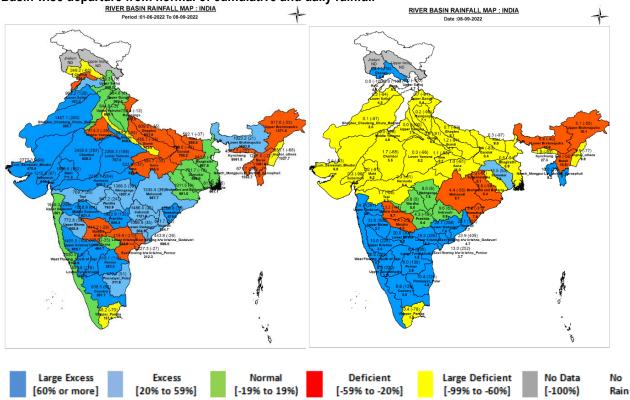


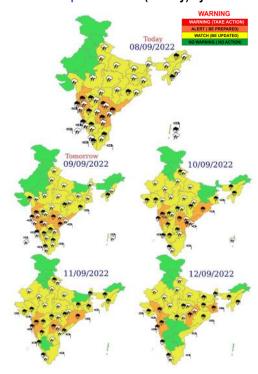
Central Water Commission Daily Flood Situation Report cum Advisories 08-09-2022

1.0 Rainfall Situation

1.1 Basin wise departure from normal of cumulative and daily rainfall



1.2 Rainfall forecast for next 5 days issued on 08th September 2022 (Midday) by IMD



- i) Isolated extremely heavy rainfall over Coastal Andhra Pradesh & Yanam on 09th September, 2022.
- ii) Isolated very heavy rainfall over Rayalaseema on 08th; Coastal Karnataka on 08th & 09th; North Interior Karnataka on 09th; Coastal Andhra Pradesh & Yanam & Telangana during 08th-10th; Odisha during 09th-11th; Chhattisgarh, Gangetic West Bengal and Gujarat Region on 12th and over Madhya Maharashtra and Konkan & Goa during 08th-12th September 2022.

2.0 Flood Situation and Advisories

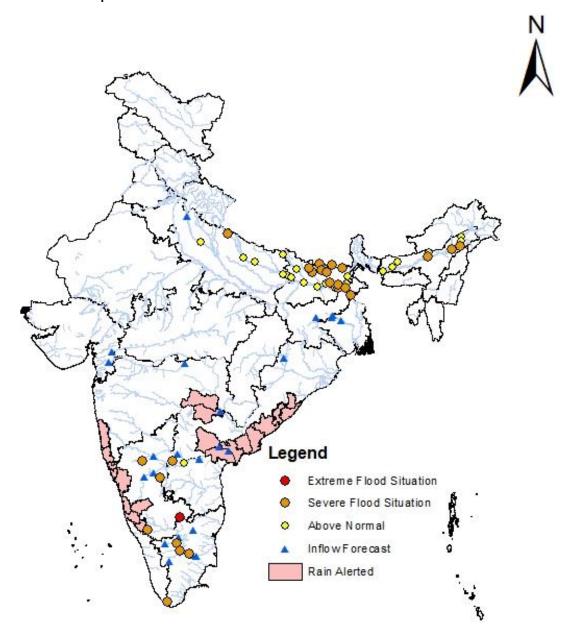
2.1 Summary of Flood Situation as per CWC Flood Forecasting Network

On 08th September 2022,16 stations (8 in Bihar, 3 in Assam, 2 in Tamilnadu and 1 each in Andhra Pradesh, Jharkhand & West Bengal) are flowing in Severe Flood Situation, 23 stations (11 in Bihar, 6 in Assam, 5 in Uttar Pradesh and 1 in Andhra Pradesh) are flowing in Above Normal Flood Situation. Inflow Forecast has been issued for 30 Barrages & Dams (8 in Karnataka, 6 in Tamilnadu, 4 in Andhra Pradesh, 3 each in Telangana, 2 in Gujarat and 1 each in Maharashtra, Odisha, Uttar Pradesh & West Bengal).

