274.6	256.9	7	193.2	256.2	-25
Nadia	327.5	234.1	40	516.3	270.8	91	139.1	236	-41	178.6	214.1	-17
North 24 Parganas	261.9	271.9	-4	662.1	317.2	109	324.1	304.3	7	180.2	279.4	-35
Purulia	162.5	222.1	-27	563.6	298.7	89	187.7	307	-39	79.6	266.7	-70
North 24 Parganas	264.3	316	-16	754.6	463.6	63	351.5	416.2	-16	196.4	356.8	-45
West Midnapore	138.1	243.8	-43	526.8	329.5	60	238.2	316	-25	177.1	276.8	-36

Annexure RF

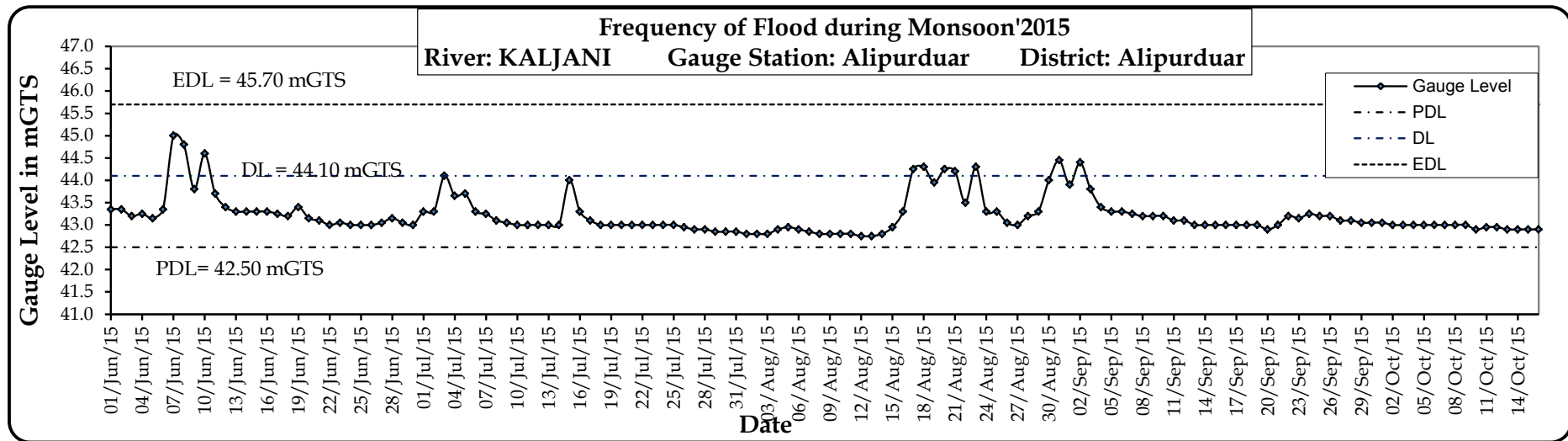
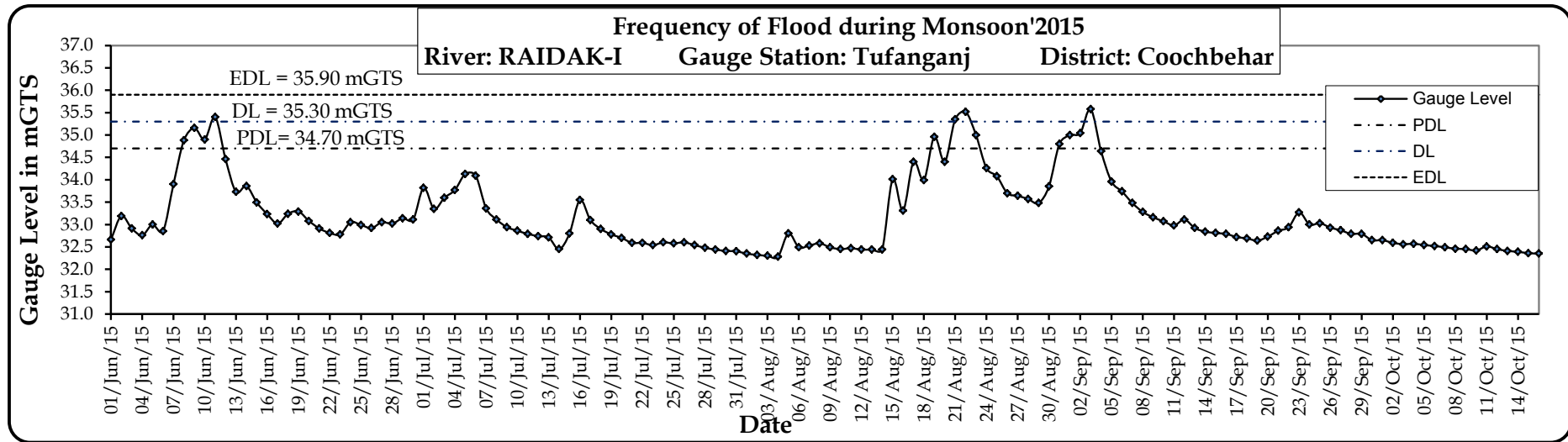
Districtwise Monthly Rainfall Statistics of West Bengal for the Year 2015

Month	October			November			December		
Rainfall in mm	Actual	Normal	% Dep	Actual	Normal	% Dep	Actual	Normal	% Dep
District									
Coochbehar	34.6	141.3	-75	13.8	15.1	-9	2.4	8.3	-71
Darjeeling	50.4	118.9	-58	5.2	16.8	-69	3.8	9.9	-62
Jalpaiguri	67.1	159.9	-58	30	18	66	7.2	7.2	0
Malda	17.2	102.5	-83	0	13.2	-100	0	6.8	-100
North Dinajpur	2.6	90.7	-97	0	9.1	-100	0	3.2	-100
South Dinajpur	24.7	112.5	-78	17.3	13	33	0	5.6	-100
Bankura	12.7	105.2	-88	0	9.8	-100	0.2	9.5	-98
Birbhum	21.1	105.1	-80	4.2	15.8	-73	0.2	5.6	-97
Burdwan	34.1	99.8	-66	0	11.4	-100	0.8	6	-87
East Midnapore	53.8	196.9	-73	10.9	34	-68	17.5	9.3	88
Hooghly	27.2	102.1	-73	0.1	16	-99	1.8	6.9	-74
Howrah	25.7	99.1	-74	0	31.3	-100	4	10.1	-60
Kolkata	98.5	155.3	-37	0	24.8	-100	2.9	8.9	-67
Murshidabad	49.9	126.3	-60	7.8	11	-29	1	6.5	-85
Nadia	48	100.2	-52	0	10.4	-100	3.3	7.8	-58
North 24 Parganas	42.5	130.9	-68	0	21.8	-100	11.1	5.7	94
Purulia	21.7	91.5	-76	0.4	16.7	-97	1.6	7.6	-79
North 24 Parganas	23.5	218.4	-89	2.8	62.3	-96	6.8	9.7	-30
West Midnapore	27.6	106.5	-74	0	17.9	-100	9.1	5.3	72

