Letter No.- 23 NGT(1)/24-27-Irrigation-4-CN- 1751788

From,

Dr. Arvind Kumar Chaurasia,
Special Secretary,
Irrigation and Water Resources Department,
Government of Uttar Pradesh.

To,

The Registrar,
Hon'ble National Green Tribunal,
Copernicus Marg, New Delhi.

Irrigation and Water Resources
Department Section-4

Lucknow. Dated-07 -07-2024

Sub:- Compliance report on behalf of State of U.P. in compliance to the order dated 27-5-2024 passed by Hon'ble National Green Tribunal in O.A.515/2023 Ganga Polution Vs State of U.P and others.

Sir,

That in pursuance to the order dated 27-5-2024 passed in O.A. No 515/2023 Ganga Polution Vs State of U.P.&Ors., the Compliance Report on behalf of State of Uttar Pradesh is annexed and file herewith.

It is requested that the same may be placed before the Hon'ble Tribunal for kind perusal and consideration.

Encl:- As above.

Your Sincerely,

(Dr. Arvind Kumar Chaurasia),
Special Secretary,

Copy to:.- Sri Bhavanar Singh Jadoun Standing Counsel Govt. of Uttar Pradesh, Hon'ble National Green Tribunal, New Delhi.

By Order ,

(Amit Pranav)
Joint Secretary

BEFORE THE HON' BLE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI
O.A. NO. 515 OF 2023

IN THE MATTER OF :

GANGA POLLUTION ..... **APPLICANTS**

VERSUS

STATE OF UP & ORS. .....**RESPONDENTS**

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(Amit Pranav)
Joint Secretary

COMPREHENSIVE REPORT/RESPONSE ON BEHALF OF THE STATE OF UTTAR PRADESH IN COMPLIANCE OF ORDER DATED 27.05.2024 PASSED BY HON'BLE THE NATIONAL GREEN TRIBUNAL IN O.A.NO.515/2023 GANGA POLLUTION VS STATE OF U.P AND OTHERS.

NGT order ref. no.	Query raised by NGT	Reply
1.	In these matters, at this stage Tribunal is considering the issue of demarcation of floodplain zone of river Ganga and its tributaries in the state of UP and action by the concerned authorities to protect the floodplain zone.	No comments.
2.	In the previous order dated 15-03-2024, Tribunal had taken note of the relevant provisions of the river Ganga (Rejuvenation, Protection and Management) Authorities order, 2016 specially Clause 3(l) defining floodplain, 3(c) buffer area, Clause 4(ix) restriction relating to construction in floodplain, Clause 55 relating to the responsibility of District Ganga Committee, Clause 24 relating to State Ganga Committee and Clause 41 relating to National Mission for Clean Ganga. After noting the aforesaid provisions, Tribunal had noted that responsibility to determine the floodplain zone primarily lies at the first instance with the authorities and thereafter action to be taken for protection of the floodplain zone.	Consideration of mentioned clause of various committee's E.g. NMCG, State Ganga committee etc. is made. Delineation & Demarcation of **FPZ** is under progress.
3	Learned counsel for the state had informed that entire stretch from Bijnor to Ballia was divided in two parts in respect of phase-I from Bijnor to Unnao. Study in respect of ascertainment of floodplain was completed by central water commission (CWC). He is directed to place the details of the same on record.	Report of phase I is enclosed **(ANNEXURE-1)**
	So far as the second phase from Unnao to Ballia is concerned,	In order of O.A. No. 200/2014 dated-24.07.2017, **(ANNEXURE-2)** the

	responsibility has been entrusted to the National institute of Hydrology, (NIH), Roorkee.	Hon'ble NGT had made responsible Central Govt. & State Govt. for the minimum flow of the river Ganga and delineation of the flood plain of the river. In compliance of order, Chief Engineer (Water Resources) vide letter No. C-182/दिनांक- 18.10.2019 **(ANNEXURE-3)** requested to Chief Engineer CWC Lucknow to identify flood plain zone. To demarcate flood plain, again a letter was sent to CWC vide letter No. 17/मु0अ0(ज0सं0)/अनिमं-1/अनिखं-3, दिनांक-10.01.2020**(ANNEXURE-4)** **to demarcate flood plain zone** but CWC informed vide letter no.-उ0गं0बे0सं0/G33/2020-21/1778-79 dt. 29.07.2020 **(ANNEXURE-5)** and suggested that State government may arrange for requisite training for this specificwork on their own based on report of flood Plain demarcation for river Ganga from Haridwar to Unnao. CWC will provide necessary technical support, it required, to the state government officials for carrying out the above mentioned study. The work of delineation and demarcation of Flood Plain zone (FPZ) is to be done by the Irrigation and Water Resource Department with assistance of National Institute of Hydrology (NIH), Roorkee, for carrying out the modelling for demarcation of flood plain zoning.As NIH has already carried out FPZ study for two stretches in Uttrakhand. National Institute of Hydrology (NIH), Roorkee, is a premier Research and Development organisation in the area of hydrology under ministry of Jal Shakti, Govt. of India. **(ANNEXURE-6)**
4		
	Learned counsel for the state had orally submitted that state authorities are demarcating the floodplain Zone in the stretch concerned with the assistance of NIH. Same is the stand taken in the report but in the report dated 24. 05.2024 filed by state of UP in compliance of the order dated	This is to mention that in para 142 of the direction issued on 13.07.2017 by Hon'ble NGT in O.A. no 200/2014: **(ANNEXURE-7) is as follows**

5.	15.03.2024 but Memorandum of Agreement between NIH and Irrigation and water Resource Department dated 22.12.2023, Annexure-R-2 to report mentions the scope of work as under:- "The scope of the proposed work includes: a. Identify and demarcate the flood plains of river Ganga in segment B of phase-II on one in twenty-five year's cycle or appropriately. b.Indentify no development/construction Zone. regulatory Zone and the activities that can be/ cannot be carried on the regulatory Zone of the flood plain."	"It is required to categorize it into different zones, namely, No Development Zone, Regulated Zone and a Free Zone for development." This is to mention that in the para 182.3 of O.A. no 200/2014Hon'ble NGT has issued direction on 13.07.2017**(ANNEXURE-7)**which is as follows: **"We direct and constitute a Special Committee consisting of representatives from MoWR, Senior Officer from Department of Irrigation, State of Uttar Pradesh, Revenue Department of Uttar Pradesh and Central Water Commission which shall identify and demarcate the floodplains of river Ganga in Segment B of Phase-I on one in twenty five years cycle."** With reference to the aforesaid, Ministry of Water resources, River Development **&Ganga Rejuvenation** constituted a special committee vide OM T-12/2017-18/268/NMCG date 01 August 2017 with the following scope: **(ANNEXURE-8)** a) Identify and demarcate the flood plains of river Ganga in segment B of phase-I on one in 25 year's cycle appropriately b) Identify no development/ construction zone, regulatory zone, and the activities that can be/ can't be carried on in the regulatory zone of the flood plain.

		The Reports of Committee is enclosed **(ANNEXURE-9)**
6.	Scope of work reveals that NIH has been entrusted with the responsibility of identification and demarcation of floodplains of river Ganga in the stretch concerned. Hence, the stand which has been taken in the report and the oral submission of counsel for state in this regard runs counter to the contents of the agreement.	The work of delineation and demarcation of Flood Plain zone (FPZ) is to be done by the Irrigation and Water Resource Department with assistance of National Institute of Hydrology (NIH), Roorkee, for carrying out the modelling for demarcation of flood plain zoning. National Institute of Hydrology (NIH), Roorkee, is a premier Research and Development organisation in the area of hydrology under ministry of Jal Shakti, Govt. of India. As per the MoA between NIH and Irrigation and water Resource Department dated 22.12.2023. **(ANNEXURE-10)** The work of demarcation will be finalised by Irrigation and water resources department, U.P. on and before 22.12.2024.
7.	Report dated 24.05.2024 also mentions that under the heading methodology the state has divided the floodplain zone in three parts as under: Û Prohibited zone: recurrence interval of 5 year. Û Regulatory zone: 25 year return period flood. Û Warning zone: 100-year return period flood.	The methodology adopted in flood plain zone delineation from Unnao to Ballia is based on the final report submitted by Central Water Commission on the study to identify and demarcate the flood plain zones of river Ganga in respect of the phase-I, segment 'B' of river Ganga (Haridwar to Unnao).
	The state has adopted the criteria of interval of five years, twenty-five years and hundred years for these three zones whereas the Ganga Rejuvenation Order in clause 3(I) clearly provides for the floodplain on the basis of frequency once in 100 years. Ganga Rejuvenation Order does not mention about any such three types of zones which have been mentioned as Prohibited Zone, Regulatory Zone and Warning Zone in	The judgement passed by Hon'ble NGT in O.A No. 200 of 2014- M.C. Mehta vs Union of India &Ors) on 13 july 2017 **(ANNEXURE-7)** in respect of Phase-I, segment 'B' of River Ganga (Haridwar to Unnao), is as under Demarcation of flood plain and connected directions. 182.3 we pass the following directions for compliance: 1. We direct and constitute a special committee consisting