origai).						
PART - I: L	LEVEL FORECAST					
S.No.	S.No. Flood Situations					
Α	Extreme Flood Situation: (Site (s) where the previous Highest Flood Level (HFL) is exceeded or equalled)	0				
В	Severe Flood Situation: (Site (s) where water level is touching or exceeding the Danger Level but below Highest Flood Level (HFL))	16				
С	Above Normal Flood Situation: (Site (s) where water level is touching or exceeding the Warning Level but below Danger Level)	23				
	Total number of sites above Warning Level (A+B+C)	39				
PART - II:	PART - II: INFLOW FORECAST					
	iumber of sites for which inflow forecasts issued: Where Inflows are equal or exceed the specified Threshold Limit for a particular reservoir / barrage)					

Details are given at link: http://www.cwc.gov.in/sites/default/files/cfcrcwcdfb08-09-2022-1 3.pdf

2.1.1 Flood Situation Map



2.2 CWC Advisories

Karnataka

Alert for water level rise may be kept in west flowing rivers Sharavati, Chakranadi, Varahi, Sita, Yennehole, Netravathi and other small rivers in **Uttara Kannada**, **Udupi**, **Dakshin Kannada** districts and also in Krishna basin and its tributaries in **Belgaum**, **Gadag**, **Haveri**, **Shimoga and Chikmangalur** districts. The current flood situation in the state as per CWC data are as follows:

District	CWC Site	River	Flood Situation	Water level Trend
Chamarajanagar	Bendrahalli	Suvarnavathi (Cauvery)	Severe	Falling
Bagalkot	Cholachagudda	Malaprabha (Krishna)	Severe	Falling
Chitradurga	Hoovinahole	Swarnamukhi (Krishna)	Severe	Falling

Major dams with more than 90% storage is as listed below. It is requested to operate projects as per SOP and releases may be done after informing lower riparian areas.

Project	District
Hemavathi	Hassan
Krishna Raja Sagar	Mandya
Ghataprabha	Belgavi
Malaprabha	Belgavi
Almatti	Vijayapura
Kabini	Mysore
Bhadra	Chickmangalur
Tungabhadra	Vijayapura
Narayanapura	Yadgir
Lingamanakki	Shimoga
Harangi	Kodagu

Telangana

Alert for water level rise may be kept in Godavari basin rivers on 08.09.2022 for next 2 days. Alert for water level rise may be kept in **Mulugu, Kumaram Bheem, Adilabad, Nirmal, Mancherial, Nizamabad, Jagital, Karimnagar, Peddapalle, Rajanna Sircilla** districts. All major/medium dams with high storages may be operated as per SOP and releases may be done after informing lower riparian areas.

Andhra Pradesh

Keep alert for water level rise in rivers Nagavalli, Vamsadhara, Godavari, Krishna, Pennar and other small rivers in **Srikakulam**, **Vizianagaram**, **Vishakhapatnam**, **E. Godavari**, **W. Godavari**, **Krishna**, **Guntur**, **YSR Kadapa**, **Prakasam**, **Ananthapuramu** districts. All major/medium dams with high storages may be operated as per SOP and releases may be done after informing lower riparian areas. Severe flood situation in the state as per CWC network is as follows:

District	CWC Site	River	Flood Situation	Water level Trend
Kurnool	Mantralayam	Tungabhadra	Severe	Rising

Maharashtra

Keep alert for water level rise in rivers Bhima and upper Krishna in **Pune and Satara** districts. Keep alert for rivers of Konkan region districts such as Vashisti, Terekhol, Tillari, Gad, Amba, Bav, Savitri, Kal, Bogeshwari and other small rivers in the said region in **Raigad, Ratnagiri and Sindhudurg** districts. Many of the dams in **Pune** district such as Bhama Askhed, Dimbhe, Chaskaman, Gunjawani, Nira Deoghar, Bhatghar, Panshet, Warasgaon, Pawana, Temghar, **Satara** district dams such as Dhom, Urmodi, Tareli, Dhom Balkawadi, Kanner and Koyna, and Tillari dam of **Sindhudurg** district have more than 80% storage. Hence projects may be operated as per SOP and releases may be done after informing lower riparian areas.