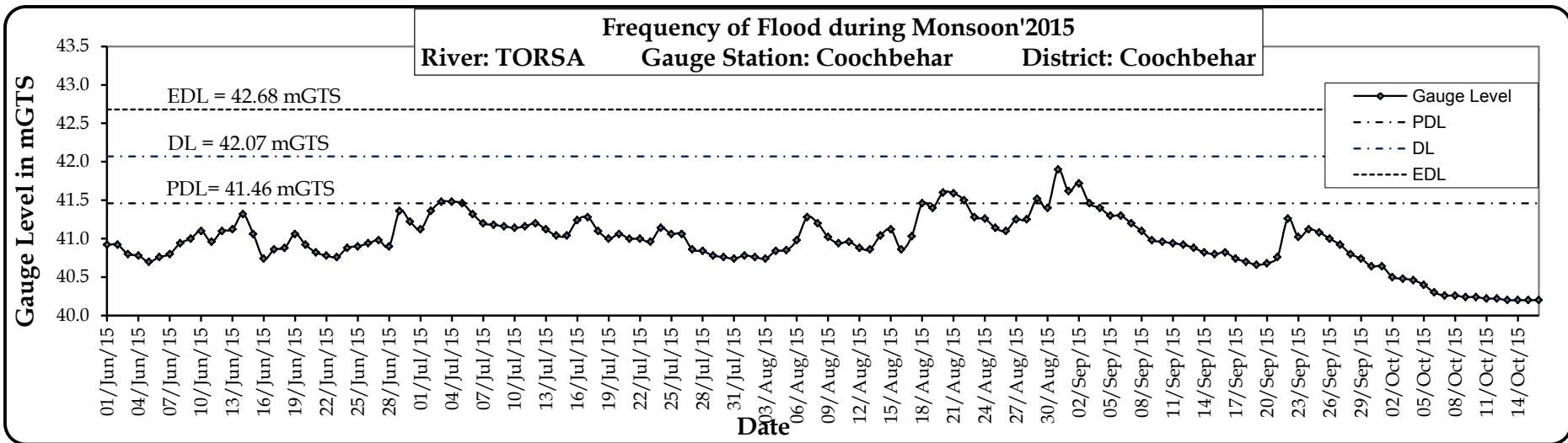
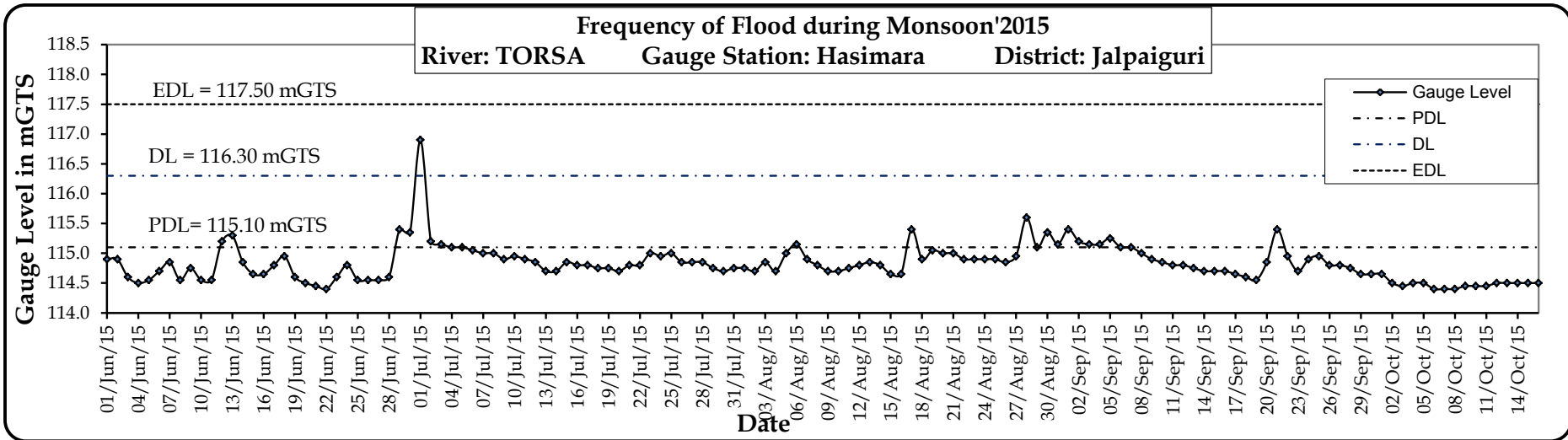
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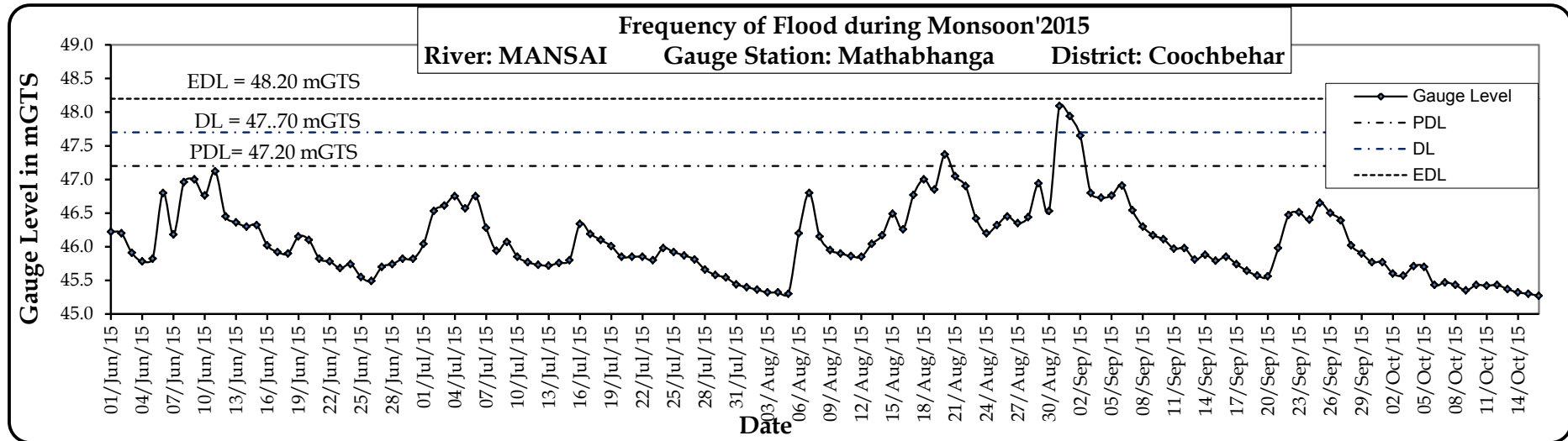
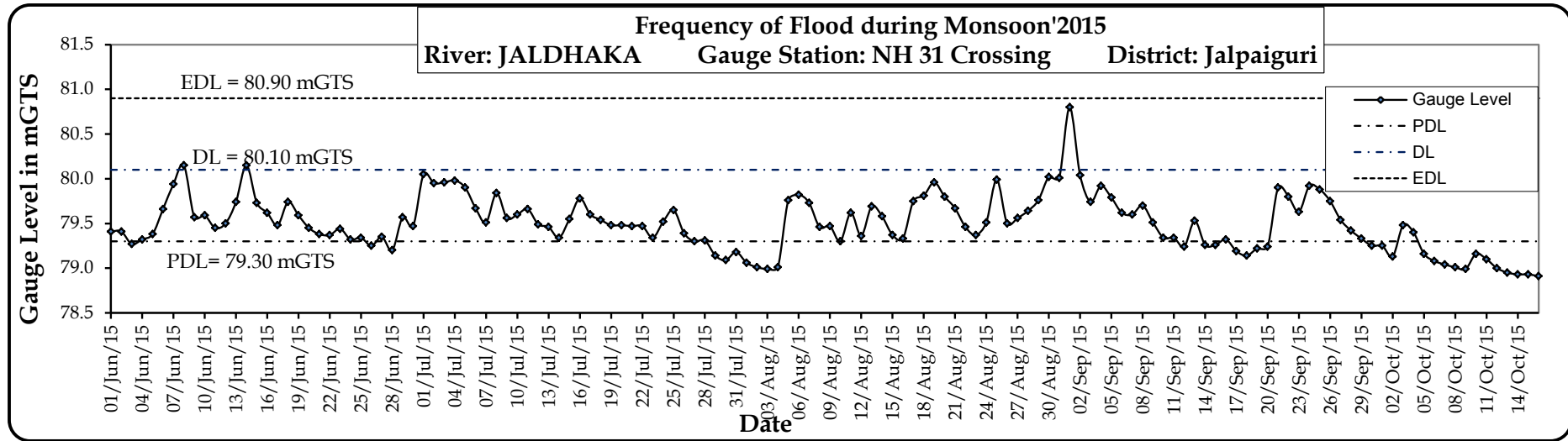
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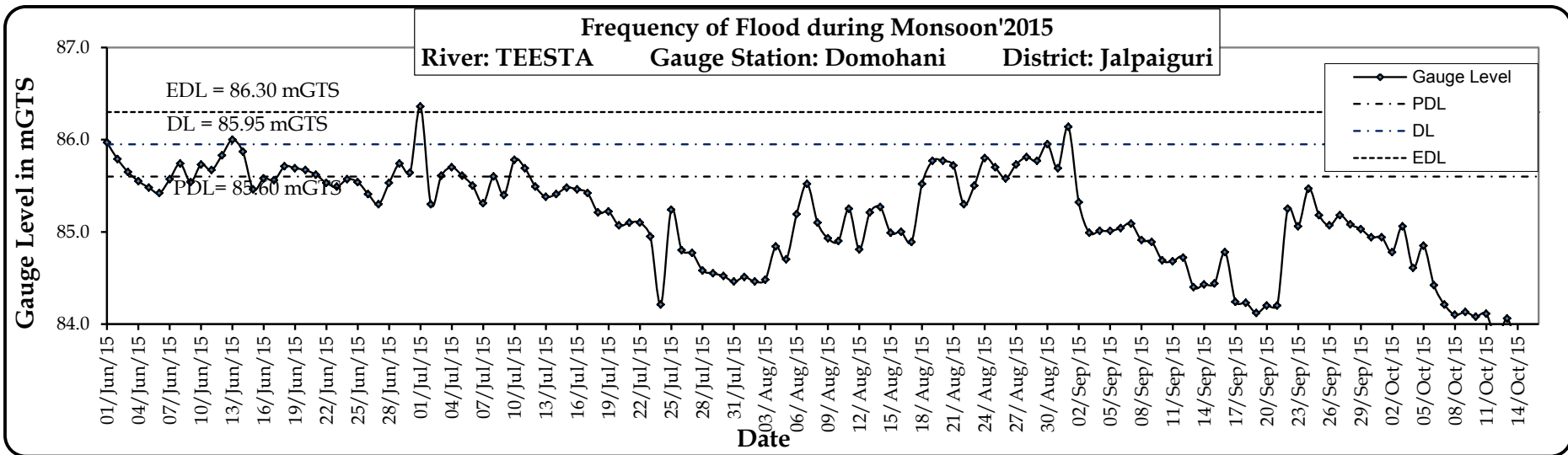
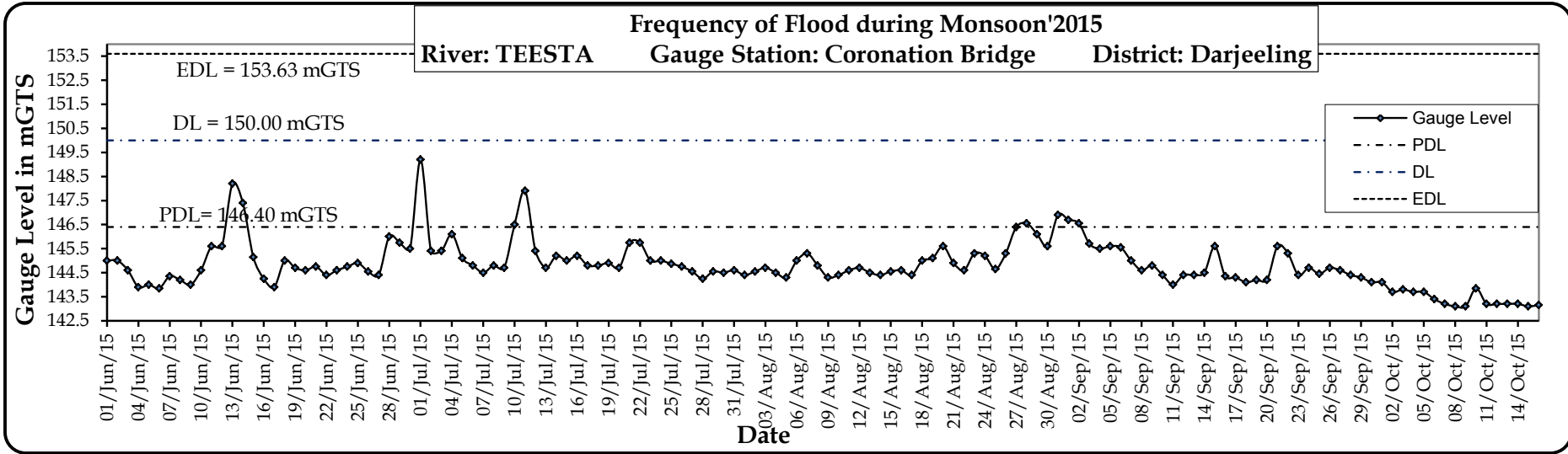
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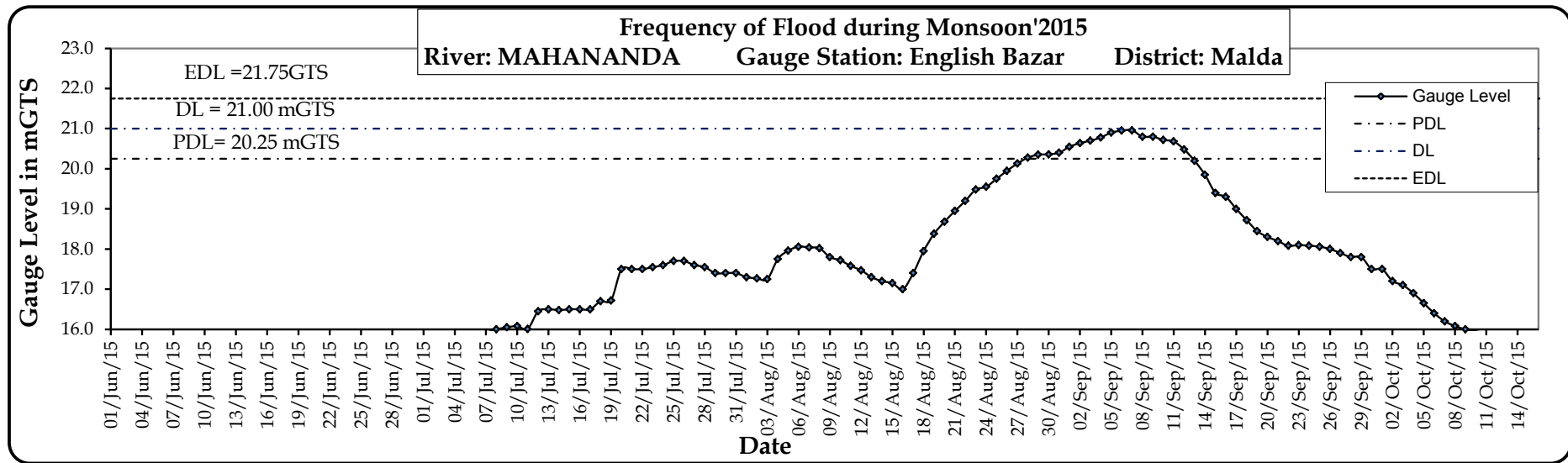