		the report. Hence, it appear that State authorities are not strictly following the Ganga Rejuvenation Order 2016.	of representatives from MoWR, Senior officer from department of Irrigation, State of Uttar Pradesh, Revenue department of Uttar Pradesh and Central Water Commission which shall identify and demarcate the floodplains of river Ganga in Segment B of Phase-I on one in 25 years cycle." With reference to the aforesaid, Ministry of Water resources, River Development **&Ganga Rejuvenation** constituted a special committee vide OM T-12/2017-18/268/NMCG dated 01 August 2017 with the following scope: **(ANNEXURE-8)** a) Identify and demarcate the flood plains of river Ganga in segment B of phase-I on one in 25 year cycle appropriately b) Identify no development/construction zone, regulatory zone, and the activities that can be/ can't be carried on in the regulatory zone of the flood plain.
	8.		In ongoing demarcation work, the department is working on the following three zones(As per the draft Technical Guidelines of Flood Plain Zoning 2023 by Central Water Commission: **(ANNEXURE-11)** (i) Prohibited zone with recurrence interval of 5 years (ii) Regulatory zone with recurrence interval of 25 years (iii) Warning zone with recurrence interval of 100 years Earlier NGT (para 182.3 of the direction issued on 13.07.2017) has directed to identify & demarcate the flood plains of river Ganga in Segment-B of Phase-I on one in 25 years cycle. In compliance of order of NGT Ministry of Water Resources, River Development & Ganga Rejuvenation constituted a special committee and department

		demarcated flood plain on one in 25 year's cycle. Ministry of water resources, river development and Ganga rejuvenation notification dated 07-Oct.2016 mentioned in para 3(l) that "flood plain means such area of river ganga or its tributaries which comes under water on either side of it due to floods corresponding to its greatest flow or with a flood of frequency once in Hundred year" **In order to incorporate all three guidelines, 5th meeting was conducted with NIH on 22.05.2024 and decided to present water surface (Elevation of design flood) of 5, 25 & 100 years return period flood. (ANNEXURE-12)Department is committed to demarcate flood plain as per provision of Ganga Rejuvenation Order (clause 3(l)).**
9.	We also take note of the fact that in respect of the stretch of Yamuna River at GautamBudh Nagar and Greater Noida in OA No. 275/2023, exercise for demarcation of floodplain zone has been undertaken on the basis of the map obtained from Survey of India with 01 m contour interval. Therefore, State authorities may consider as to why the same approach cannot be adopted for demarcating the flood plain zone of river Ganga in the stretch under consideration.	In the present study following data are being used: a. Long term Annual maximum discharge series b. Hourly stage/discharge data for selected event c. River cross section data d. Structures, bridges, barrage and embankments e. Flood inundation extent from satellite data f. Flood extent based on water recurrence using satellite data Along with above LiDAR DEM (Digital Elevation Model) with 1 m resolution is used with the correction of river profile below the water surface based on available cross section. LiDAR data was provided by the CWC. The survey was conducted under National Hydrology Project (NHP) by Survey of India. These are much accurate

		and precise data than map from Survey of India with 01 m contour interval data. DEM fulfils the same purpose as map from Survey of India with 01 m contour interval. The above data set is being used for carrying out hydrodynamic modelling for flood plain zoning. Using the corrected DEM and the outputs of flood frequency analysis, the hydrodynamic Model Coupled 1-D & 2D of full 2D will be setup using HEC-RAS or MIKE Flood under Hydraulic Modelling. Therefore, hybrid approach (flood frequency analysis and satellite data analysis) will combine both the results by taking union of the areas obtained from both the results.
10	Learned counsel appearing for state of UP has submitted that NIH will be able to submit the interim report by October 2024 and completion of work defined in the Agreement date 22-12-2023 will be completed by December 2024.	Interim report will be submitted up to October 2024 by NIH to irrigation & water resource department, U.P. for suggestions, modification and verification, which then incorporated to get final report submission by December 2024.
11.	Work of demarcation of floodplain zone is required to be expedited and the authorities are required to complete the same in the shortest possible manner as delay in this regard is affecting the rights of many of the parties.	DEM and cross sectional data is being processed by NIH for demarcation work to get concluded. The Flood Plain Zoning is in process. NIH is collecting & processing the data in order to fix Co-ordinates of Flood Plain Zones. Cross sectional data is made available by Irrigation Department, U.P. also.
12.	Learned Counsel appearing for respondent no.26 in item number 16 (OA No. 515/2023) has submitted that the delay in work of demarcation of floodplain zone is adversely effecting it because certain development on the land purchased by respondent no. 26 is required to be carried out but on	The delineation and demarcation of FPZ will be finalised by December 2024.

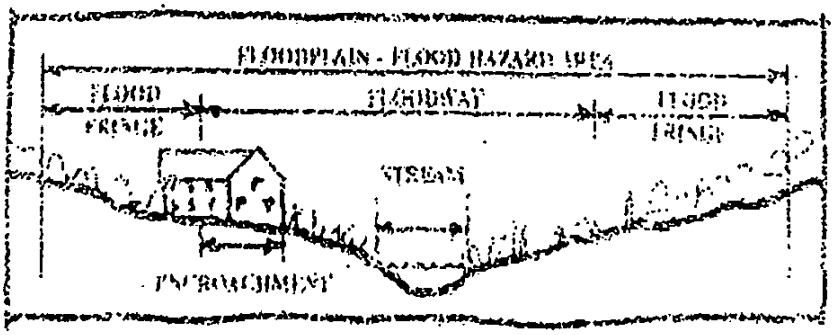
	account of uncertainty, work has been held up since long.	
13.	In view of the observations made above, we direct the Principal Secretary, Irrigation Department, State of UP to file a fresh report at least one week before the next date of hearing by e-mail at judicial-ngt@gov.in preferably in the form of searchable PDF/ OCR Support PDF and not in the form of Image PDF.	Compliance will be done.
14.	Having regard to the nature of matter, we also direct Additional Chief Secretary (ACS)/Principal Secretary, Irrigation Department, State of UP to remain virtually present on next date of hearing to assist the Tribunal.	It will be complied.
15.	We also deem it proper to implead the following as respondents in the matter:- i. Central Water Commission (CWC) through its Chairman. ii. National Mission for Clean Ganga (NMCG) through its Chairman.	No comments.
16.	Let notice be issued to above newly added respondents for filing their response at least one week before the next date of hearing.	No comments.
17	Learned Counsel for some of the parties have also stated that IAs filed by them in the writ petition before the High Court are still pending. They are required to provide numbers of pending IAs so that they can be listed for consideration before the Tribunal.	No comments.
18	A copy of this order be sent to Additional chief Secretary (ACS)/Principal secretary, Department, State of UP by email for compliance.	No comments.

Signed by (Anil Garg)
Anil Garg Principal Secretary
Date: 05-07-2024 19:07:33

Annexure-01

Final Report

STUDY TO IDENTIFY AND DEMARCATE THE FLOOD PLAINS OF RIVER GANGA IN SEGMENT B OF PHASE I (HARIDWAR TO UNNAO)



Ministry of Jal Shakti

Department of Water resources, River development & Ganga Rejuvenation

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1. INTRODUCTION

Floods constitute one of the major national calamities faced by India almost every year resulting in substantial loss of life, large scale damage to property, disruption of community lifelines besides entailing untold misery to the millions Concerted efforts have been made over the years to reduce the damage due to floods and mitigate the sufferings of the people Various structural flood control measures were taken up in the past including construction of reservoirs, embankments, drainage channels, etc. It is, however, now realised that absolute and permanent protection to all flood prone areas and for all magnitudes of floods by structural measures alone is not only impossible but also not economically viable. The emphasis has therefore been rightly shifted to non-structural measures like Flood Plain Zoning and Regulation, Flood Forecasting, etc., to effectively supplement the structural measures for providing sustainable protection to flood affected areas.

The broad concept in flood plain zoning is to regulate the land use in order to mitigate the damage potential. The role of flood plains and need for flood plain zoning was recognised by the Central Water Commission (CWC) as early as 1975. CWC had prepared a Model Floodplain Zoning Bill for adaptation by states but it did not receive due attention of states.

1.1 BACKGROUND

In pursuance to the directions contained in the judgment passed by Hon'ble NGT on 13th July 2017 in respect of Phase-I, Segment 'B' of River Ganga (Haridwar to Unnao), Ministry of Water resources, River development & Ganga Rejuvenation constituted a special committee vide OM T-12/2017-18/268/NMCG dated 01 August 2017 (copy enclosed as Annexure-1) with following scope:

a) Identify and demarcate the flood plains of river Ganga in segment B of Phase- I on one in twenty five year's cycle or appropriately

b) Identify no development /construction zone, regulatory zone and the activities that can be /cannot be carried on in the regulatory zone of the floodplain.

The first meeting of the committee was held under the chairmanship of Member (WP&P), CWC on 21 09 2017(Annexure-2), wherein it was decided to constitute a core group to carry out following task:

- Data collection and compilation of available information

- Identification of flood event dates corresponding to 2, 5, 10, 25, 50, 100 return period and supplying the same to NRSC for further analysis
- Processing of collected information

Using the available datasets and latest modelling techniques, a presentation on flood plain demarcation for the reach from Haridwar to Unnao was made to the committee during the second meeting held at CWC HQ on 30th January 2018 (Annexure-3). The committee decided to prepare an interim report based on the analysis done so far mentioning the assumption made and/or limitations of the study.

Further on the basis of the discussion held during the third meeting held on 23rd April, 2018 (Annexure-4), it was decided to re-examine the flood frequency analysis and validate the study by incorporating details of embankments, cross-section of river at every 5 Km interval upto 1 m above HFL, to be provided by Irrigation department, Govt. of U.P.