Tamil Nadu

The current flood situation in the state as per CWC data are as follows:

District	CWC Site	River	Flood Situation	Water level Trend
Krishnagiri	Singasadanapalli	Ponnaiyar	Extreme	Falling
Erode	Kodumudi	Cauvery	Severe	Steady
Erode	Urachikottai	Cauvery	Severe	Falling
Thiruchirapalli	Musiri	Cauvery	Severe	Steady
Kanyakumari	Thiruvarambu	Kodaiyar	Above Normal	Falling
Thiruchirapalli	Thandalaiputhur	Ayyar (Cauvery)	Above Normal	Steady
Salem	Thevur	Sarabenga (Cauvery)	Above Normal	Steady
Dharmapuri	Hogenakkal	Chinnar (Cauvery)	Above Normal	Falling
Kanyakumari	Kuzhuthurai	Thambraparni	Above Normal	Rising

Bihar

Due to propagation of flood wave mainly from Yamuna and southern tributaries of Ganga, Ganga main stem is in severe flood situation. Flood situation is expected to recede slowly in main Ganga stem in 2 to 3 days if no runoff further reaches from northern and southern tributaries. Northern tributaries of Ganga in the state such as Kosi, Bagmati, Kamalabalan, Parman and Gandak are also in severe flood situations. The details flood situation existing as per CWC network is as given below:

District	CWC Site	River	Flood Situation	Water level Trend
Bhagalpur	Azmabad	Ganga	Severe	Falling
Bhagalpur	Kahalgaon	Ganga	Severe	Falling
Supaul	Birpur	Kosi	Severe	Rising
Supaul	Basua	Kosi	Severe	Rising
Khagaria	Baltara	Kosi	Severe	Falling
Kathihar	Kursela	Kosi	Severe	Falling
Muzzafarpur	Runisaidpur	Bagmati	Severe	Falling
Muzaffarpur	Benibad	Bagmati	Severe	Steady
Madhubani	Jhanjharpur	Kamalabalan	Severe	Steady
Araria	Araria	Parman	Severe	Steady

Jharkhand

Due to propagation of flood wave mainly from Yamuna and southern tributaries of Ganga, Ganga main stem is in severe flood situation with receding trend. The details flood situation existing as per CWC network is as given below:

Distr	ict CWC Site	River	Flood Situation	Water level Trend
Sahibo	ganj Sahibganj	Ganga	Severe	Falling

West Bengal

Due to draining out of runoff of river Yamuna, southern and northern tributaries of Ganga, Lower Ganga basin in **Murshirabad** is in severe flood situation with falling conditions. The flood situation in the state as per CWC data is as follows:

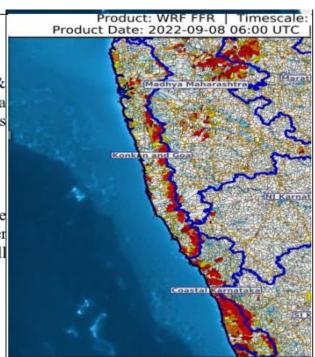
District	CWC Site	River	Flood Situation	Water level Trend
Murshirabad	Farakka	Ganga	Severe	Falling
Murshirabad	Biswanathpur	Padma (Ganga basin)	Above Normal	Falling

2.3 Flash Flood Guidance

24 hours Outlook for the Flash Flood Risk (FFR) till 1130 IST of 09.09.2022:

Moderate flash flood risk over Konkan & Goa, Coastal Karnataka, Madhya Maharashtra and adjoining Marathawada Met Sub-divisions likely in next 24 hours.

Surface runoff/ Inundation may occur at some fully saturated soils & low-lying areas over AoC as shown in map due to expected rainfall occurrence in next 24 hours.