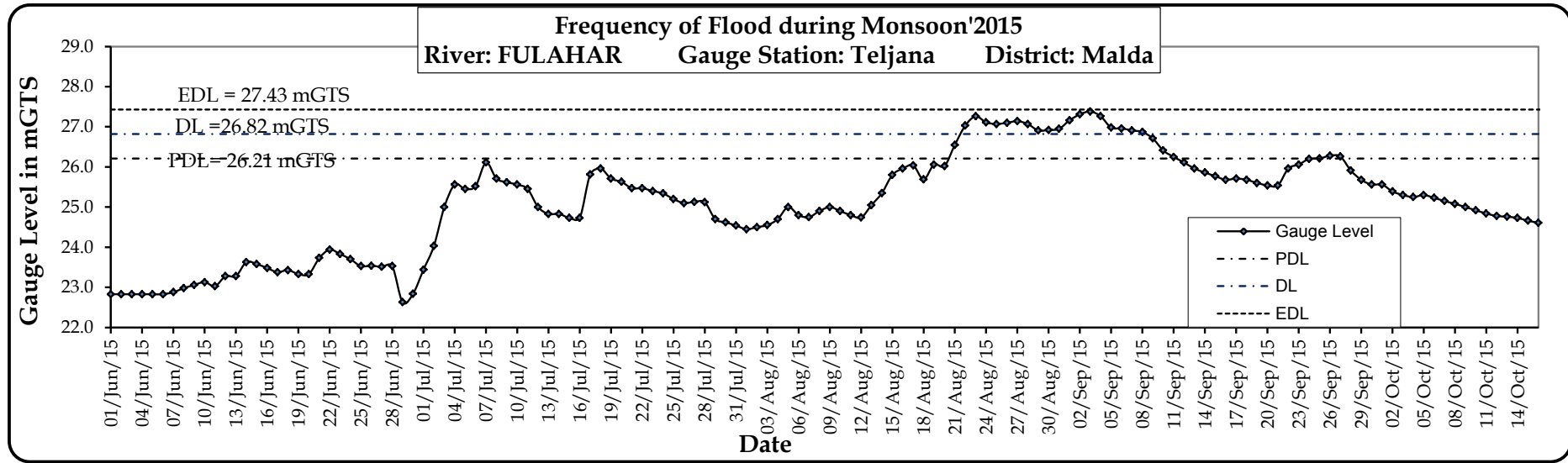
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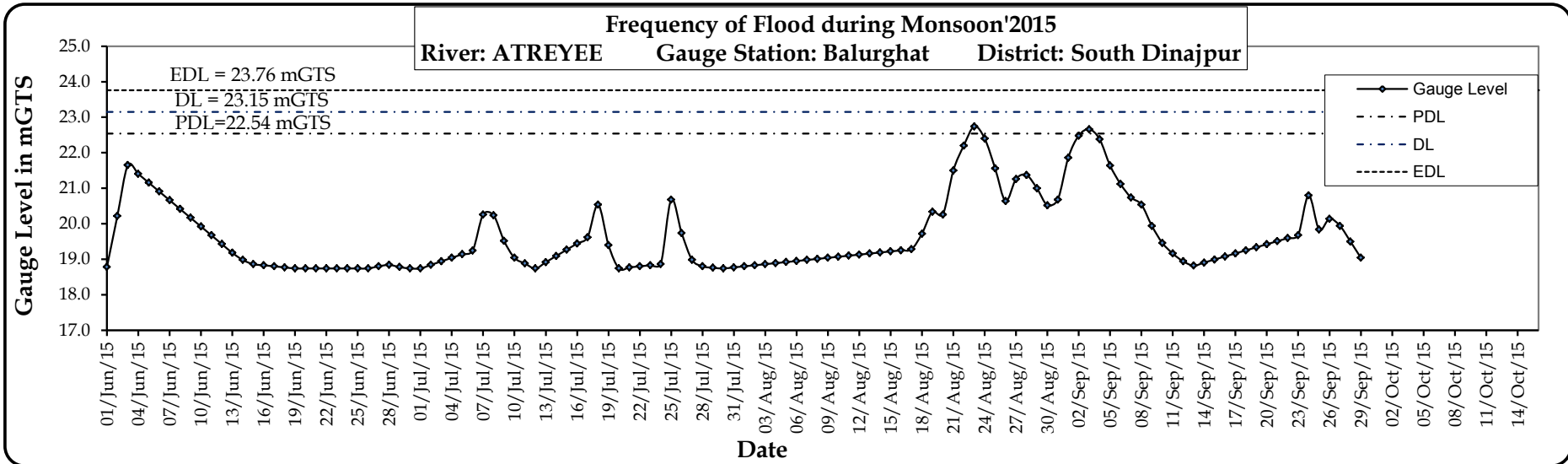
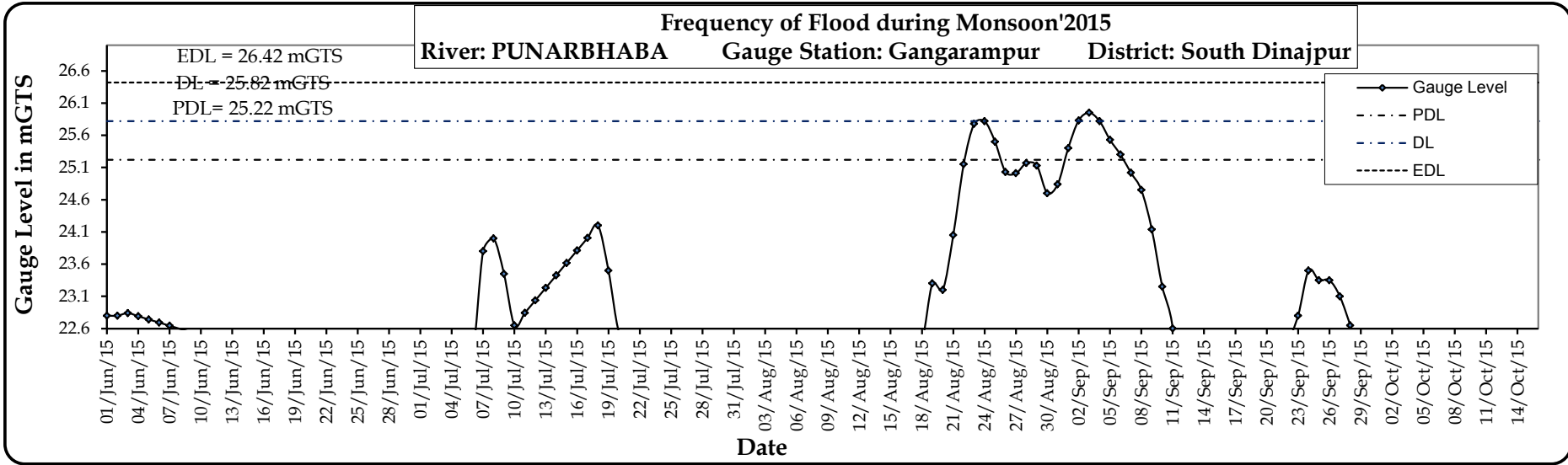
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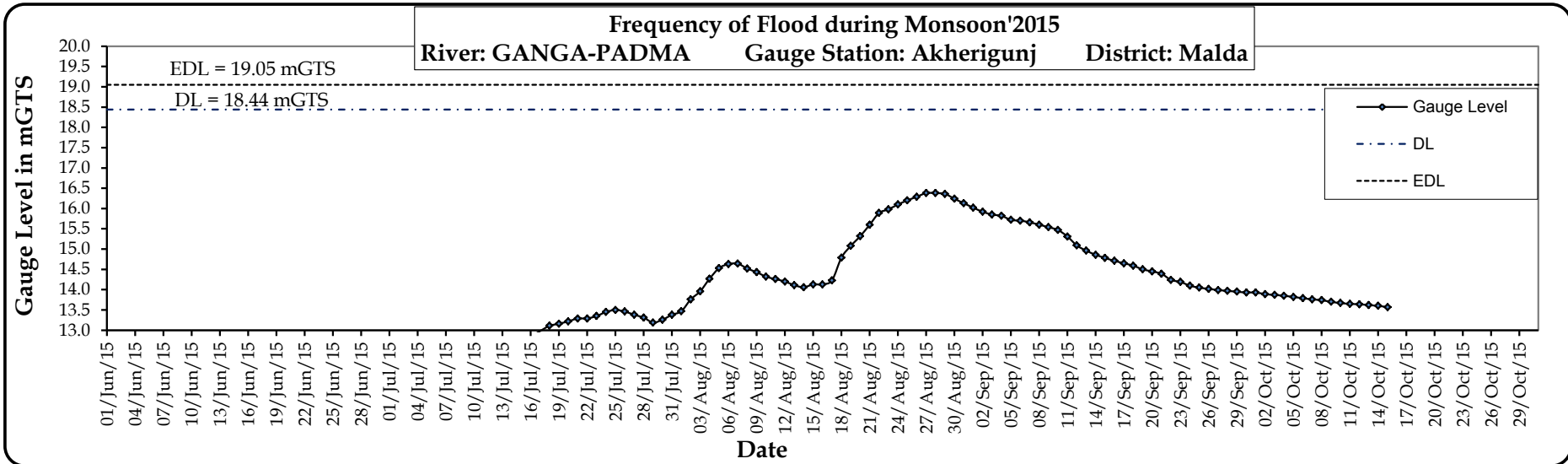
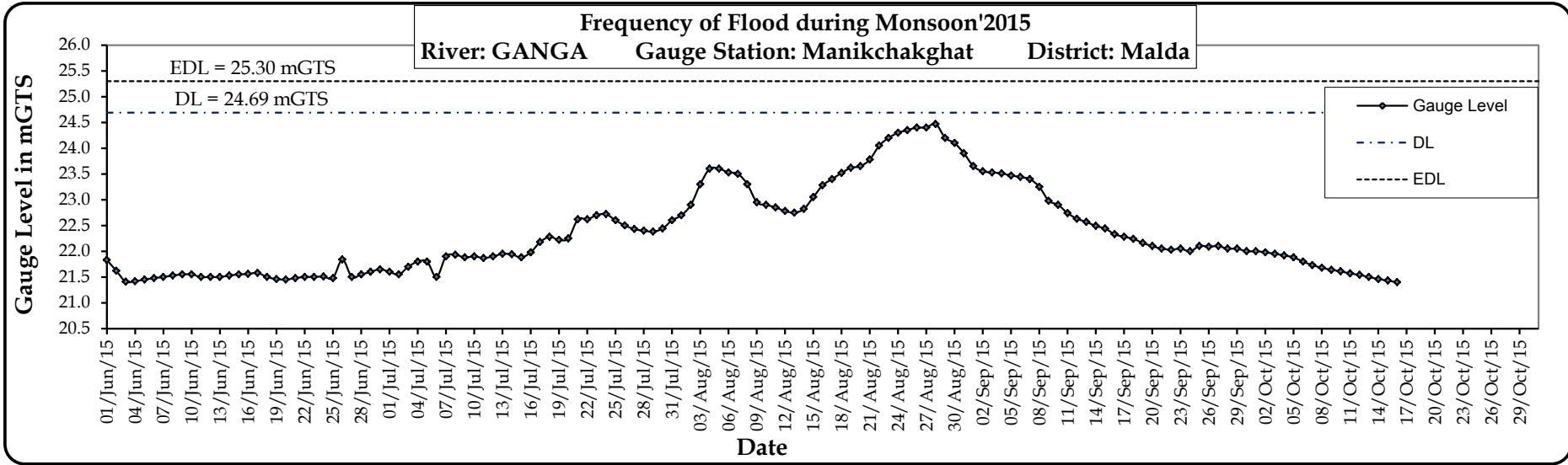
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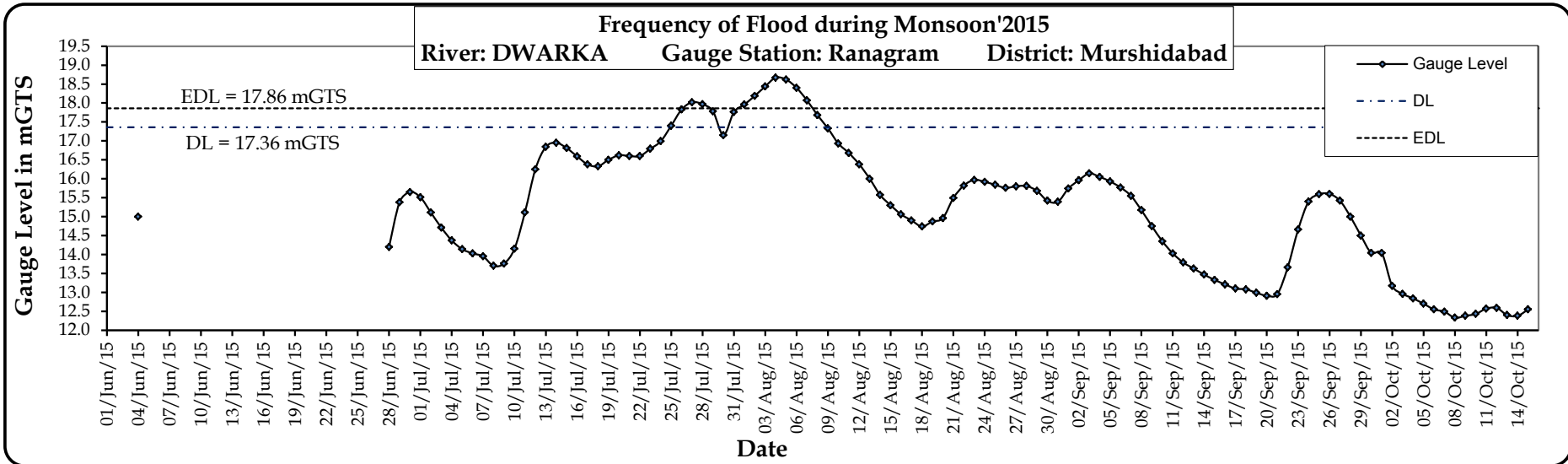