During the 4th meeting held on 22nd April, 2019 (Annexure-5), the core group presented 3 types of flood demarcation analysis viz. Fully based on Satellite, Fully based on Model with DEM reconditioning and Hybrid approach. It was decided to carry out the ground truth verification by Irrigation department, Govt. of U.P. in consultation with core group' officers in field offices of CWC/ GFCC

In compliance to the decision taken in the 4th meeting, the ground truth verification was done in 3 phases i.e. (from 07.05.2019 to 08.05.2019, 15.05.2019 to 17.05.2019, 11.06.2019). The report of the same is enclosed as Annexure-6.

Subsequent to completion of exercise of ground truth verification, the report was revised on the basis of the recommendations of the joint team constituted for ground truth verification. The report, including the activities that can be/cannot be carried out in the No development / Regulatory zones of the floodplain, was presented during the 5th meeting of the Special Committee held on 29th August 2019 (Annexure 7).

Taking into consideration the findings of ground truth report, embankment data provided by U.P. Govt., other datasets/information and comments of the participants received during the 5th meeting, the report on demarcation of floodplains along with the activities to be carried out in such demarcation zones has been finalized.

2. DATA USED

Following data/information was used:

- 90m Digital elevation model (DEM) from Shuttle Radar Topography Mission (SRTM) of United States.
- Analyzed Satellite datasets of Joint Research Commission- European Commission for the period from (1984-2015)

- Cartosat 30 m DEM from Indian Space Research Organization (ISRO)
- Historical Annual Peak discharge data of CWC sites
- Satellite images of flood events from National Remote Sensing Centre.
- Embankment data provided by Irrigation Department, Govt. of U.P.

3. SOFTWARE USED

3.1 MIKE FLOOD

It includes a wide selection of specialized 1D and 2D flood simulation engines, enabling to model any flood problem - whether it involves rivers, floodplains, flooding in streets, drainage networks, coastal areas, dams, levee and dike breaches, or any combination of these. MIKE FLOOD is capable to generate dynamic flood depth maps and velocity distribution (spatially) maps of flood water propagation.

There are several advantages of applying models like MIKE FLOOD. It provides more reliable and accurate flood maps and flood hazard maps, than simpler methods like superimposing static water level maps on topographic maps. It simulates water levels accurately taking into account backwater effects from e.g. obstructions on the flood plain, and simulates correctly pathways, which may not necessarily be the shortest and direct distance between e.g. the river and the point of concern.

This technique requires a fine resolution land terrain model. The land terrain model, HD model are dynamically linked in MIKE FLOOD, and generate flood depth map and flood velocity map in every time step of its computation process.

3.2 ARCGIS

It is a geographic information system (GIS) for working with maps and geographic information. It is used for creating and using maps, compiling geographic data, analyzing mapped information, sharing and discovering geographic information, using maps and geographic information in a range of applications, and managing geographic information in a database.

4. METHODOLOGY

All the relevant information were collected from various agencies and then analyzed in the following manner:

4.1 FLOOD FREQUENCY ANALYSIS

The flood frequency analysis was carried out by Hydrology North, CWC. Various distribution viz. 2-Parameter log Normal, 3-Parameter log Normal, 2-Parameters Gamma,

Log Pearson Type-III and Gumble have been used to derive return period flood. The average historical data availability was around 40 years. The results are shown in Table 1.

Table 1: Flood Frequency Analysis

S.No	Station	Distribution	Magnitudes (m^3/s) for different return period flood					
			2 yr	3 yr	10 yr	25 yr	50 yr	100 yr
1	Rishikesh	Gumbel	5240	6286	8914	10763	12135	13497
2	Garhmukteshwar	2-Parameter log Normal	4631	5535	7870	9555	10832	12125
3	Kachla Bridge	Gumbel	6140	7168	9751	11569	12917	14255
4	Fatehgarh	Gumbel	4594	5737	8608	10628	12126	13614
5	Ankinghat	Log Pearson III	7117	8597	11687	13377	14426	15326
6	Kanpur	2- Parameter Gamma	7984	9506	13057	15348	16962	18507

4.2 SATELLITE DATA SELECTION

1. Based on the CWC records, dates for some high flood events in the recent past were identified for collecting satellite imagery data from NRSC.

← NRSC provided satellite images for two flood events dated on 18-19 June 2013 and 23rd & 25th September 2010 through their web messaging service (WMS). Using GIS software, outer envelope of flood extent was digitized manually.

2. Joint Research Centre- European Commission have analyzed Landsat multispectral Satellite images of past 31 years (1984-2015) for deriving frequency with which water returns from year to year i.e. recurrence interval. The same has been used in the study through Google Earth Engine platform.

4.3 DIGITAL ELEVATION MODEL SELECTION

SRTM 90 m and Cartosat 30 m DEM available in public domain were considered for the study area. It was noticed that SRTM 90 m DEM was relatively better representing elevation value, more commonly used by scientific community and was therefore selected for use in the model. The comparison of elevation values of few selected stations in the study area is shown in Table 2:

Table 2. Spot Height Analysis

Station	Spot Heights(m)		
	SRTM	Cartosat	Difference
Ankinghat	127	121.6	5.4
Garhmuketshwar	201	199	2
Fatehgarh	138	135.8	2.2
Kachhalabridge	161	164.5	-3.5
Kanpur	115	111.5	3.5
Haridwar	294	293.7	0.3

4.4 DEM REFINEMENT:

SRTM DEM 90 m was further processed to improve the river profile below the water surface, since SRTM does not capture the same. To achieve this, lean season satellite imageries for last 30 years, representing the river portion only was adjusted according to the average mean depth based on the cross section data of CWC at six gauging locations.

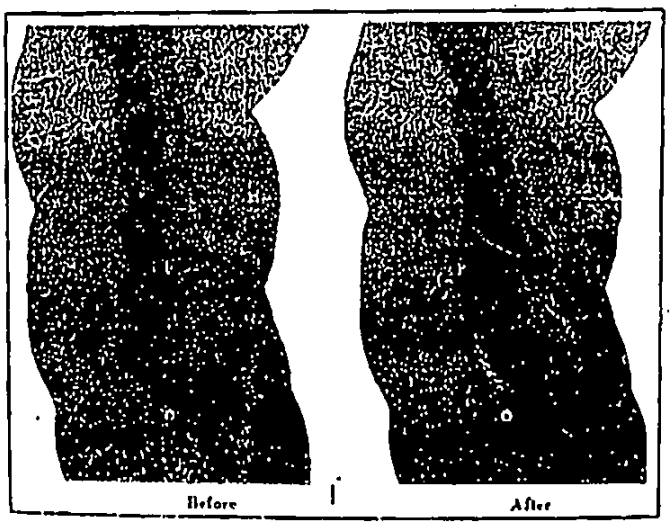

Figure 2: DEM refinement –River Bathymetry

4.5 MODELLING METHODOLOGY

Using the SRTM 90m DEM and the outputs of flood frequency analysis, a coupled hydrodynamic model - one dimensional (1D) and two dimensional (2D) was setup (Figure 1). The details of setup are as under.

- Upstream branch to provide constant flood magnitude equal to the given return period at rishikesh using a 1D model.
- Downstream branch for draining the flow from dalmu using a 1D model.
- Flood plain bathymetry for routing the flows between rishikesh and dalmu using a 2D Hydrodynamic modeling.
- Five flow locations (Garhmukteshwar, Kachla Bridge, Fatehgarh, Ankinghat and Kanpur) in 2D model for maintating constant river flows equal to the given return period flood magnitude.
- 2D domain was represented by finite difference rectangular grid (MIKE 21 "classic")

Steady state analysis was performed to workout the extent of floodplain for various return period flood.

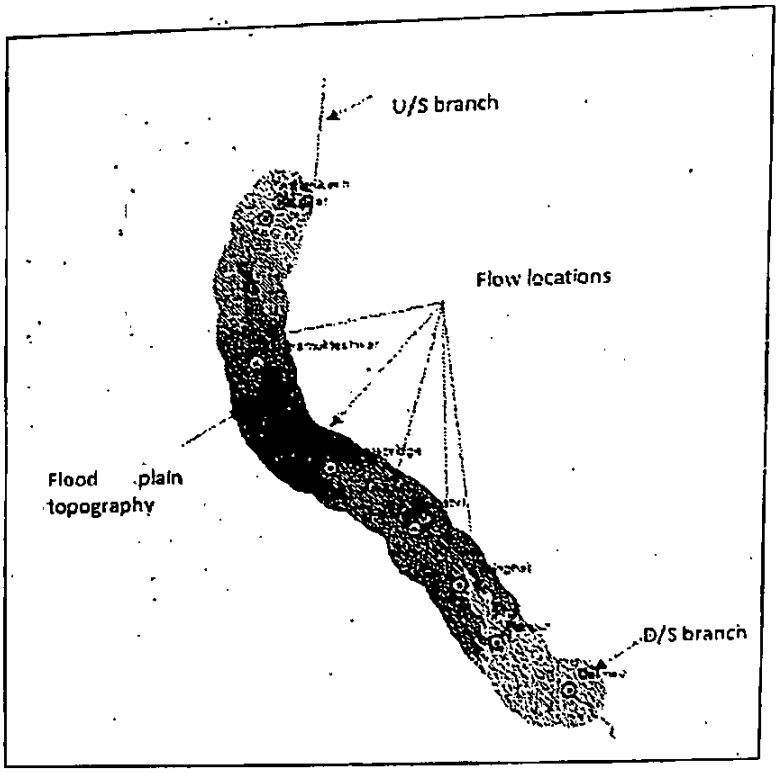

Figure 3: Model Setup

5. Approaches analyzed for flood plain demarcation

5.1 Flood Plain Demarcation based on Satellite Data/Images

5.1.1 No Development Zone

Satellite data of past 31 years (1984-2015) of JRC (Joint Research Centre-European Commission) was taken for study to demarcate flood boundary based on recurrence interval It was found that the flood extent corresponding to recurrence interval of 2, 3 & 5 years were most frequent with little difference in spatial extent. This was mainly due to presence of embankment and braided nature of the river. It was thus considered most appropriate for No-Development Zone which is also in-line with the NDMA guidelines for *Management of floods, 2008.*