3.0 Advisory Flood Forecast for next 5-days

The flood situation at Flood Forecasting Stations likely to be above warning level for next 5 days:

S.No.	Station	River	District	State	09-09-2022	10-09-2022	11-09-2022	12-09-2022	13-09-2022
1	BHANDARA	WAINGANGA	BHANDARA	Maharashtra	N	S	S	S	S
2	DOWLAISWARAM	GODAVARI	EAST GODAVARI	ANDHRA PRADESH	AN	AN	AN	S	S
3	BALTARA	KOSI	Khagaria	Bihar	S	S	S	S	S
4	BASUA	KOSI	Supaul	Bihar	S	S	S	S	S
5	BENIBAD	BAGMATI	Muzaffarpur	Bihar	S	S	S	S	S
6	JHANJHARPUR	KAMLA	Madhubani	Bihar	S	S	AN	AN	AN
7	KAHALGAON	GANGA	Bhagalpur	Bihar	S	S	AN	AN	AN
8	KURSELA	KOSI	Katihar	Bihar	S	S	S	AN	AN
9	SAHIBGANJ	GANGA	Sahibganj	Jharkhand	S	S	AN	AN	AN
10	TURTIPAR	GHAGARA	Ballia	Uttar Pradesh	AN	S	AN	AN	AN
11	DUMARIAGHAT	GANDAK	Gopalganj	Bihar	S	S	S	S	AN
12	RUNISAIDPUR	BAGMATI	MUZAFFARPUR	Bihar	S	S	S	S	S
13	FARAKKA_BG	GANGA	Murshidabad	West Bengal	S	S	S	S	S
14	KHOWANG	BURIDEHING	Dibrugarh	Assam	AN	N	N	N	S
15	NANGLAMORAGHAT	DESANG	Sivasagar	Assam	S	AN	AN	AN	S
16	NEAMATIGHAT	BHRAMPUTRA	Jorhat	Assam	S	S	S	S	S
17	NUMALIGARH	DHANSARI	Golaghat	Assam	N	N	N	AN	S
18	SHIVSAGAR	DIKHOW	Shivsagar	Assam	N	N	N	AN	S
19	TEZPUR	BHRAMPUTRA	Sonitpur	Assam	S	AN	AN	AN	AN
20	KODUMUDI	CAUVERY	Erode	Tamil Nadu	S	S	AN	AN	AN
21	MUSIRI	CAUVERY	Tiruchirappalli	Tamil Nadu	S	S	S	AN	AN
22	NELLORE	PENNAR	Sri Potti Sriramulu Nellore	Andhra Pradesh	S	S	S	S	S
23	AKHUAPADA	BAITRANI	BHADRAK	Odisha	N	N	N	S	S
24	MANDLA	NARMADA	Mandla	Madhya Pradesh	N	N	N	N	S
25	KASHINAGAR	VAMSADHARA	GAJAPATI	Odisha	N	S	S	AN	N
26	MANTRALAYAM	TUNGABHADRA	KurnoolÃ,Â	Andhra Pradesh	S	S	S	AN	AN
27	KOPERGAON	GODAVARI	AHMEDNAGAR	MAHARASHTRA	N	N	N	AN	N
28	AYODHYA	GHAGRA	AYODHYA	Uttar Pradesh	AN	AN	AN	AN	N
29	BHAGALPUR	GANGA	Bhagalpur	Bihar	AN	AN	N	N	N
30	DARAULI	GHAGRA	Siwan	Bihar	AN	AN	AN	AN	AN
31	DHENGRAGHAT	MAHANANDA	Purnia	Bihar	AN	AN	AN	AN	AN