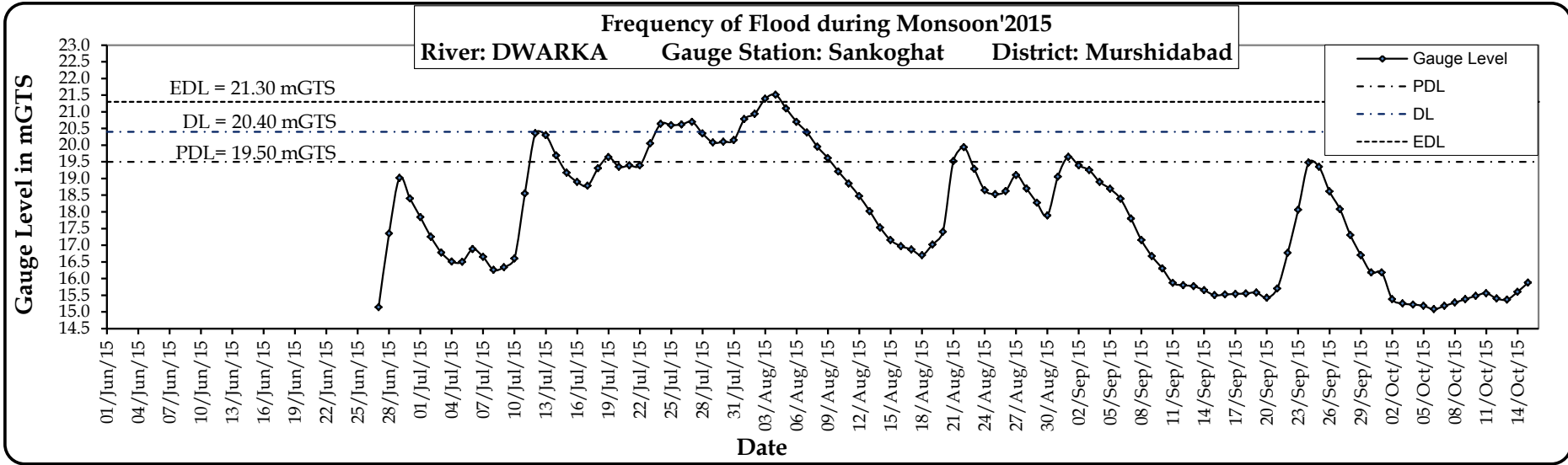
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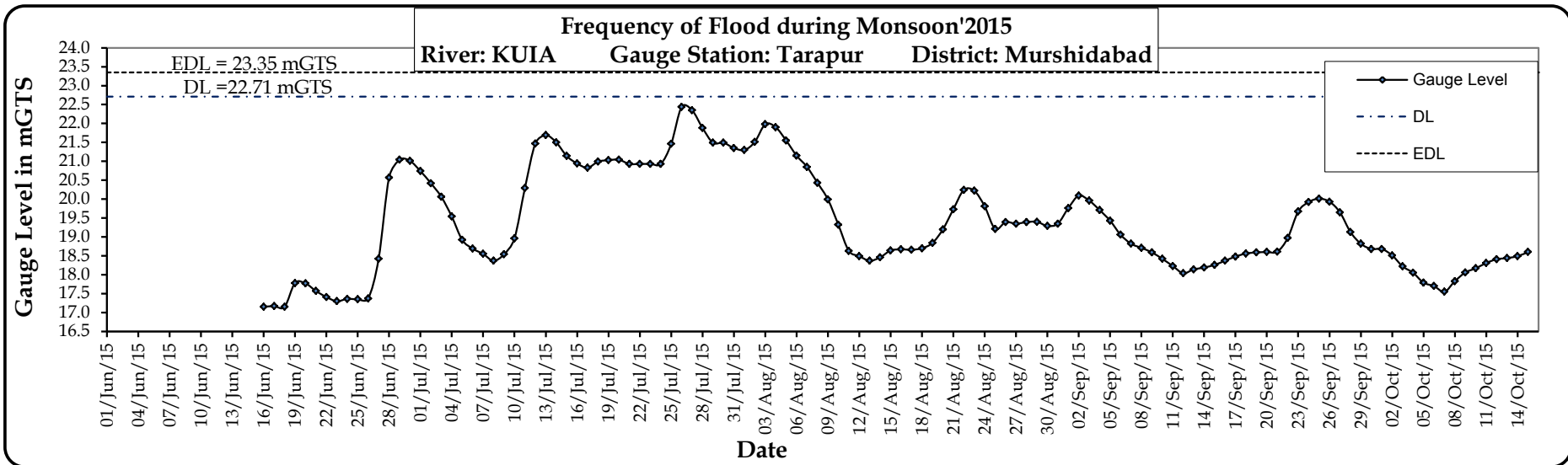
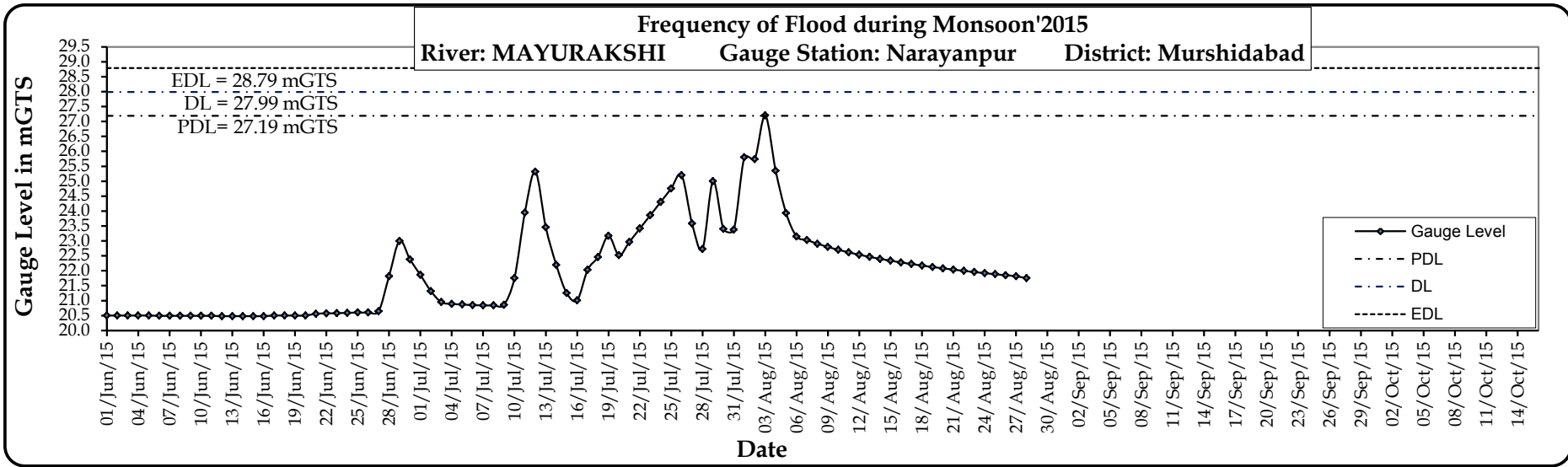
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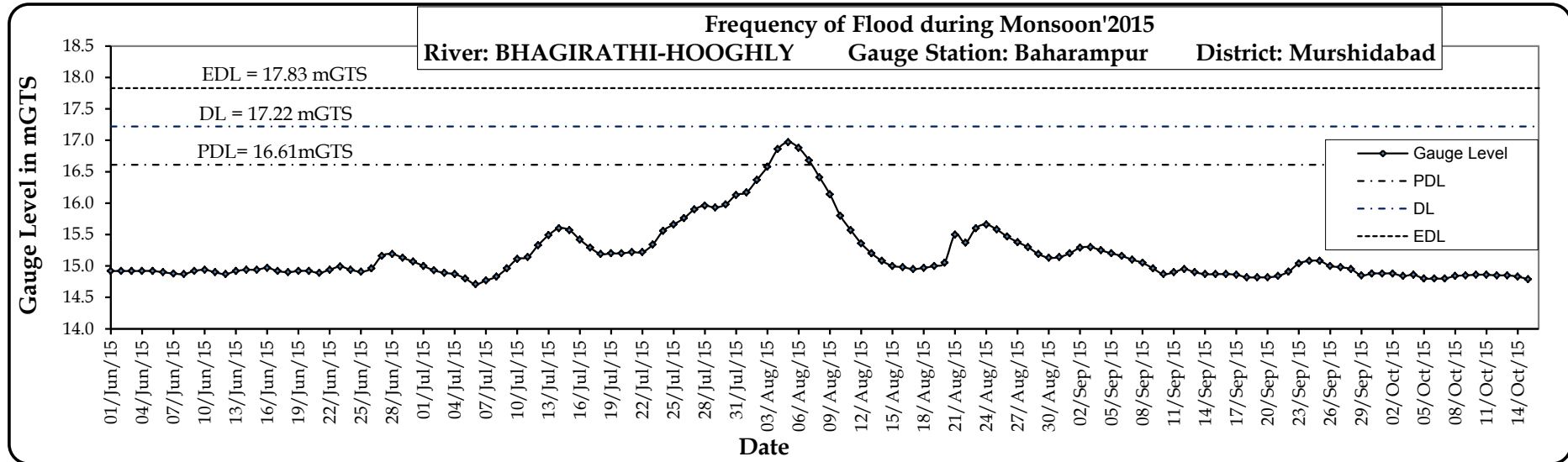
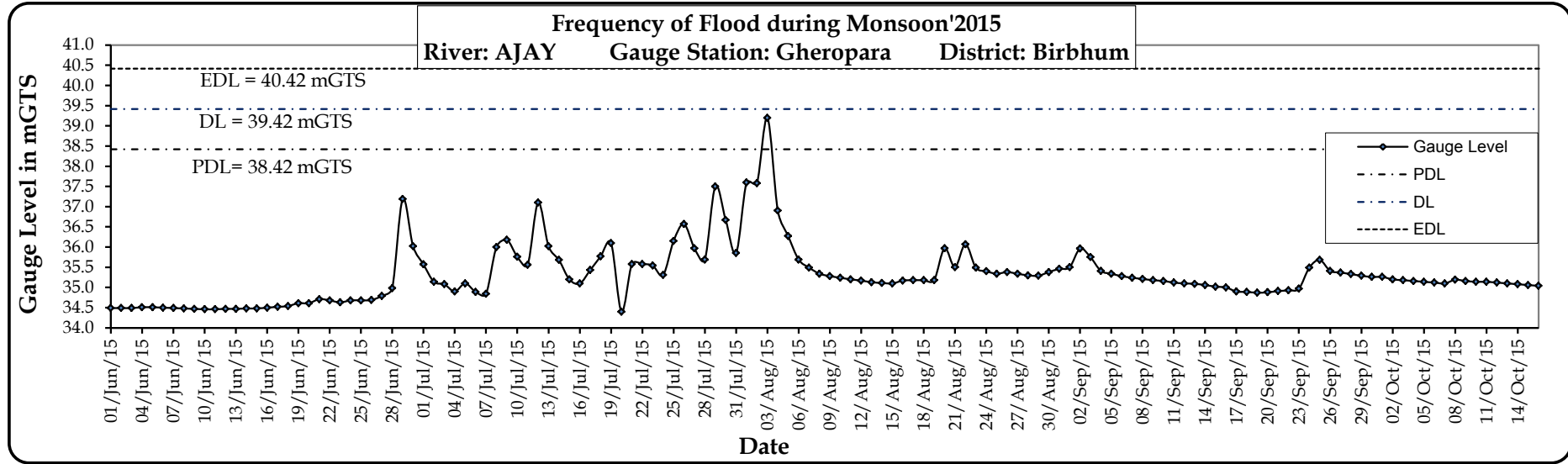
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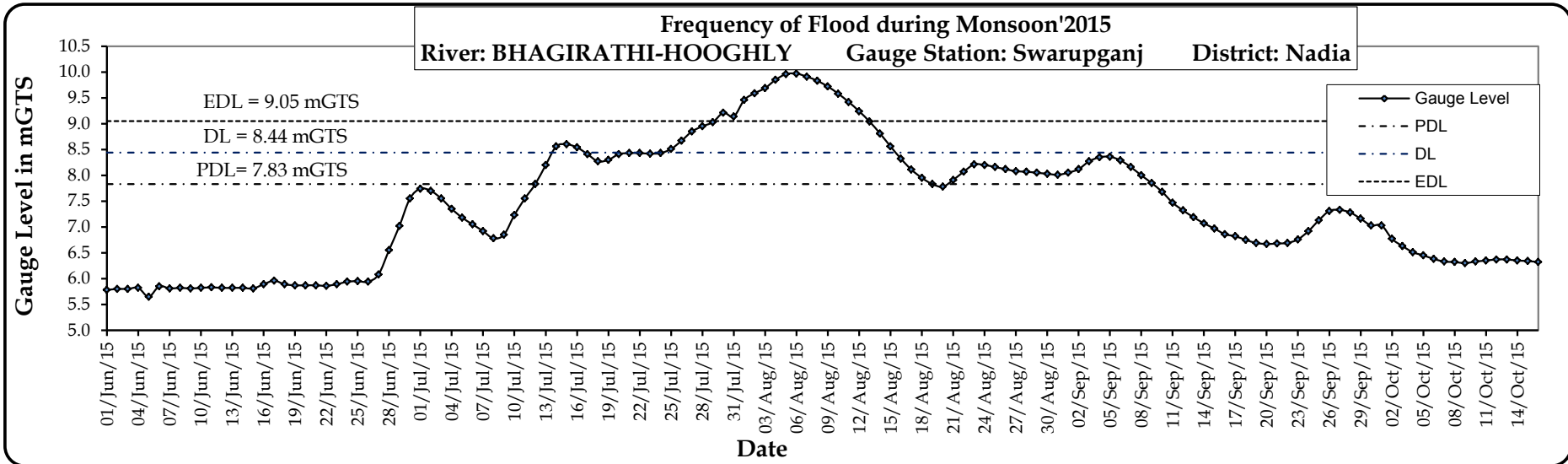