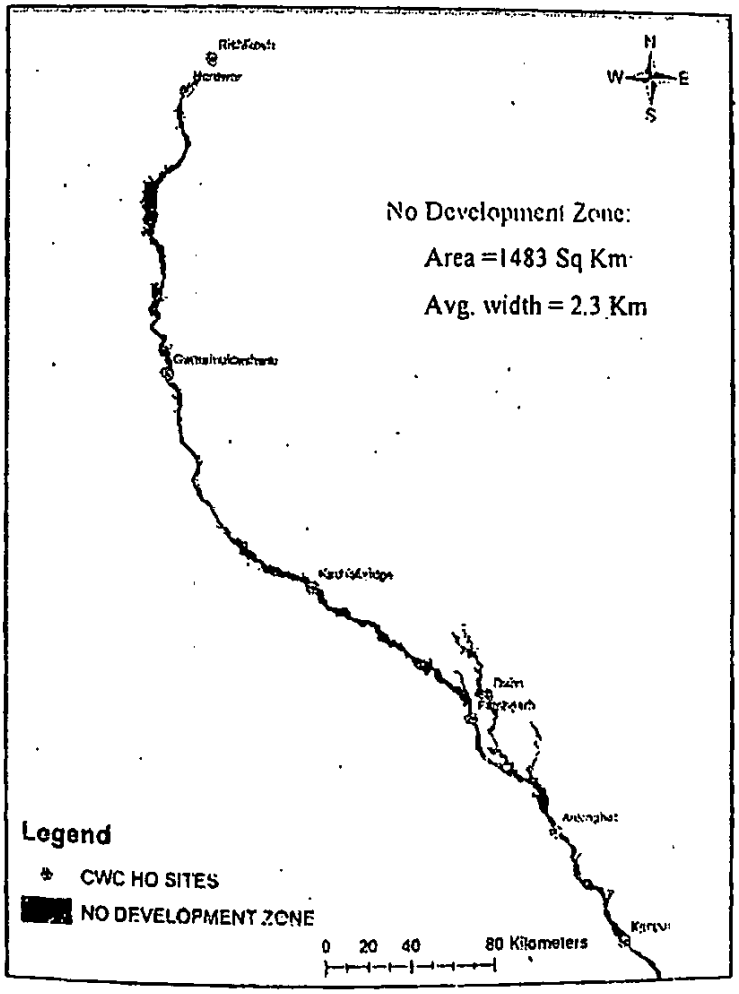

Figure 4: No Development zone based on Satellite datasets

5.1.2 Regulatory Zone

Outer envelope of flood extent on the satellite images provided by NRSC was digitized manually. The outer extent of Satellite images for two flood events dated on **18-19 June 2013** and **23rd & 25th September 2010** which was found to be near to 25 year return flows has been considered for as **Regulatory Zone demarcation.** This accounts for both protected i.e. embanked as well as unprotected flood plain area in the analysed reach.

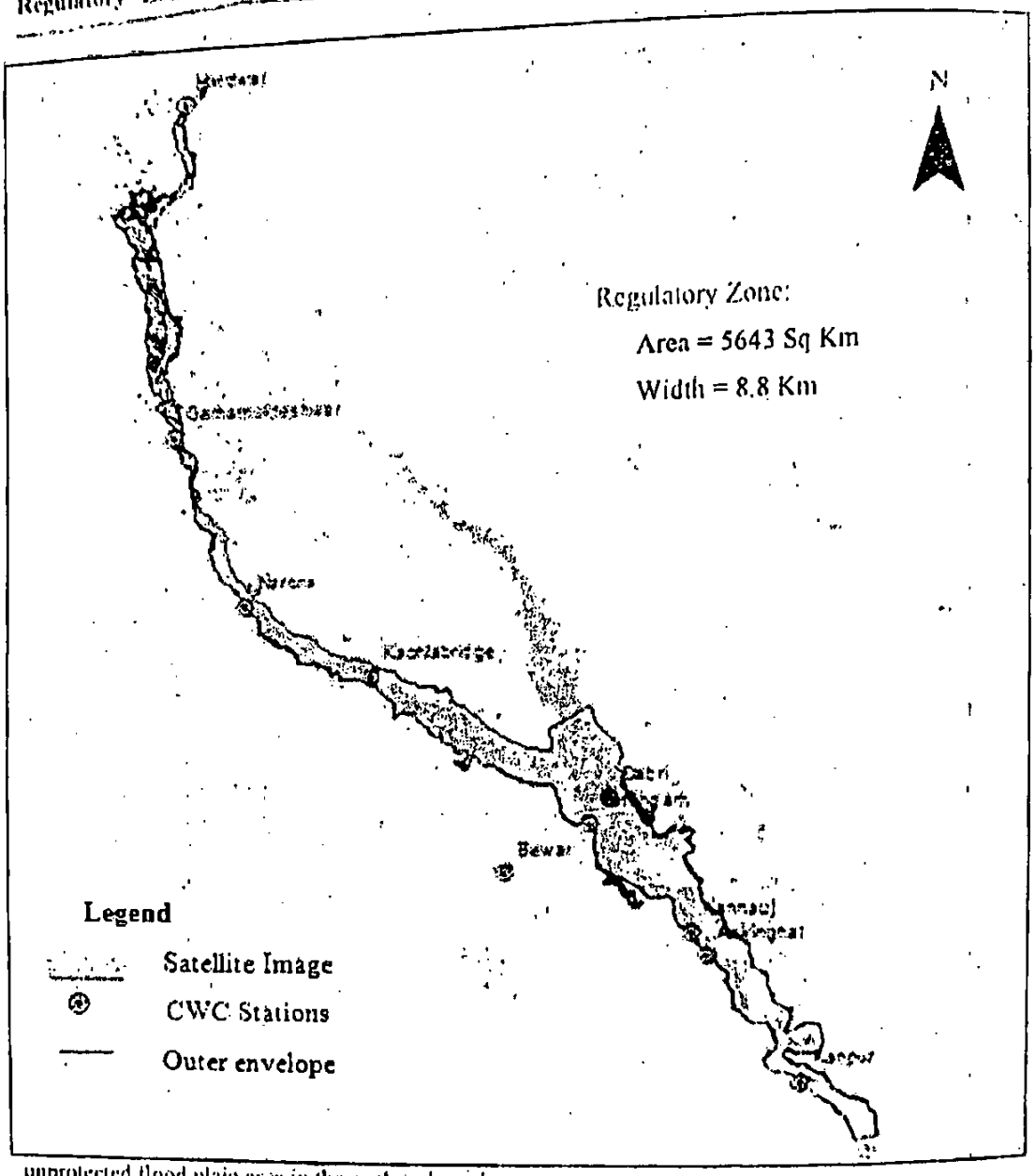

Figure 5: Satellite derived Floodplain- Outer extent of Regulatory Zone

5.2 Model based Flood Plain Demarcation

The SRTM 90m DEM used for modeling was further processed to cater for the sub-surface river bathymetry which was not accounted in the original DEM. The final model results show many small islands within the flood extent causing inundation gaps. These gaps have been filled to get final inundation area.

No Development Zone - Based on **2-Year** Return Period Flood (without Embankment)

Regulatory Zone – Based on **25 Year** Return Period Flood (without Embankment)