32	ELGINBRIDGE	GHAGRA	BARABANKI	Uttar Pradesh	AN	AN	N	N	AN
33	GANGPUR_SISWAN	GHAGRA	Siwan	Bihar	AN	AN	AN	AN	AN
34	HATHIDAH	GANGA	Patna	Bihar	AN	AN	AN	AN	AN
35	JHAWA	MAHANANDA	Katihar	Bihar	AN	AN	N	N	N
36	KACHHLABRIDGE	GANGA	Budaun	Uttar Pradesh	AN	AN	N	N	N
37	KAMTAUL	ADHWARA	Darbhanga	Bihar	AN	N	N	N	N
38	KHAGARIA	BURHI GANDAK	Khagaria	Bihar	AN	AN	AN	AN	AN
39	PATNAGANDHIGHAT	GANGA	Patna	Bihar	AN	AN	N	N	N
40	REWAGHAT	GANDAK	MUZAFFARPUR	Bihar	N	AN	AN	AN	AN
41	DHENG_BRIDGE	BAGMATI	Sitamarhi	Bihar	AN	AN	AN	AN	AN
42	JAINAGAR	KAMLA	Madhubani	Bihar	AN	AN	AN	AN	AN
43	BEKI_NH_CROSSING	BEKI	Barpeta	Assam	AN	AN	AN	AN	AN
44	DIBRUGARH	BHRAMPUTRA	Dibrugarh	Assam	AN	AN	AN	AN	AN
45	GOALPARA	BHRAMPUTRA	Goalpara	Assam	AN	AN	AN	AN	AN
46	GUWAHATI	BHRAMPUTRA	Kamrup Metropolitan	Assam	AN	AN	N	N	N
47	JIABHARALI_NT_X	JAIBHARALI	Sonitpur	Assam	AN	AN	AN	AN	AN
48	DHUBRI	BHRAMPUTRA	Dhubri	Assam	AN	AN	AN	AN	AN
49	ANNA_PURNA_GHAT	BARAK	Cachar	Assam	N	N	N	N	AN
50	MATIZURI	KATAKHAL	Hailakandi	Assam	N	N	N	N	AN
51	NH_BRG_KURNOOL	TUNGABHADRA	Kurnool	Andhra Pradesh	AN	AN	AN	N	N
52	ARARIA	PARMAN	Araria	Bihar	AN	AN	N	N	AN

Abbreviation: N: Normal Flood Situation, AN: Above Normal Flood Situation, S: Severe Flood Situation, E: Extreme Flood Situation

For more details, please visit https://ffs.india-water.gov.in/ for flood oftdation, St. Severe F