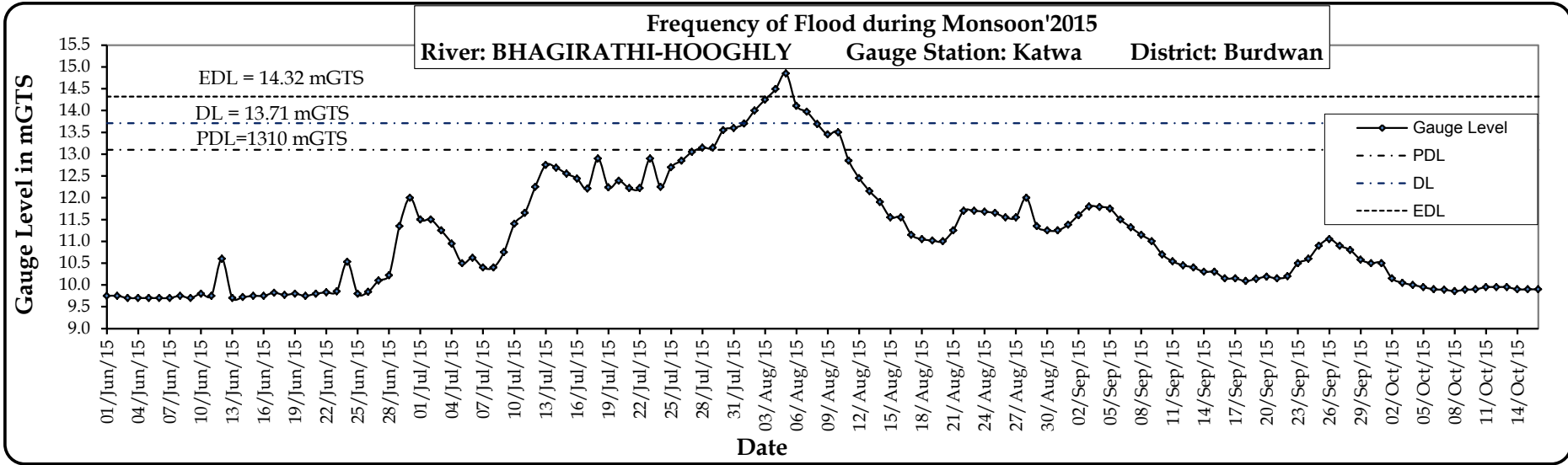
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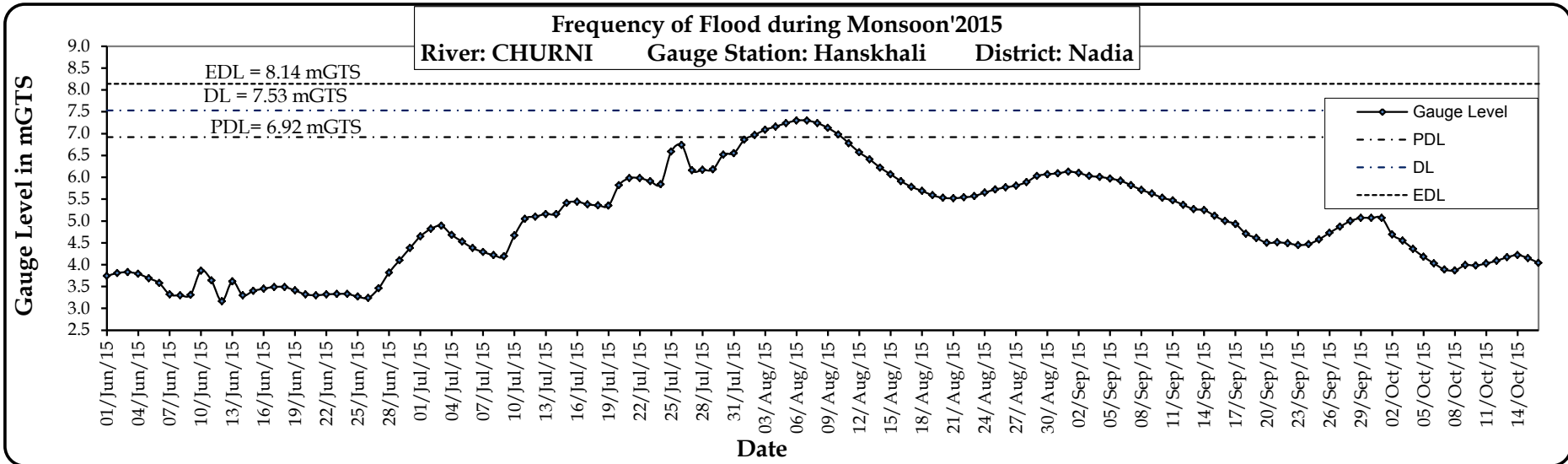
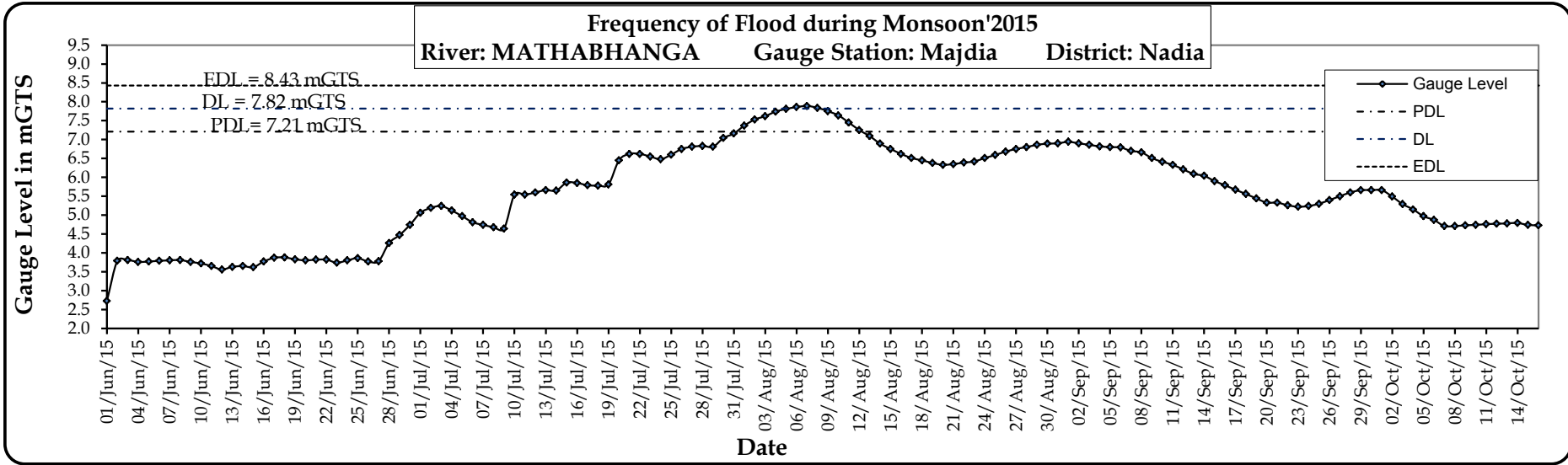
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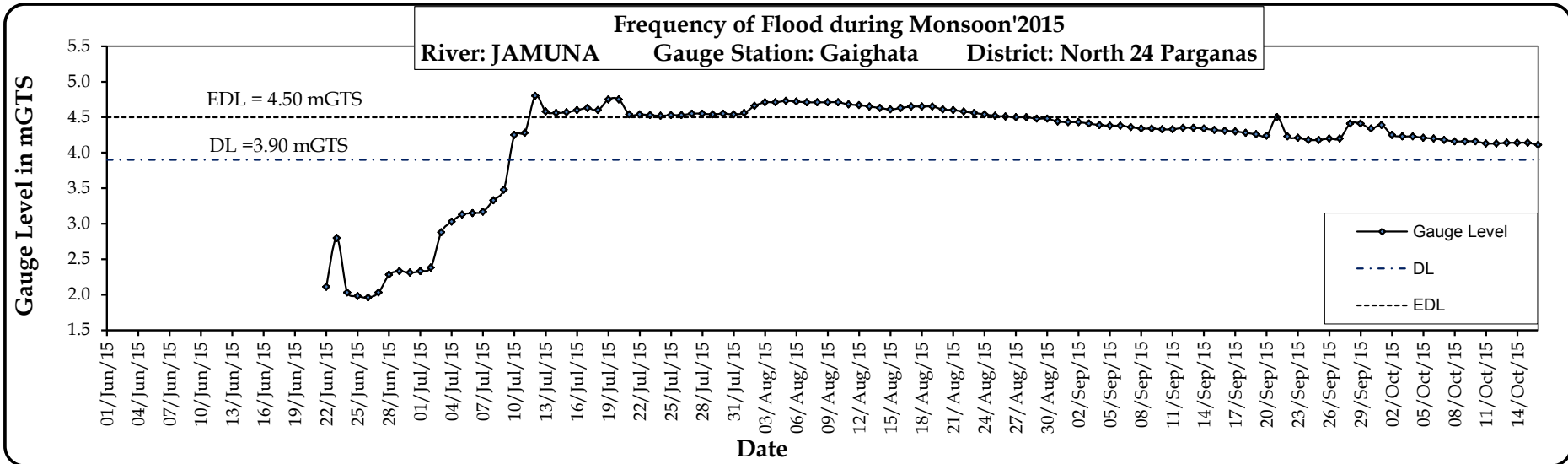
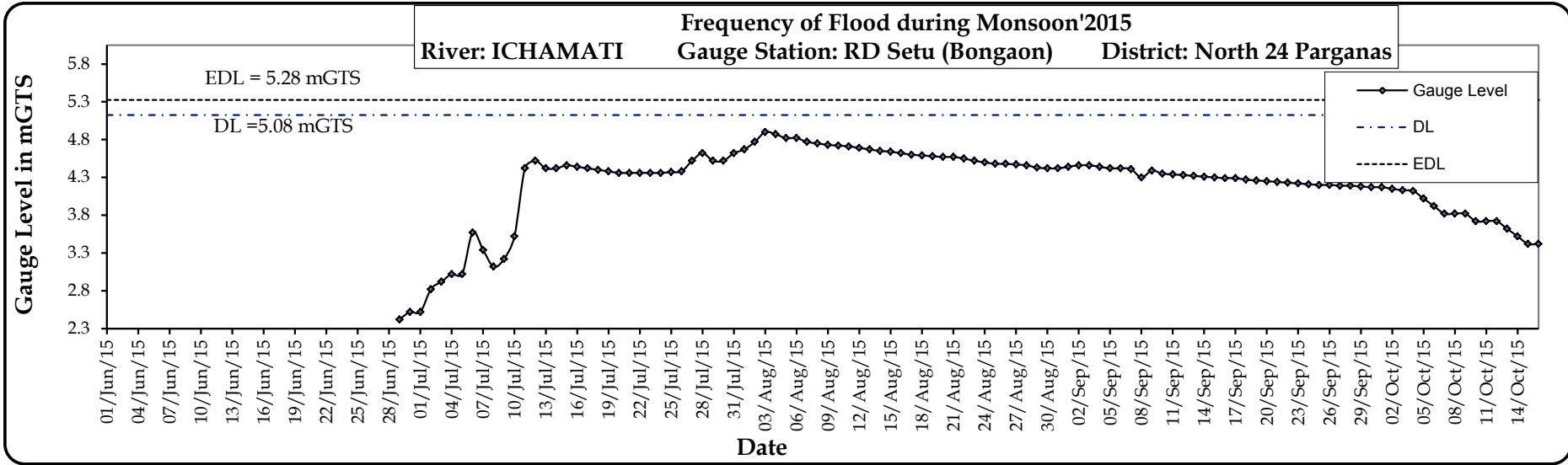
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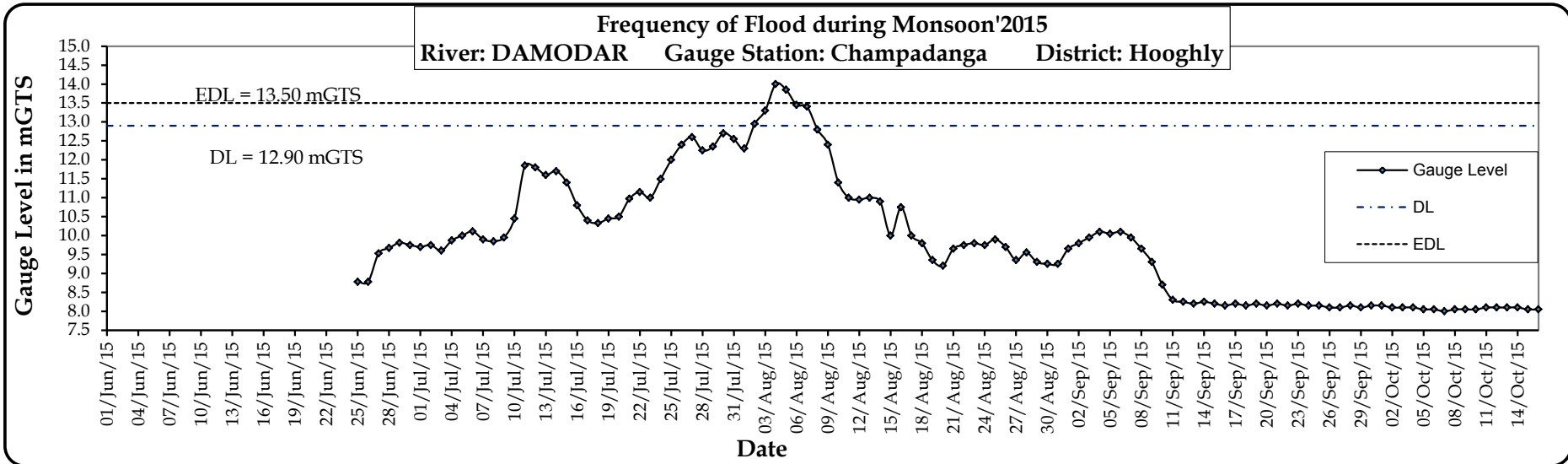
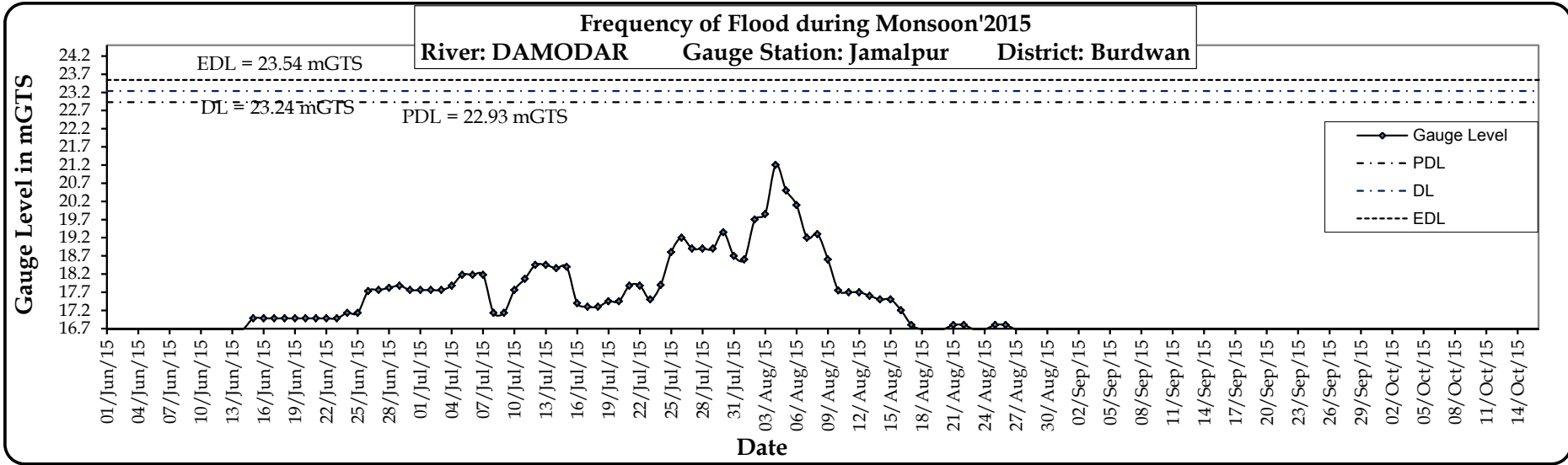