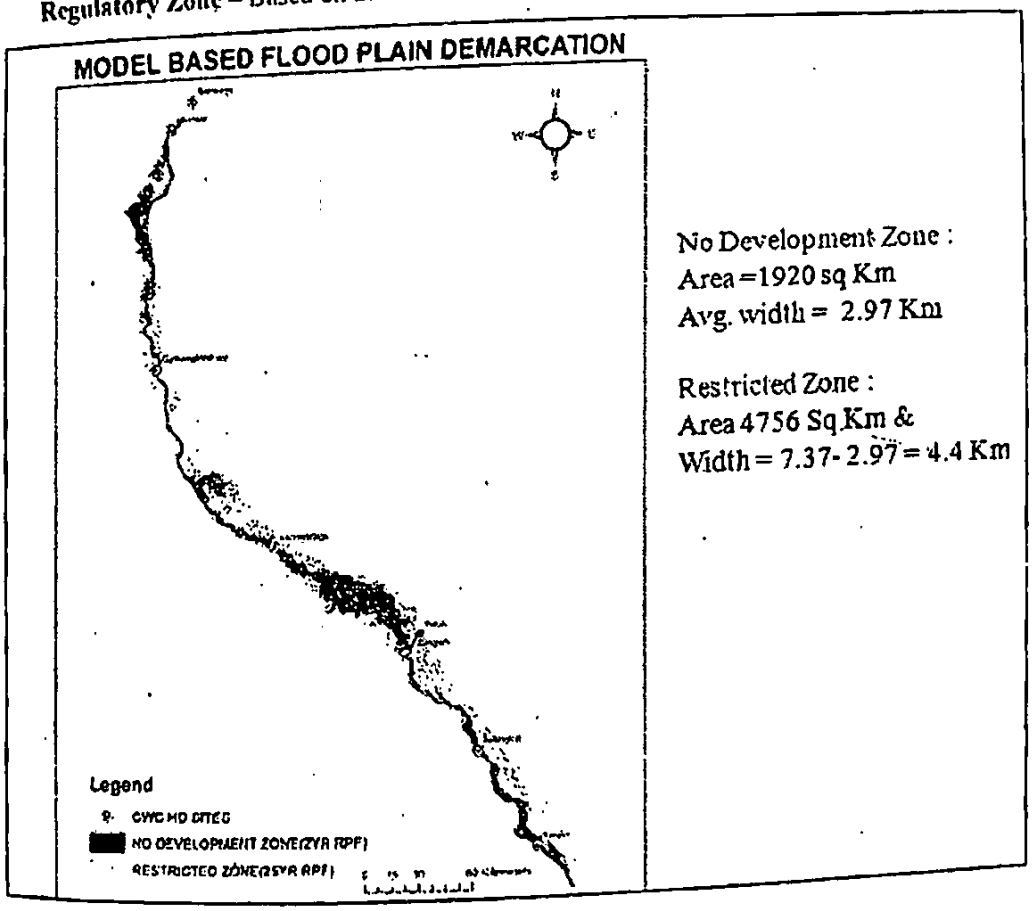

Figure 6: Floodplain Demarcation based on Model Result

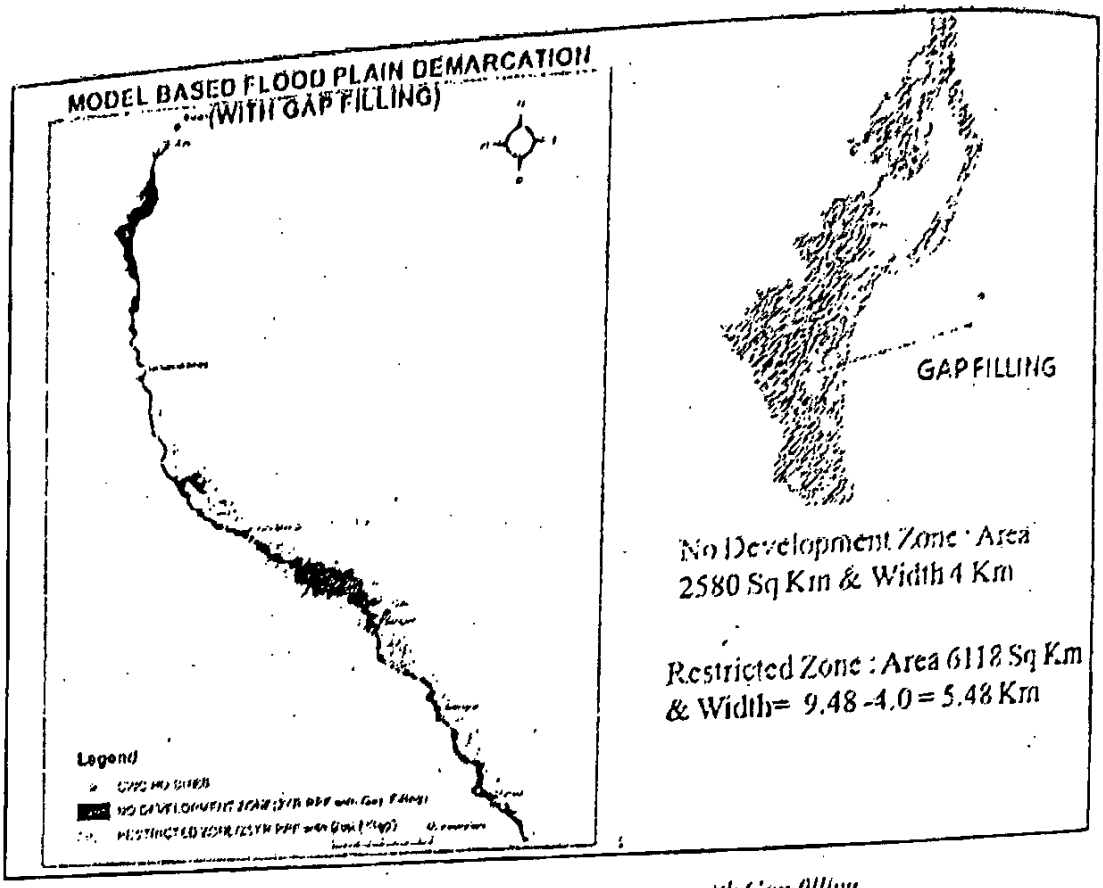

Figure 7: Model Based Flood Plain Demarcation with Gap filling

5.3 Hybrid Approach for Flood Plain Demarcation:

The results of satellite analysis and modelling have their own limitation Satellite may not cover the full flood event and model results are subjected to DEM quality. Therefore hybrid approach has been adopted by combining both the results by taking union of the areas obtained from both the results.

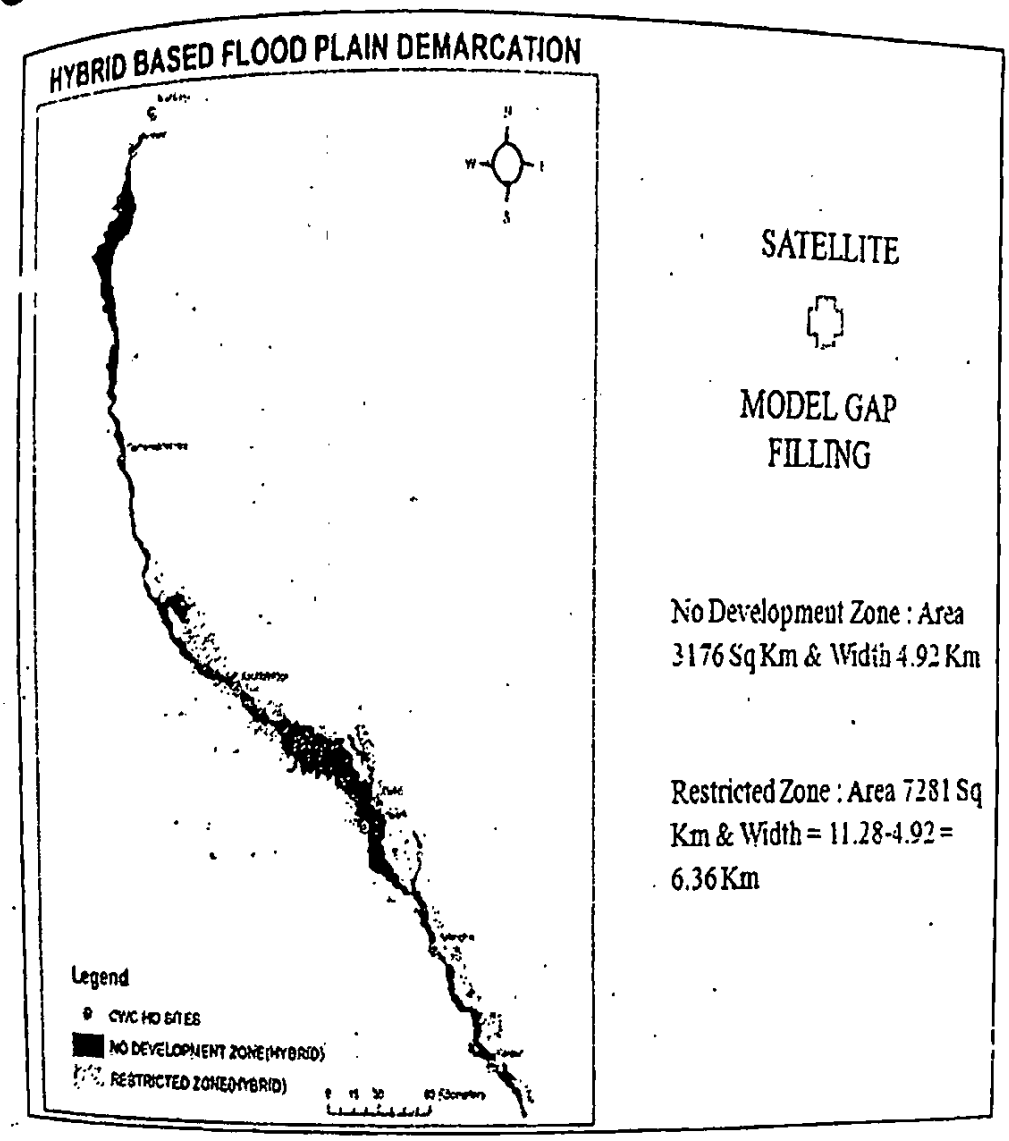

Figure 8: Flood plain Demarcation based on Hybrid Approach

6. FINAL FLOOD PLAIN DEMARCATION

As decided during the 4th meeting, the Hybrid based Flood Plain Demarcation combining results of satellite imageries and model with gap filling were shared with I&WRD, Govt. of UP, regional offices of CWC/DFCC for ground truth verification jointly near all important cities/municipalities/major habitations. Subsequently, ground truth verification was carried out by the team consisting of officials from Central Water Commission, Ganga Flood Control Commission, National Institute of Hydrology and State Government of Uttar Pradesh and Uttarakhand in following three segments:

Segment-I from 07.05.2019 to 08.05.2019 in reach Haridwar to Bijnore

Segment-II from 15.05.2019 to 16.05.2019 in reach Kannauj to Kanpur/ Unnao

Segment-III from 11.06.2019 in reach Brijghat/Garhmukteshwar to Narora

During the ground truth verification exercise, the committee members used the Google Earth mobile application platform for overlaying all the results i.e. Satellite, Model and Hybrid in KML format so that they could compare the result location on mobile application with the actual ground location and marks the difference. Besides this, during the visits, the information available from local residents was also gathered to verify the results.