4.0 Storage Position in Dams where Inflow forecast is being issued by CWC as on 08th September 2022

Storage above 85%
Storage above 60%



#	Reservoir/Dams	River/Sub-Basin /Basin	State	US/ DS District	Rainfall situation				
					Day 1 Day 2 Day		Day 3	Day 4	Day 5
1	Pulichinthala	Krishna/Lower Krishna/ Krishna	AP	Nalgonda(Tel)/Guntoor,Krishna (AP)					
2	Srisailam	Krishna/Lower Krishna/Krishna	AP	JogulambaGadwal(Telangana), Kurnool(AP)/ Nalgonda(Telangana), Guntoor (AP)					
3	Somasila	Pennar/Lower Pennar/Pennar	AP	Kadapa(AP)/Nellore(AP)					
4	Madduvalasa	Nagavalli/Nagavalli/EFR Mahanadi & Godavari	AP	Vizianagaram(AP)/Srikakulam(AP)					
5	Musi	Musi/Lower Krishna/ Krishna	Tel	Nalgonda					
6	Sriramasagar	Godavari/Middle Godavari/Godavari	Tel	Nanded (Mah), Nirmal(Telangana)/Metpally, Mancherial(Telangana)					
7	SripadaYellampally	Godavari/Middle Godavari/Godavari	Tel	Mancherial/JaishankarBhupalpally					
8	Kaddam Dam	Kaddam/Middle Godavari/Godavari	Tel	Adilabad,Nirmal/Mancherial					
9	Singur	Manjira/Manjira/Godavari	Tel	Bidar(Kar)/Sangareddy(Telangana)					
10	Nizamsagar	Manjira/Manjira/Godavari	Tel	Medak/Kamareddy					
11	PD Jurala	Krishna/Middle Krishna/Krishna	Tel	Raichur (Kar)/JogalambaGadwal(Telangana)					
12	Ukai	Tapi/Tapi/Tapi	Guj	Nadurbar(Mah), Tapi(Guj)/ Surat (Guj)					
13	Narayanpur	Krishna/Upper Krishna/Krishna	Kar	Bagalkot, Vijayapura/ Raichur, Yaadgir					
14	Harangi	Cauvery/Upper Cauvery/Cauvery	Kar	Kodagu/Mandya					
15	Hemavathy	Hemavathy/ Hemavathy/Cauvery	Kar	Hassan, Kodagu/Mandya, Mysore					
16	Karanja	Karanja/Manjira/Godavari	Kar	Bidar (Kar), Vikarabad(Telangana)/Bidar(Kar)					
17	Tungabhadra	Tungabhadra/Middle Tungabhadra/Krishna	Kar	Gadag/Bellary, Koppal, Raichur					
18	Kabini	Kabini/Kabini/Cauvery	Kar	Wayanad (Ker)/Mysuru(Kar)					
19	Bhadra	Bhadra/UpperTungabhadra/Krishna	Kar	Chikmagaluru/Shimoga					
20	KRS	Cauvery/Middle Cauvery/Cauvery	Kar	Mandya, Mysore					
21	Malaprabha	Malaprabha/Malaprabha/Krishna	Kar	Belgaum					
22	Hidkal	Ghataprabha/Ghataprabha/Krishna	Kar	Kolhapur (Mah)/ Belgaum (Kar)					
23	Almatti	Krishna/Upper Krishna/Krishna	Kar	Kolhapur(Maharashtra)/ Bagalkote(Karnataka)					
24	Idukki	Periyar/Upper Periyar/West flowing rivers from Tadri to Kanyakumari	Kerala	Theni (Tamil Nadu), Ernakulam					
25	Edamalayar	Edamalayar/Middle Periyar/West flowing rivers from Tadri to Kanyakumari	Kerala	Coimbatore (Tamil Nadu)					
26	Koyna	Koyna/Upper Krishna/Krishna	Mah	Satara/Kolhapur, Sangli					
27	Warana	Warna river/Upper Krishna/Krishna	Mah	Sangli,Kolhapur Sangli,Kolhapur					
28	Veer	Nira/Upper Bhima/Krishna	Mah	Pune, Satara					
2 9	Ujjani	Bhima/Upper Bhima/Krishna	Mah	Pune, Solapur					
30	Yeldari	Purna/Purna/Godavari	Mah	Hingoli, Parbhani/Nanded					
31	Upper Wardha	Wardha/Wardha/Godavari	Mah	Wardha, Amravati					
32	Issapur	Kayadhu/Penganga/Godavari	Mah	Hingoli, Yavatmal					
33	Totladoh	Pench/Wainganga/Godavari	Mah	Chindwara(MP)/Nagpur(Mah)					
34	Jaikwadi	Godavari/Upper Godavari/Godavari	Mah	Aurangabad, Ahmadnagar/Bid, Jalna					
35	Mula	Mula/Upper Godavari/Godavari	Mah	Ahmadnagar					
36	Manjlegaon	Sindphana/Middle Godavari/Godavari	Mah	Beed/Parbhani					
37	Hathnur Dam	Hatnur/Upper Tapi/Tapi	Mah	Burhanpur (MP)/Jalgaon(Mah)					
38	Salandi	Salandi/Brahmani and Baitarni/Brahmani and Baitarni	Odisha	Mayurbhanj,Kendujhar/Bhadrak					
39	Rengali	Brahmani River/Brahmani and Baitarni/Brahmani and Baitarni	Odisha	Deogarh/Angul, Dhenkanal					