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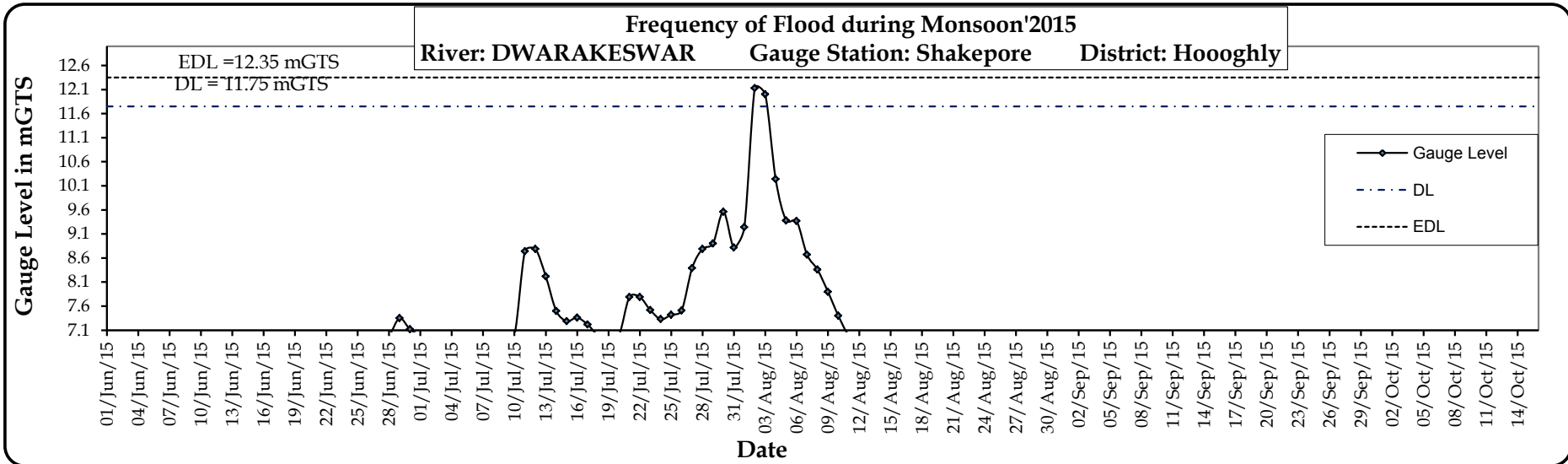
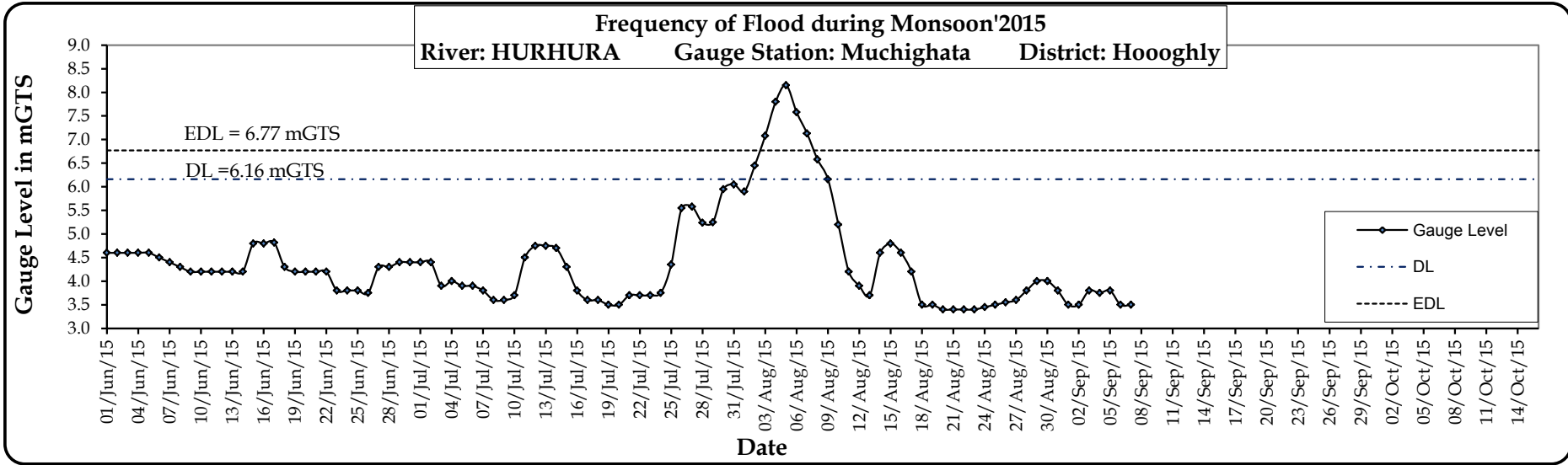
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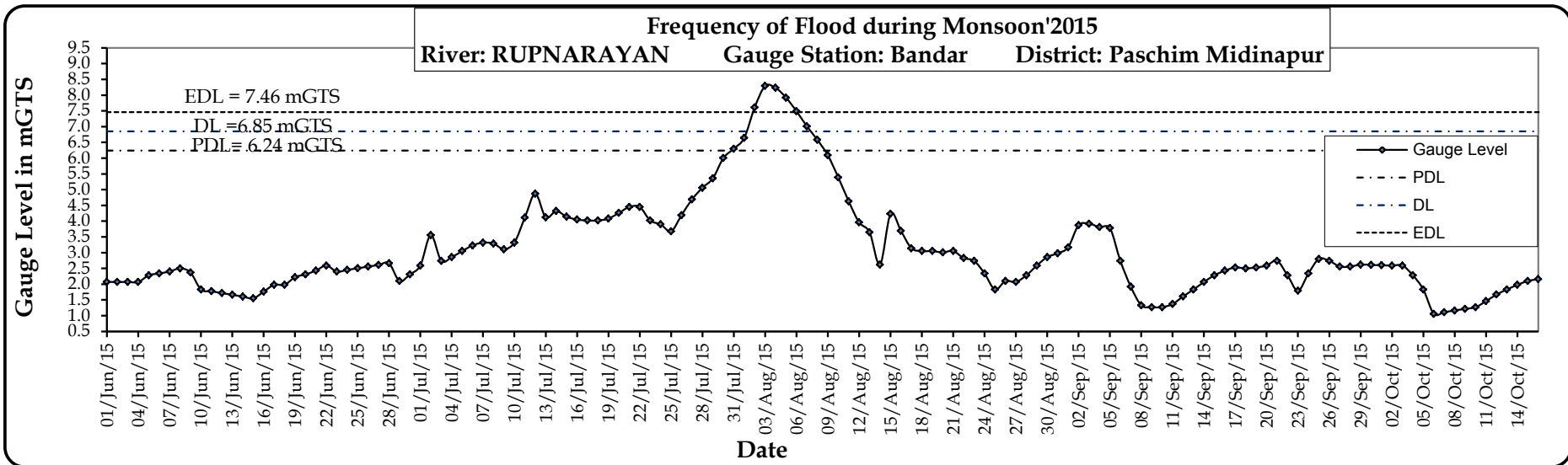
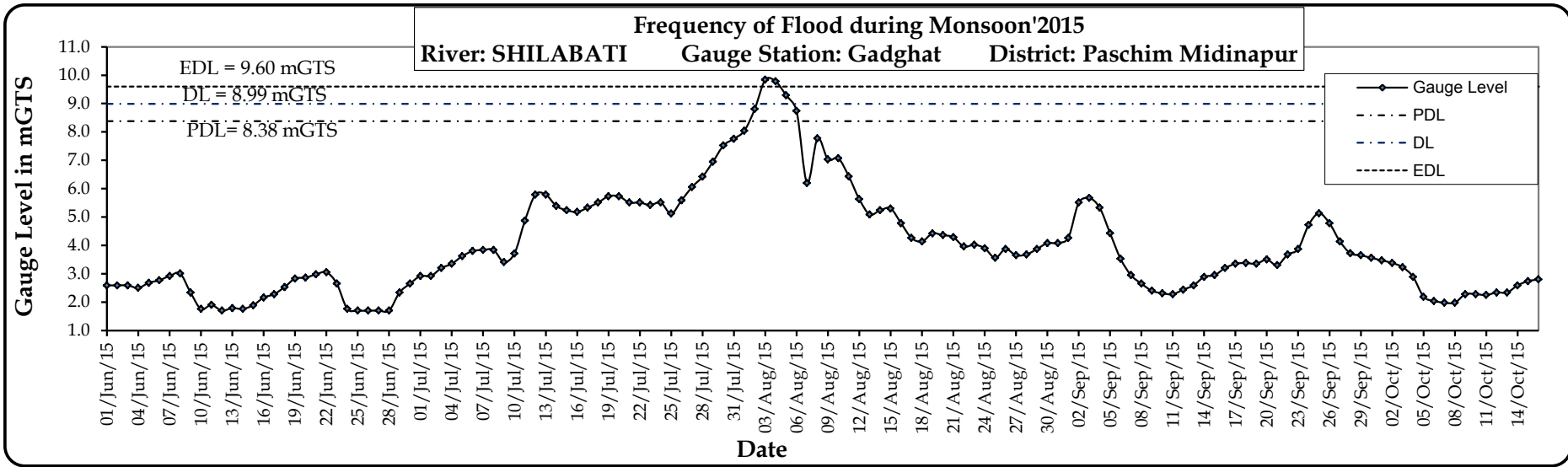
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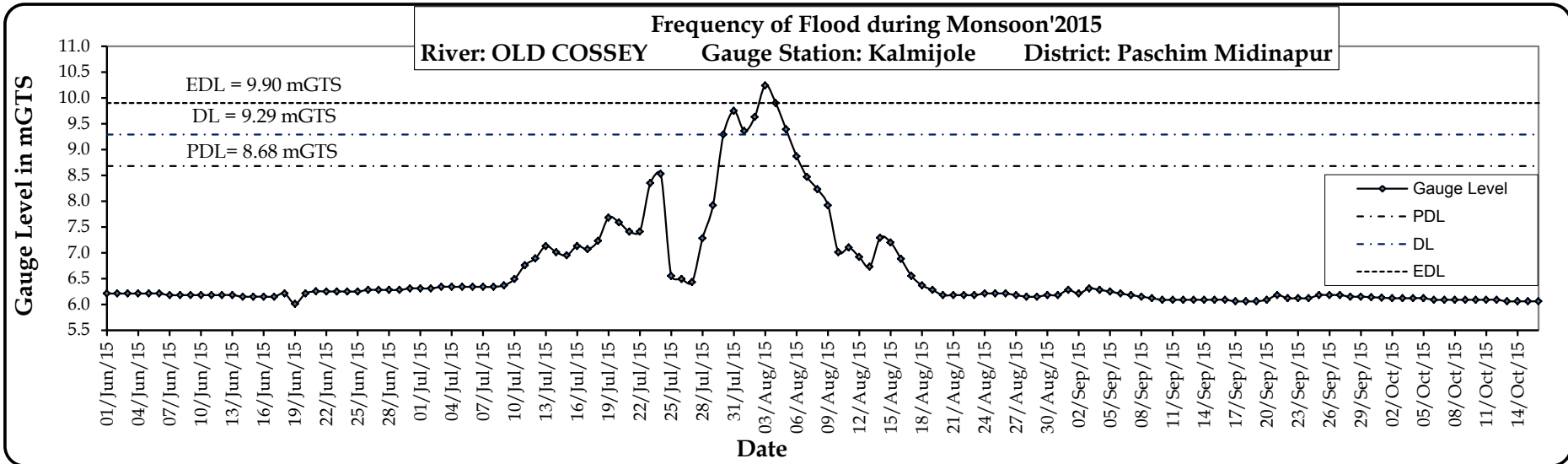
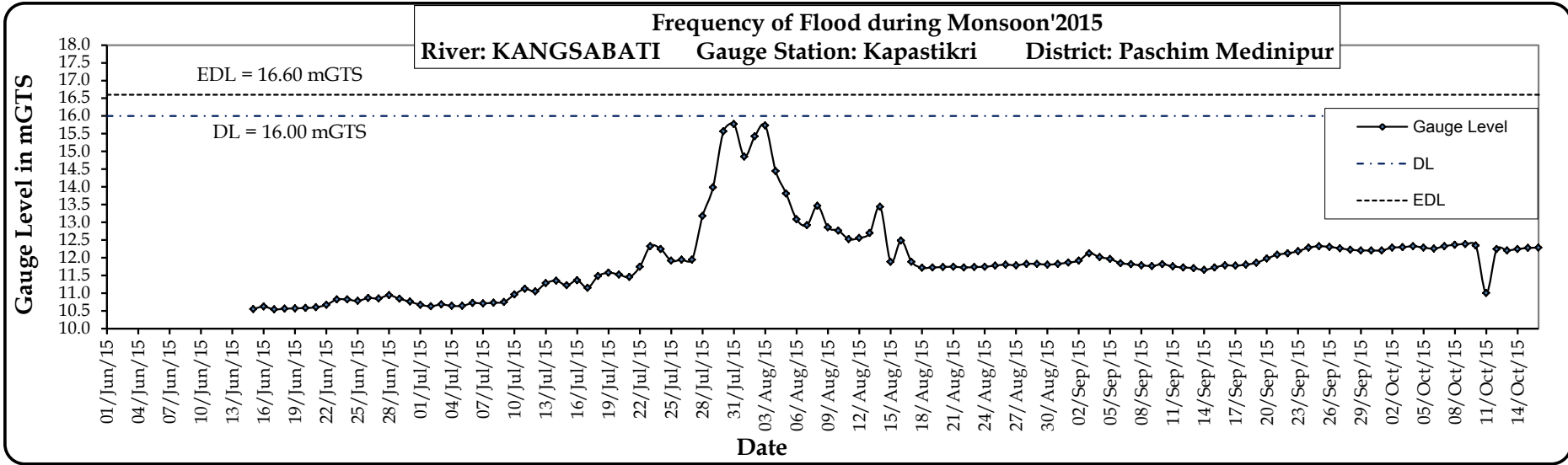