No development zone demarcated using satellite data was found to be more or less conforming to the ground reality. The same has been selected and finalized further by incorporating the details of embankments, bunds collected from U.P. Govt.

The final average satellite based No Development Zone width i.e. 3.15 Km has been arrived through refining the previous No Development zone by incorporating the findings of ground truth verification report such as gap-filling, correcting the bank lines, smoothening the outer edges, and extending the No Development zones upto the embankment line where ever applicable. This resulted in increase of area of No Development Zone from 1483 Sq Km to 2032 Sq. Km., consequently, increasing the average width from 2.3 Km to 3.15 Km.

Similarly, the satellite based average Regulatory Zone width i.e. 10.12 Km has been arrived through refining the previous Restricted Zone by taking the union of satellite area provided by NRSC and the newly defined No Development Zone and smoothening the outer edges. This has again resulted in increase of area from 3643 Sq Km to 6530 Sq Km., consequently increasing the average width from 8.8 Km to 10.12 Km.

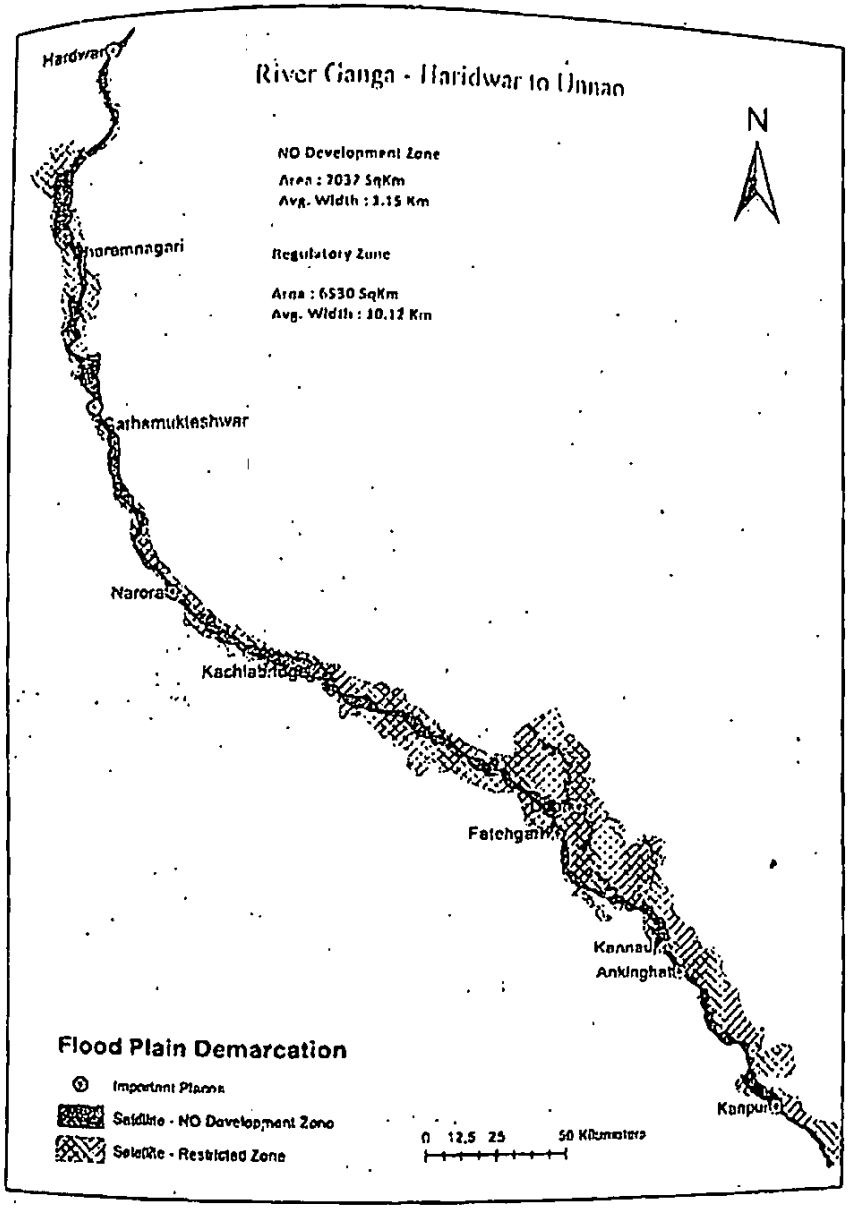

Figure 9: Final Flood Plain based on Ground Truth Verification

7. ASSUMPTIONS AND LIMITATIONS

For Satellite

- Flood extent covered by satellite depends upon revisit period, cloud cover, river turbidity, river seasonality etc. & classification algorithms used by space agency.
- image processing algorithms, etc.
- Embankment breach scenerios are not accounted
- Cannot segregate reverine flooding from other types of flooding.

For Model

- Mannings value of 0.04 was adopted uniform throughout the flood plains as well as river channel.
- Limitations of topography i.e. 90m SRTM DEM
- River bathymetry accounted using available cross sections only.
- Effects of flood embankments ,roads, buildings ,hydraulic structures,bridge etc were not considered.
- Scenerios like Dambreak and GLOF are not coinsidered
- Morphological changes not coinsidered
- Flooding due to drainage congestion, water clogging etc not accounted.
- Sudy area is coinfined to Maximum 30 km buffer on either side of river centerline
- Evaporation ,infiltration and diversion losses neglected

For Ground Truth Verification

- Restricted zone could not be verified
- Subject to the accuracy of geo-location services available on mobile
- Only accessible and habituated areas were surveyed

8. ACTIVITIES IN FLOOD PLAIN ZONE

The following literatures were considered for defining activities that can be/cannot be carried out in the No development / Restricted zones of the floodplain.

1. Concept paper on river Conservation Zone prepared by the expert group of Ministry of Environment and Forest & Climate Change
2. National Disaster Management Authority guidelines for flood management
3. Flood Plain Zoning notification of Uttarakhand Irrigation Department
4. NMCG guidelines for Ganga Basin

The above literatures were discussed by the committee during the 5th meeting of the Committee held on 29th August 2019 in firming up the activities that can be/cannot be carried out in the No development / Regulatory zones of the floodplain. Finally following activities were identified and recommended by the committee

8.1 NO DEVELOPMENT ZONE

Prohibited activities in No Development Zone:

All activities except mentioned under the regulated activities in no-development zone

Regulated Activities in No Development Zone:

i Temporary constructions, if absolutely necessary, in exceptional circumstances like natural calamities or religious events at traditional locations, with prior permission of the National Mission for Clean Ganga acting through the State Ganga Committee and the District Ganga Committee.

ii. Regulated Sand/ Stone/ sediment/ river borne material mining may be allowed as per MoEF&CC guidelines

iii. Repair/renovation of protected monuments, temples, boating jetties, parks, ghats and crematorium

iv. Existing structure, whether permanent or temporary for residential or commercial or industrial or any other purposes in the River Ganga, Bank of River Ganga or in active flood plain area of River Ganga or its tributaries provided that such construction has already been completed, shall be reviewed by the National Mission for Clean Ganga so as to examine as to whether such constructions are causing interruption in the continuous flow of water or pollution in River Ganga as per provisions under para [6(3)] of Ministry of Water Resources, River Development and Ganga Rejuvenation notification no. S.O. 3187(E), dated the 7th October 2016 (as amended from time to time) (copy enclosed) regarding constitution of an authority, namely, the National Mission for Clean Ganga for Rejuvenation, Protection and Management of River Ganga.

v. Organic farming by owners/lease holders

vi. Plantation of native trees / shrubs (for commercial use)

vii. Measures for control of erosion and floods, maintenance or de-silting of river ways, waterways and channels

viii. Repair of breaches in embankments

ix. Laying of unpaved paths for access to the river for cultural, religious or any other purposes

x. Various activities such as engineered diversion and storage of water in River Ganga, construction of bridges and associated roads and embankments over the River Ganga or at its River Bank or its flood plain area, construction of Ghats or extension of any existing Ghat, construction of jetties, construction of permanent hydraulic structures for storage or diversion or control of waters or channelization of River Ganga, etc., shall be governed as mentioned under para (42) of Ministry of Water Resources, River Development and Ganga Rejuvenation notification no S.O. 3187(E), dated the 7th October 2016 (as amended from time to time) regarding constitution of an authority, namely, the National Mission for Clean Ganga for Rejuvenation, Protection and Management of River Ganga

xi. Navigation, Water Sports, Water Transport related activities

8.2 REGULATORY ZONE

Prohibited Activities in Regulatory Zone

Red category of industries as mentioned in CPCB guidelines (as amended from time to time)

Regulated Activities in Regulatory Zone:

i. Construction of residential/ Institutional/ commercial buildings, school, dispensaries, recreational facilities with certain stipulations as mentioned in NDMA guidelines (as amended from time to time) such as prohibition of basement in buildings construction on stilts (columns), plinth level above the flood lines, provision of stairway in single storey building, roof level of single storey or first floor level above 100 years flood level/HFL, preferably utilizing ground floor for non-residential purposes.

ii. Various activities such as engineered diversion and storage of water in River Ganga, construction of bridges and associated roads and embankments over the River Ganga or at its River Bank or its flood plain area, construction of Ghats or extension of any existing Ghat, construction of jetties, construction of permanent hydraulic structures for storage or diversion or control of waters or channelization of River Ganga, etc. shall be governed as mentioned under para (42) of Ministry of Water Resources, River Development and Ganga Rejuvenation notification no. S.O. 3137(E), dated the 7th October 2016 (as amended from time to time) regarding constitution of an authority, namely, the National Mission for Clean Ganga for Rejuvenation, Protection and Management of River Ganga

iii. Setting up of non-polluting cottage industries.

iv. Construction / expansion/ modernization of bridges, roads and similar facilities that may affect ND Zone

v. Creation of navigational facilities involving dredging, mechanised ferries, jetties etc

vi. Green and Orange category of industries as mentioned in CPCB guidelines (as amended from time to time)

vii. Water Sports, Water Transport related activities

viii. Stone crushing plants etc.