40	Upper Indravathi	Indravati/Indravati/Godavari	Odisha	Kalahandi, Nabarangpur, Koraput/Norangpur(Odisha), Bastra(Chsgrh)			
41	Hirakud Dam	Mahanadi River/Upper Mahanadi/Mahanadi	Odisha	JanjgirChampa, Raigarh(Chsgrh), Jharsuguda, Bargarh,			
41	nii akuu Daiii	Wananau Kivery Opper Wananau Wananau	Ouisiia	Sambalpur(Odisha)/Subarnapur, Baudh, Anugul (Odisha)			
42	Bango	Hasdeo/Upper Mahanadi/Mahanadi	Chhattis	Gurguja/Korea, Korba			
43	Ravi Shankar	Mahanadhi/Upper Mahanadi/Mahanadi	Chhatt	Kanker/Gariaband			
44	Bhavanisagar	Bhavani/Middle Cauvery/Cauvery	TN	Palakad (Kerala), Nilgiri(TN), Coimbatore (TN)/ Erode (TN)			
45	Mettur	Cauvery/Middle Cauvery/Cauvery	TN	Dharmapuri, Salem/Erode, Namakkal			
46	Vaigai	Vaigai/Upper Vaigai/East flowing rivers South of Cauvery Basin	TN	Theni/Madurai			
47	Sathanur Dam	Ponnaiar/Middle South Pennar/East flowing rivers between Pennar and Cauvery Basin	TN	Dharmapuri, Tiruvannamalai/Villupuram, Cuddalore			
48	SomKamlaAmba	Som/Mahi B/Mahi	Raj	Udaipur/Dungarpur			
49	RanaPratapSagar	Chambal/Upper Chambal/Ganga	Raj	Neemuch(MP)/Dholpur, Kota, Bundi(Raj)			
50	Gudha	Mejchambal/Upper Chambal/Ganga	Raj	Bhilwara/Bundi			
51	Parwati	Parbati/ Kalisindh/Upper Chambal	Raj	Baran (Raj)/Baran (Raj), Kota (Raj), Sheopur (MP)			
52	MahiBajajsagar	Mahi/Upper Mahi/Mahi Basin	Raj	Ratlam(MP)/Banswara, Pratapgarh, Dungapur (Raj)			
53	Gambhiri	Gambhiri/Upper Chambal/Ganga	Raj	Chittorgarh			
54	Bisalpur	Banas/Upper Chambal/Ganga	Raj	Bhilwara/Tonk			
55	Panchana	Gambhiri/Upper Chambal/Ganga	Raj	Karauli			
56	Gandhisagar	Chambal/Upper Chambal/Ganga	MP	Mandsaur,Neemuch(MP)/Dholpur(Raj)			
57	Tawa	Tawa/Middle Narmada/Narmada	MP	Betul, Hoshnabad/Sehore			
58	Rajghat	Betwa/Betwa/Ganga	MP	Ashoknagar(MP), Lalitpur(UP)/Shivpuri, Lalitpur(UP)			
59	Barna	Barna/Middle Narmada/Narmada	MP	Raisen/Hoshangabad,Narsinghpur			
60	Indira Sagar	Narmada/Narmada b/w Hosangabad to SSP/Narmada	MP	Harda, Dewas, Khandwa/Khargone			
61	Upper Wainganga	Wainganga/Wainganga/Godavari	MP	Seoni/Balaghat			
62	Bargi	Narmada/Upper Narmada/Narmada	MP	Mandla, Seoni/Jabalpur, Narsimhapur			
63	Bansagar	Sone/Sone/Ganga	MP	Katni, Umaria, Shahdol, Satna/ Rewa, Sidhi			
64	SardarSarovar	Narmada/Narmada b/w Hosangabad to SSP/Narmada	Guj	Narmada(Guj), Nadurbar(MP)/Narmada, Vadodra, Bharuch (Guj)			
65	Kadana	Mahi/Middle Mahi/Mahi Basin	Guj	Banswara (Raj)/Mahisagar,Panchmahals(Guj)			
66	Dharoi	Sabarmati /Middle Sabarmati/Sabarmati Basin	Guj	Sabarkantha/Mehsana (Guj)			
67	Dantiwada	Banas/Banas A/West Flowing Rivers of Kutch and Saurashtra including Luni	Guj	Sirohi (Raj), Banaskanta(Guj)/Patan(Guj)			
68	Madhuban	Damanganga/Damanganga/West Flowing Rivers from Tapi to Tadri	Guj	Valsad (Guj)/Selvasa (UT of DNH)			
69	Tenughat	Damodar/LowerGanga/Ganga	Jharkhand	Ramgarh(Jhar)/BokaroJhar)			

Note- Based on above information, Project Authority may regulate the reservoirs as per standard operating manuals/ rule levels to avoid downstream flooding and upstream submergence.