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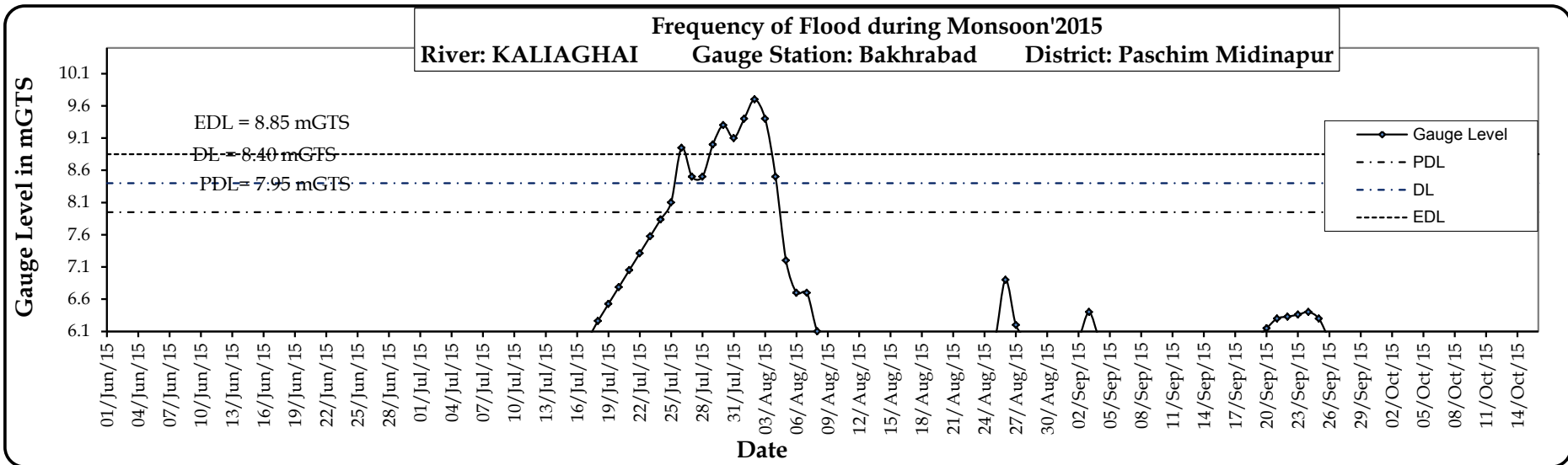
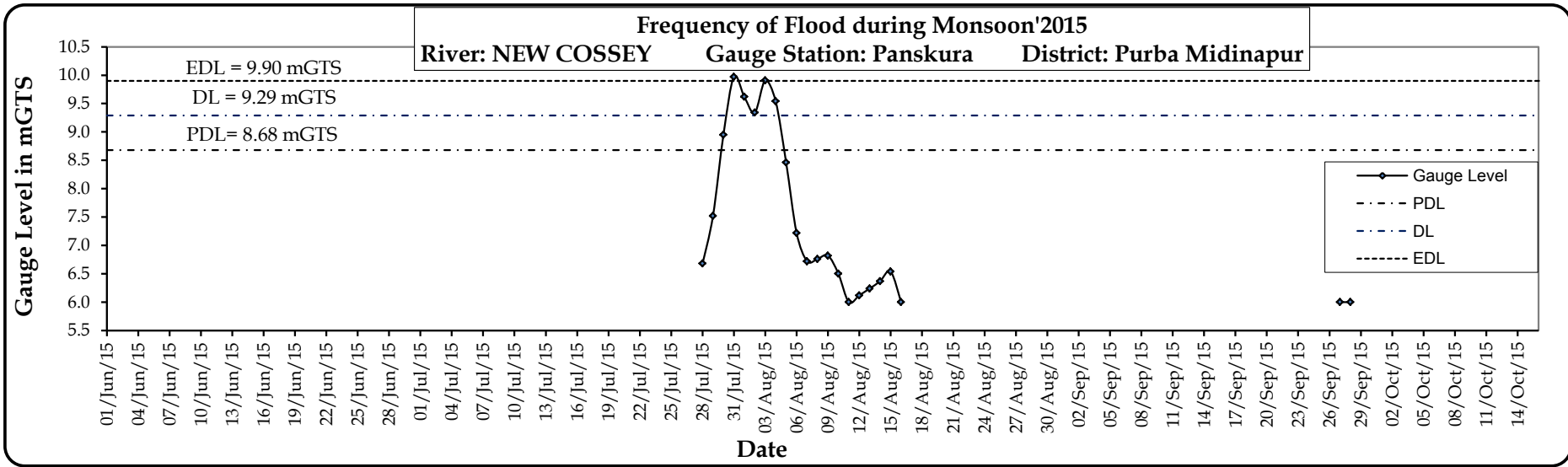
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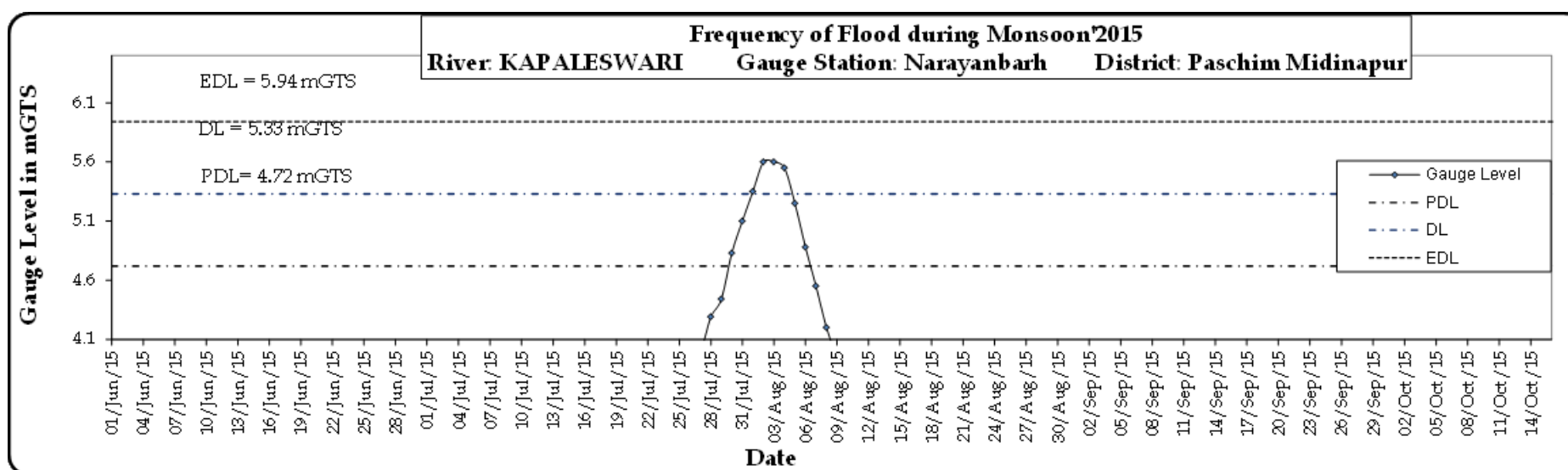
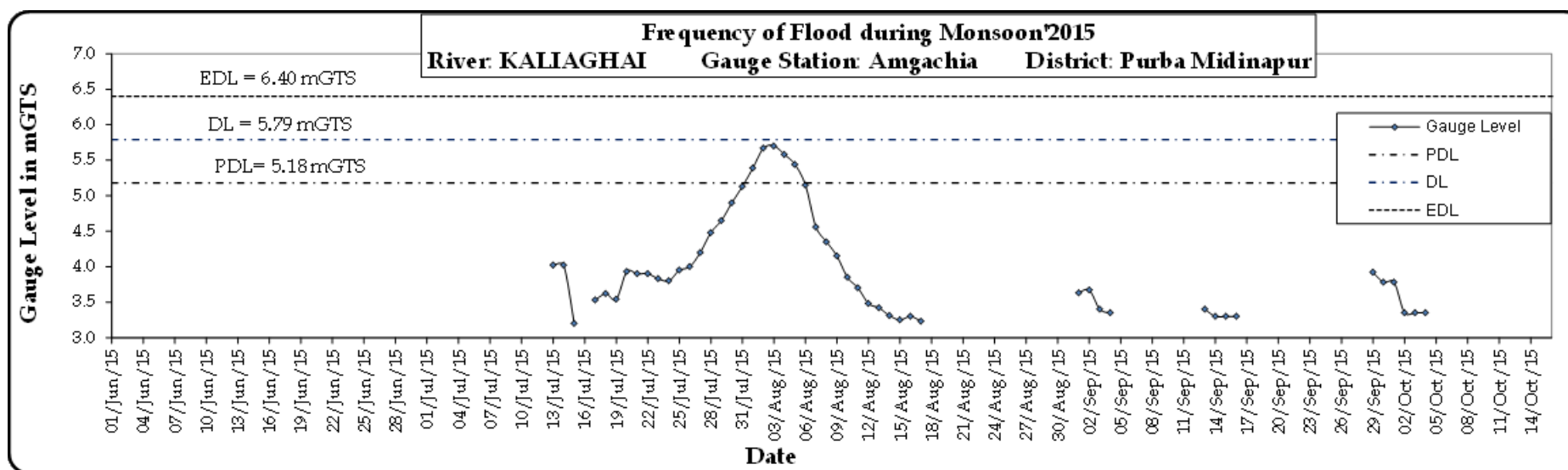
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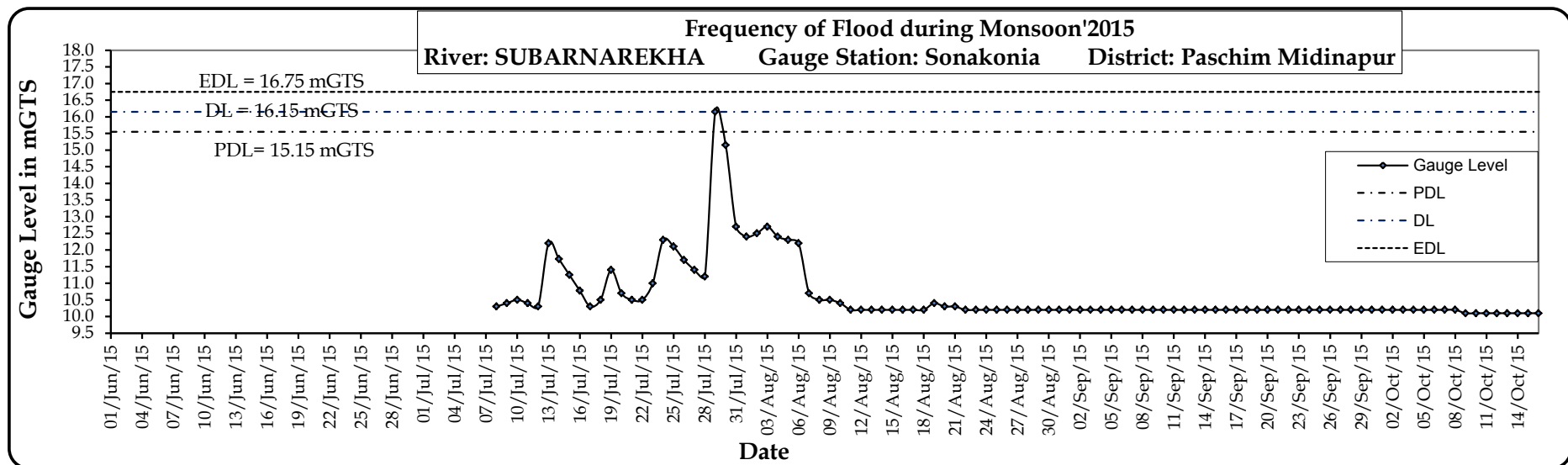
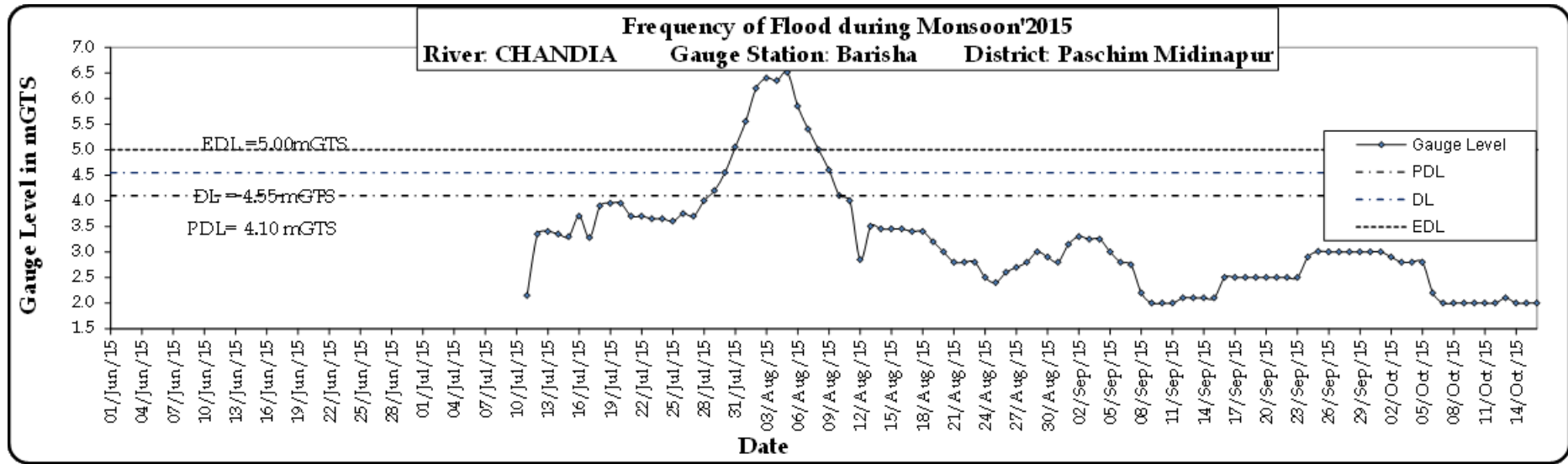
Annexure G