9. Concluding Remarks

1. As per the recommendations of the report of ground truth verification (Annexure-6). Satellite based No Development Zone was found to be more or less confirming to the ground reality which was found to be most frequent with respect to recurrence interval of 2-5 years. The same has been selected and finalized further by incorporating the details of embankments, bunds collected from U.P. Govt.
2. The outer extent of Satellite images for two flood events dated on 18-19 June 2013 and 23rd & 25th September 2010 provided by NRSC has been considered as Regulatory / Restricted Zone which was confirming to the 25 years return period flood.
3. The lat/long of demarcating pillars for both left and right side of No Development zone at interval of 200 m is provided in Annexure-8.
4. The lat/long of demarcating pillars for both left and right side of restricted zone at interval of 200 m is provided in Annexure-9.
5. Total flood plain area for No Development Zone is 2032 sq. KM corresponding to the average width of 3.15 KM
6. Total flood plain area for Restricted/ Regulatory Zone is 6530 sq. KM corresponding to the average width of 10.12 KM.

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Annexur-02

BEFORE THE NATIONAL GREEN TRIBUNAL,
PRINCIPAL BENCH, NEW DELHI

Original Application No. 200/2014
(C.W.P. No. 3727/1985)
(M.A. No. 594 of 2017 and 598 of 2017)
And
Original Application No. 501 of 2014
(M.A. No. 404 of 2015)
And
Original Application No. 146 of 2015
And
Appeal No. 63 of 2015
And
Original Application No. 127 of 2017
And
Original Application No. 133/2017
(W.P. (C) No. 200/2013)

IN THE MATTER OF : -

M.C. Mehta Vs. Union of India & Ors.
And
Anil Kumar Singhal Vs. Union of India & Ors.
And
Society for Protection of Environment & Biodiversity & Anr.
Vs.
Union of India & Ors.
And
Confederation of Delhi Industries & CEPT Societies
(An Organisation of CETP Societies)
Vs.
D.P.C.C. & Ors.
And
J.K. Srivastava Vs. Central Pollution Control Board & Ors.
And
Swami Gyan Swarop Sanand Vs. Ministry of Home Affairs & Ors.

CORAM: HON'BLE MR. JUSTICE SWATANTER KUMAR, CHAIRPERSON
HON'BLE DR. JUSTICE JAWAD RAHIM, JUDICIAL MEMBER
HON'BLE MR. JUSTICE RAGHUVENDRA S. RATHORE, JUDICIAL MEMBER
HON'BLE MR. BIKRAM SINGH SAJWAN, EXPERT MEMBER
HON'BLE MR. RANJAN CHATTERJEE, EXPERT MEMBER

Present Applicant: AGREED

Mr. I.K. Kapila, Adv., Uttar Pradesh Jal Nigam
Dr. Preetam Yashvant, MD, RUDSICO, Rajasthan
Dr. Vijai Singhal, Chief Env. Engineer
Mr. Yogesh Kumar Mittal, SE (IS) - Water Resources, Rajasthan
Dr. Sandeep Singh, Adv. for State of Uttar Pradesh
Mr. Jitendra Luhadia, S.E. (D), CAD, Kota - Water Resources Rajasthan
Ms. Panchajanya Batra Singh, Adv. for Ministry of Environment, Forest and Climate Change
Mr. Vipin Kumar, Resident Commissioner, Govt. of Bihar
Mr. J.B. Ravinder, Jt. Adviser, Mininistry of HUA (MoUD)
Mr. Shailendra Kumar Singh, Special Secretary, Urban Development, Uttar Pradesh
Mr. Rahul Khurana, Adv. for State of Haryana
Mr. Rajive Kumar, Chief Secretary, Uttar Pradesh
Mr. Dcpinder Singh Dhesi, Chief Secretary, Haryana
Mr. Malay Shrivastava, on behalf of Shri Basant Prata Singh, Chief Secretary, Madhya Pradesh
Mr. Malay Shrivastava, Chairman, Madhya Pradesh Pollution Control Board
Mr. Anjani Kumar Singh, Chief Secretary, Bihar
Mr. Vivek Kumar Singh, Principal Secretary (Env.), Bihar

Mr. Sunil K. Gulati, Officiating – Chairman Haryana Pollution Control Board
Mr. S.P.S. Parihar, Chairman, Central Pollution Control Board
Mr. Vivek Kumar Singh, Chairman, Bihar Pollution Control Board
Mr. Rajiv Upadhyay, Member Secretary, Uttar Pradesh Pollution Control Board
Mr. T.U. Khan, Environmental Engineer, In-Charge Circle-2, Uttar Pradesh Pollution Control Board
Mr. K.C.A. Arun Prasad, Member Secretary, Rajasthan Pollution Control Board
Mr. S. Narayanan, Member Secretary, Haryana Pollution Control Board
Mr. A.A. Mishra, Member Secretary, Madhya Pradesh Pollution Control Board
Mr. Alok Kumar, Member Secretary, Bihar Pollution Control Board
Dr. A.B. Akolkar, Member Secretary, Central Pollution Control Board
Mr. Nanoranjan Hota, Adviser, Ministry of Environment, Forest and Climate Change
Mr. Sundeep, Director, National Mission for Clean Ganga
Mr. D.P. Mathuria, Executive Director, National Mission for Clean Ganga
Prof. A.K. Gosain, Professor, Indian Institute of Technology,
Prof. Vinod Tare, Professor, Indian Institute of Technology, Kanpur
Mr. Manoj Kumar Singh, Principal Secretary, Uttar Pradesh
Mr. Y.K. Jain, M.D., Uttar Pradesh Jal Nigam
Ms. Renuka Kumar, Principal Secretary, Environment & Forests, Uttar Pradesh.

Date and Remarks	Orders of the Tribunal
Chamber Meeting July 24, 2017	In furtherance to the order dated 13th July, 2017, the State of Haryana, State of Uttar Pradesh, State of Bihar, State of Rajasthan and State of Madhya Pradesh have been represented through their respective Chief Secretaries. We appreciate the presence of the Chief Secretaries, and Additional Chief Secretaries/Principal Secretaries from different State Governments; Executive Director, National Mission for Clean Ganga; Advisor, Ministry of Environment, Forest and Climate Change; Professor A.K. Gosain, Prof. Vinod Tare and other local authorities who are present from different States and authorities.

GREEN TRIBUNAL

	Chamber Meeting **July 24, 2017** **ss**	Presence of Chairman and Member Secretary of Central Pollution Control Board and officers of the State Boards is also highly appreciated. After detailed discussions all are unanimous and in facts have given in its entirety their inputs to the Central Government and the State Government would be quite keen to implement the Judgment of the Tribunal in relation to Segment-B of Phase-I of river Ganga (from Haridwar to Unnao, State of Uttar Pradesh). All of the State Governments, Boards and authorities are expected to file Status Report in terms of the judgment of the Tribunal dated 13th July, 2017. As far as the Phase-2 of river Ganga i.e. from the Border of Unnao, Kanpur to the Border of Bihar which will obviously includes the pollution of river Ganga being caused from the beginning of the State of Bihar as well as river Yamuna and its Tributaries falling within the jurisdiction of State of Haryana, State of Madhya Pradesh, State of Rajasthan, State of Bihar and State of Uttar Pradesh, the respective States shall file the proposed action plan with regard to prevention and control of pollution and rejuvenation of river Ganga and its tributaries falling under Phase-2. The action plan would be both for industrial as well as sewage pollution for the river Ganga and its tributaries including river Yamuna which is its main tributary. The comprehensive scope of the Status Report/Action Plan to be filed, as discussed at length and all States are clear, would include giving the drain joining the Ganga river and its tributaries in the