Annexure G



Annexure G



Annexure

Date	Dugapur Barrage			Massanjore Dam			Tilpara Barrage			Mukutmanipur Dam			REMARKS
	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	
1-Jun-15	211.50	550	50	359.25	0	0	190.50	0	0	403.54	0	0	
2-Jun-15	211.50	550	50	359.25	0	0	190.50	0	0	403.54	0	0	
3-Jun-15	211.50	550	50	359.25	0	0	190.50	0	0	403.54	0	0	
4-Jun-15	211.50	530	45	359.20	0	0	190.50	0	0	403.55	0	0	
5-Jun-15	211.50	450	50	359.15	0	25	190.50	0	0	403.55	0	0	
6-Jun-15	211.50	450	50	359.15	0	24	190.50	0	0	403.56	0	0	
7-Jun-15	211.50	450	50	359.10	0	0	206.07	0	0	440.00	0	0	
8-Jun-15	211.50	450	50	359.10	16	0	190.50	0	0	403.54	0	0	
9-Jun-15	211.50	1575	1075	359.10	0	0	190.50	0	0	403.54	0	0	
10-Jun-15	211.50	1575	1075	359.05	0	0	190.50	0	0	403.55	0	0	
11-Jun-15	211.50	1575	1075	359.05	0	0	190.50	0	0	403.55	0	0	
12-Jun-15	211.50	1575	1075	359.05	0	0	190.50	0	0	403.56	0	0	
13-Jun-15	211.50	1575	1075	359.05	0	0	190.50	0	0	403.44	0	0	
14-Jun-15	211.50	1575	1075	359.05	0	0	190.50	0	0	403.53	0	0	
15-Jun-15	211.50	2650	2150	359.05	0	0	190.50	0	0	403.44	0	0	
16-Jun-15	211.50	1575	1075	359.10	100	0	190.50	0	0	403.54	0	0	
17-Jun-15	211.50	1575	1075	359.05	0	0	190.50	0	0	403.54	0	0	
18-Jun-15	211.50	1575	1358	359.10	0	0	190.50	0	0	403.54	0	0	
19-Jun-15	211.50	1575	1075	359.10	0	0	190.50	0	0	403.54	0	0	
20-Jun-15	211.50	1575	1575	359.10	0	0	190.50	0	0	403.54	0	0	
21-Jun-15	211.45	1575	1075	359.00	0	0	190.44	0	0	403.44	0	0	
22-Jun-15	211.45	1575	1075	359.15	0	0	190.45	0	0	403.44	0	0	
23-Jun-15	211.50	1575	1075	359.15	100	0	190.50	0	0	403.44	0	0	
24-Jun-15	211.50	6951	6450	359.25	100	0	190.50	0	0	403.54	0	0	
25-Jun-15	211.50	4801	4301	359.50	500	0	190.50	0	0	403.54	0	0	
26-Jun-15	211.50	4801	4301	361.40	4750	0	190.50	0	0	403.52	0	0	
27-Jun-15	211.50	3725	3225	363.74	0	0	190.50	0	0	403.54	0	0	
28-Jun-15	211.50	3120	3120	366.20	2035	0	190.50	0	0	403.64	463	0	
29-Jun-15	211.45	5877	5396	370.41	4201	0	190.50	0	0	403.64	464	0	
30-Jun-15	211.50	5875	5376	371.15	4199	0	190.50	0	0	403.74	464	0	

*Reservoir Level-Inflow-Outflow Data are at 8.00 AM

Date	Dugapur Barrage			Massanjore Dam			Tilpara Barrage			Mukutmanipur Dam			REMARKS
	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	
1-Jul-15	211.50	5877	5376	371.55	700	0	190.50	0		403.93	457	0	
2-Jul-15	211.50	5876	5376	371.60	175	0	190.50	0	0	404.03	464	0	
3-Jul-15	211.50	10178	9678	371.75	0	0	196.70	300	0	404.26	1112	0	
4-Jul-15	211.50	16166	16166	371.85	0	0	198.90	0	0	404.26	686	0	
5-Jul-15	211.50	8027	7527	372.00	0	0	199.90	0	0	404.55	1269	0	
6-Jul-15	211.50	7328	7328	371.96	0	0	200.85	433	0	404.75	1852	0	
7-Jul-15	211.50	8026	7526	372.80	2450	0	201.60	333	0	405.43	2516	0	
8-Jul-15	211.50	8025	7524	373.35	2200	0	204.80	1983	0	407.25	11124	0	
9-Jul-15	211.50	13404	12903	374.37	4501	0	204.00	527	0	409.28	5564	0	
10-Jul-15	211.50	17702	172	375.49	4275	25	203.90	1527	2044	410.33	8059	0	
11-Jul-15	211.44	20928	20427	378.10	16202	0	203.65	6560	9336	413.90	8060	0	
12-Jul-15	211.50	23081	22581	381.40	10802	0	203.20	19384	11212	415.48	4030	0	
13-Jul-15	211.50	28457	27957	382.40	0	0	203.00	2473	3913	416.01	2686	0	
14-Jul-15	211.50	24156	24156	382.70	1275	0	204.00	1920	1022	416.40	2015	0	
15-Jul-15	211.50	15554	15054	382.94	1063	0	203.20	427	494	416.40	2015	0	
16-Jul-15	211.50	15554	12902	384.00	7501	0	204.70	1663	2090	416.96	2686	0	
17-Jul-15	211.50	13404	13404	384.54	6301	0	203.10	1967	5143	417.25	3358	0	
18-Jul-15	211.50	15554	15554	385.15	0	0	204.61	9800	8196	417.76	4030	0	
19-Jul-15	211.50	10898	10753	385.60	6301	0	202.70	3240	2019	419.16	4028	0	
20-Jul-15	211.50	19852	19352	385.85	1575	0	202.30	1832	1974	419.84	4028	0	
21-Jul-15	211.50	20430	20430	386.74	4232	0	203.80	3178	5968	421.65	11216	0	
22-Jul-15	211.50	20430	20430	386.74	4232	0	203.80	3178	5968	421.65	11216	0	
23-Jul-15	211.50	34079	33579	387.34	21180	0	203.40	9258	9108	422.21	5608	0	
24-Jul-15	211.50	40636	40636	388.19	6257	6255	203.30	13744	12248	422.53	5608	0	
25-Jul-15	211.50	44937	44437	388.10	2278	9479	202.39	9139	11771	423.06	5572	0	
26-Jul-15	210.99	48638	48138	388.19	5033	1684	202.39	23956	7320	423.09	1395	5134	
27-Jul-15	211.50	35728	35228	388.20	1634	1154	202.00	4962	3758	423.26	6461	5159	
28-Jul-15	211.50	29398	29958	388.09	1545	1545	202.66	4179	2859	424.86	21660	5307	
29-Jul-15	211.50	44337	43836	389.50	12860	3859	203.00	14974	15709	432.70	40018	26271	
30-Jul-15	210.99	45937	45430	389.35	8092	8092	202.40	10436	7416	431.49	13514	30151	
31-Jul-15	211.50	36254	38975	389.35	20310	9475	202.40	9757	52232	430.05	601	14971	

*Reservoir Level-Inflow-Outflow Data are at 8.00 AM

ANNEXURE

Date	Dugapur Barrage			Massanjore Dam			Tilpara Barrage			Mukutmanipur Dam			REMARKS
	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	
1-Aug-15	211.50	45771	47580	392.25	24755	19778	203.00	21289	31042	429.20	4584	10000	
2-Aug-15	211.50	55288	63375	392.30	20034	19921	202.70	32820	33146	431.60	35500	10000	
3-Aug-15	211.50	93236	92736	393.40	14646	25000	197.90	45763	41987	433.30	32173	10000	
4-Aug-15	211.50	92443	117175	391.50	9735	4778	196.20	30997	26005	434.00	16500	5000	
5-Aug-15	211.50	91649	91125	391.20	4164	4715	202.20	14780	3676	433.95	5188	5258	
6-Aug-15	211.50	89286	82225	391.10	3088	2911	203.00	6544	5864	433.69	2166	10000	
7-Aug-15	211.50	74416	74120	391.30	3475	2911	203.30	3623	2979	432.90	124	9750	
8-Aug-15	210.99	62416	60416	391.20	1670	2319	203.70	2855	1517	431.98	4672	10020	
9-Aug-15	211.43	34604	30308	391.00	1099	2318	203.90	2475	1022	431.04	408	9790	
10-Aug-15	211.44	31308	24725	390.85	1496	2321	203.70	2200	506	430.50	1000	10000	
11-Aug-15	211.50	27428	23650	390.69	1839	0	205.50	2740	0	428.70	1311	9273	
12-Aug-15	211.50	29503	21502	390.25	1665	0	205.90	3711	0	427.25	2846	8963	
13-Aug-15	211.50	28008	21503	389.84	1076	0	205.60	4029	0	426.44	3707	6129	
14-Aug-15	211.50	31158	23656	389.55	4030	4005	205.90	4001	4001	425.49	0	4309	
15-Aug-15	211.50	24703	17202	389.10	848	0	205.90	4288	0	424.70	0	0	
16-Aug-15	211.45	18755	10750	388.60	4009	0	205.85	4301	0	424.20	1667	0	
17-Aug-15	211.45	16602	8601	388.35	1093	0	205.70	4228	0	423.74	1088	0	
18-Aug-15	211.45	12801	4300	388.20	1726	2626	205.80	4373	0	423.15	1049	0	
19-Aug-15	211.45	11726	3225	388.25	2587	2287	205.60	3924	0	422.60	1588	0	
20-Aug-15	211.50	16604	8602	388.80	4846	1546	205.20	4223	0	422.30	3058	0	
21-Aug-15	211.50	16604	8602	390.80	13125	0	250.60	4829	2134	421.91	2980	0	
22-Aug-15	211.50	18755	10753	391.50	25	0	205.10	2200	0	421.60	2581	0	
23-Aug-15	211.50	17680	9678	390.99	3011	6338	204.40	3992	4140	421.09	682	0	
24-Aug-15	211.50	18752	10751	390.30	2783	6279	205.60	7333	2134	420.53	1290	0	
25-Aug-15	211.50	16300	8600	389.60	1824	7362	205.50	7049	3192	419.84	287	0	
26-Aug-15	211.50	14152	6451	388.90	1996	6212	205.40	7696	4250	419.19	1978	0	
27-Aug-15	211.50	13652	6451	388.25	2357	6464	205.40	7436	8052	418.79	3262	0	
28-Aug-15	211.50	13654	6451	388.15	1032	0	205.10	5337	0	418.63	2712	0	
29-Aug-15	211.50	10503	4301	388.14	928	628	205.20	2173	0	418.53	2662	0	
30-Aug-15	211.50	10503	4301	388.45	2126	626	204.60	2735	0	418.00	1075	0	
31-Aug-15	211.50	10503	4301	389.00	3911	586	204.90	4192	4212	418.50	672	0	

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Date	Dugapur Barrage			Massanjore Dam			Tilpara Barrage			Mukutmanipur Dam			REMARKS
	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	Reservoir Level (ft)	Inflow (Cusecs)	Outflow (Cusecs)	
1-Sep-15	211.50	13729	7527	389.35	3236	0	204.40	4743	2076	418.79	2687	0	
2-Sep-15	211.50	15395	10753	389.55	2106	0	204.60	3317	2084	419.19	2686	0	
3-Sep-15	211.50	17327	11827	389.60	1002	0	204.20	1498	1033	419.38	42220	0	
4-Sep-15	211.50	17902	12902	389.55	1739	3421	204.50	1302	520	419.65	994	0	
5-Sep-15	211.50	16904	12903	389.05	276	3402	204.90	4600	4212	419.77	671	0	
6-Sep-15	211.50	8301	4301	388.65	1546	3386	204.50	4075	2080	440.00	663	0	
7-Sep-15	211.50	6151	2150	388.20	1269	3969	204.70	3599	3135	419.94	0	0	
8-Sep-15	211.50	4051	50	388.05	509	1409	204.80	1956	0	420.01	663	0	
9-Sep-15	211.50	3052	50	387.75	89	0	205.50	2448	0	420.04	467	0	
10-Sep-15	211.50	1550	50	387.50	386	0	205.60	2273	0	420.11	467	0	
11-Sep-15	211.50	2300	50	387.00	285	0	205.90	3060	0	420.11	0	0	
12-Sep-15	211.50	7051	50	386.45	903	3309	205.60	4071	0	419.38	2576	0	
13-Sep-15	211.50	8052	50	385.75	115	3284	205.30	3983	0	418.50	374	0	
14-Sep-15	211.50	3550	50	385.10	797	0	205.40	4273	0	417.68	2516	0	
15-Sep-15	211.50	8551	50	384.40	540	4215	205.50	4273	0	416.89	2643	0	
16-Sep-15	211.50	9050	50	383.60	589	5189	205.60	4792	0	416.01	640	0	
17-Sep-15	211.50	7052	50	382.85	0	4385	205.30	4916	0	415.19	1346	0	
18-Sep-15	211.50	9252	50	382.10	1174	4361	205.20	4528	0	414.30	638	0	
19-Sep-15	211.50	8552	50	381.30	1239	4196	205.50	4947	0	413.35	0	0	
20-Sep-15	211.50	8795	50	380.60	1555	4805	205.70	4945	0	412.30	207	0	
21-Sep-15	211.50	8552	8552	380.35	671	1858	204.20	3984	0	411.44	2729	0	
22-Sep-15	211.50	9251	50	380.35	4164	4164	205.80	3974	0	410.49	145	0	
23-Sep-15	211.50	9251	50	380.15	2584	3534	205.70	4528	0	409.55	2489	0	
24-Sep-15	211.50	6058	50	380.60	3495	1357	205.50	3684	0	409.28	4832	0	
25-Sep-15	211.50	2051	50	381.00	1925	25	204.70	1100	0	409.71	428	0	
26-Sep-15	211.50	2051	50	381.20	925	25	204.20	481	0	409.84	686	0	
27-Sep-15	211.50	1550	50	381.30	475	25	203.00	44.5	0	409.93	464	0	
28-Sep-15	211.50	1550	50	381.35	250	25	204.00	600	0	410.00	232	0	
29-Sep-15	211.50	1050	50	381.40	250	25	204.50	319	0	410.03	338	0	
30-Sep-15	211.50	1300	50	381.45	272	47	204.90	255	0	410.03	336	0	

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