NATIONAL GREEN TRIBUNAL PRINCIPAL BENCH

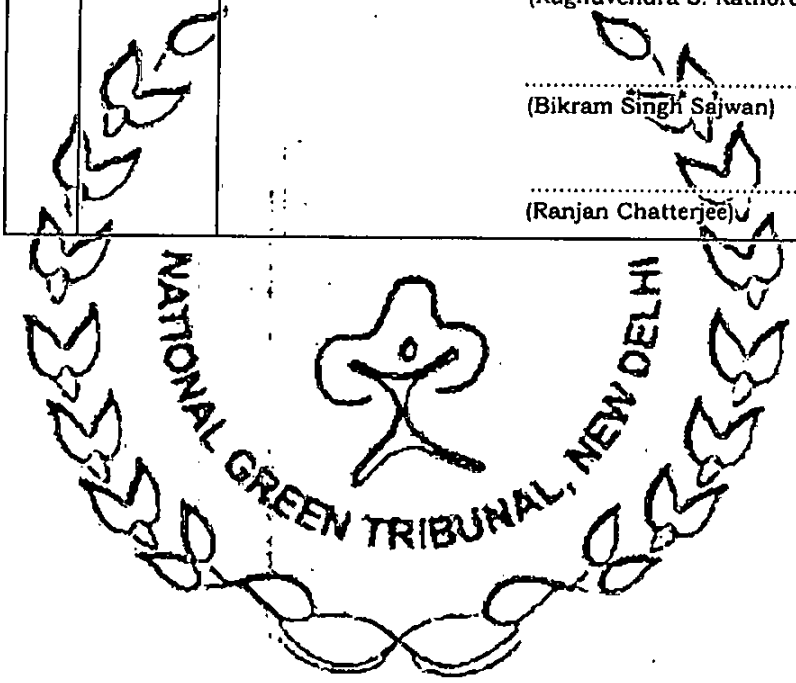
	Chamber Meeting July 24, 2017 ss	areas under their jurisdiction, the quantum of the flow of the respective drains quality of the effluent, the proposed Action Plan with regard to setting up of STP, CETP for ensuring treatment of the drains which are meeting the river Ganga or its tributaries. It will be stated as to what will be the scope of recycling/reuse of treated water in those areas and how much of the treated waste would be put into the river. These features as of now are only indicative and not actual. The data should be submitted to the Tribunal should be duly verified and authenticated. It must not happen that during the course of deliberation before the Tribunal, deficiencies and inaccuracies are found in the data submitted to the Tribunal. Inaccurate data completely frustrates the entire process of adjudication. The State of Haryana would submit a separate plan with regard to treatment of the six major drains which are stated to be meeting river Yamuna through Nazafgarh drain or direct within the territorial jurisdiction of State of Haryana. We make it clear, that the minimum flow of the river Ganga and delineation of the flood plain of the river is to be determined by the Central Government and the State Government in accordance with law. Our directions are interim and they are in operation till varied by the Tribunal on the request of the appropriate Government or authority.
	Chamber Meeting	We also make it clear that the State Government or local authorities are at liberty to enforce the "polluter pays

NATIONAL GREEN TRIBUNAL HEARD

	July 24, 2017 ss	principle" and require the contributory of pollution to pay by way of environmental compensation an amount as the State/public authority may deem fit and proper to ensure that the local authorities do not starve of fund for carrying out their statutory duties. It is commonly agreed and we direct that the data must be at least to the limited extent, cross checked before it is placed before the Tribunal. As far as the State of Rajasthan is concerned, besides filing Status Report and Action Plan as directed by the Tribunal, the State would also file a separate report in relation to the industrial pockets at Pali, Bhiwadi and Balotra particularly in relation to compliance of the order of the Tribunal. It is undisputed that the ground water in these areas is highly polluted. It is also directed that while furnishing the Status Report/Action Plan, the sewage or effluents which goes directly into the river beyond the provided sewer line of drain network should also be taken into consideration. The Status Report/Action Plan should be submitted within five weeks from today with a copy to the Principal Committee/Supervising Committee constituted under the main judgment dated 13th July, 2017. In the next meeting, we request all the members present today to be present on that day besides that DG NMCG; Additional Secretary, Ministry of Environment, Forest and Climate Change; Additional Secretary, Urban Development (GoI); Professor A.K. Gosain; Professor Vinod Tare and Professor A.A. Kazmi, Roorkee shall be present

NATIONAL GREEN TRIBUNAL NEW DELHI

	Chamber Meeting **July 24, 2017** **ss**	on that day. The chamber meeting would be held on 15th of September, 2017 at 01:00 PM. List these matters on 15th September, 2017. .....,CP (Swatanter Kumar) .....,JM (Dr. Jawad Rahim) .....,JM (Raghuvendra S. Rathore) .....,EM (Bikram Singh Sajwan) .....,EM (Ranjan Chatterjee)



Annexure-03

प्रेषक,

मुख्य अभियन्ता(ज0सं0)
सिंचाई एवं जल संसाधन विभाग
उत्तर प्रदेश, लखनऊ,

सेवा में,

मुख्य अभियन्ता,
केन्द्रीय जल आयोग,
जहानवी सदन, इन्दिरागर,
लखनऊ।

पत्रांक: ८-182-/मुअजस/ दिनांक : 18 अक्टूबर, 2019

विषय– ओ0ए0 सं0–200/2014 सैगमेंट–सी, फेज–2 (उन्नाव से बलिया) गंगा फ्लड प्लेन आइडेंटिफिकेशन के सम्बन्ध में।

महोदय,

उपरोक्त विषय के सम्बन्ध में आपको अवगत कराना है कि सैगमेंट–सी, फेज–2 (उन्नाव से बलिया) गंगा फ्लड प्लेन आइडेंटिफिकेशन दिनांक 31 दिसम्बर 2019 तक किया जाना है।

कृपया प्रथम फेज की तरह द्वितीय फेज राष्ट्रीय हरित अधिकरण द्वारा दी गयी टाइम लाइन के अन्तर्गत आइडेंटिफिकेशन किया जा सके एवं डिमार्केशन ऑफ पिलर्स एण्ड नो कंस्ट्रक्शन जोन में अतिक्रमण हटाने की कार्यवाही सम्बन्धित जिलाधिकारियों द्वारा किया जा सके। यह कार्यवाही प्रत्येक दशा में 31 जुलाई 2020 तक किया जाना निर्णिय किया गया है।

9/10

गोपाल सिंह
मुख्य अभियन्ता (ज0सं0)

पत्रांक: /मुअजस/ तद् दिनांक

प्रतिलिपि निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित है :–

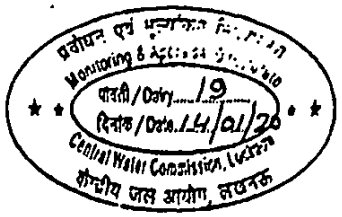
1. प्रमुख अभियन्ता एवं विभागाध्यक्ष, सिंचाई एवं जल संसाधन विभाग, उ0प्र0 लखनऊ।
2. विशेष सचिव, सिंचाई एवं जल संसाधन अनुभाग–4, उत्तर प्रदेश शासन लखनऊ।
3. मुख्य अभियन्ता, गंगा, सिंचाई विभाग, उ0प्र0, मेरठ।
4. मुख्य अभियन्ता, रामगंगा (नोडल अधिकारी), सिंचाई विभाग, उ0प्र0, कानपुर।
5. मुख्य अभियन्ता, सोन (सह संयोजक), सिंचाई विभाग, उ0प्र0, वाराणसी।
6. अधीक्षण अभियन्ता, अनुसंधान एवं नियोजन मण्डल–1, जल संसाधन, सिंचाई एनेक्सी भवन, लखनऊ।

गोपाल सिंह
मुख्य अभियन्ता (ज0सं0)

WR Files

Annexure-04

/2022/O/o CE(UGBO)



प्रेषक:-

मुख्य अभियन्ता(जल संसाधन),
कार्यालय प्रमुख अभियन्ता,
सिंचाई एवम् जल संसाधन विभाग, उ0प्र0,
लखनऊ।

सेवा में,

मुख्य अभियन्ता,
जल शक्ति मंत्रालय,
जल संसाधन नदी विकास एवं गंगा संरक्षण विभाग,
जान्हवी सदन, इन्दिरा नगर, लखनऊ।
(ई-मेल:dirmalucknow-cwc@nic.in)

पत्रांक: 17 /मु0अ0(ज0सं0)अनिमं-1/अनिग्र-3, लखनऊ:दिनांक 10 जनवरी, 2020

विषय:-मा0 राष्ट्रीय हरित अधिकरण, नई दिल्ली में विचाराधीन ओ0ए0 संख्या-606/2018 के अर्न्तगत यमुना, रामगंगा,बेतवा एवं घाघरा नदियों के ई-फ्लो एवं फ्लड प्लेन जोन के निर्धारण के सम्बन्ध में।

महोदय,

कृपया उपरोक्त विषय का अवलोकन करने की कृपा करें। जिसके अन्तर्गत उत्तर प्रदेश राज्य में 12 नदियों पर क्रिटिकल पोल्यूटेड स्ट्रेचस चिहिन्त किये गये हैं। इन नदियों के लिए ई-फ्लो एवं फ्लड प्लेन जोन का निर्धारण किया जाना है। नदियों का विवरण निम्नलिखित है:-

क्र0 स0	नदी का नाम	क्रिटिकल पोल्यूटेड स्ट्रेचस
1	हिन्डन	सहारनपुर से गाजियाबाद
2	यमुना	अजगरपुर से इटावा एवं शाहपुर से प्रयागराज
3	गंगा	कन्नौज से वाराणसी
4	रामगंगा	मुरादाबाद से कन्नौज
5	वेतवा	हमीरपुर से वागपुरा
6	घाघरा	बरहलगंज से देवरिया
7	राप्ती	डोमिनगढ से राजघाट
8	सरयू	अयोध्या से इलफातगंज
9	काली नदी पूर्वी	मुजफ्फरनगर से गुलावटी
10	वरूणा	रामेश्वर से वाराणसी
11	गोमती	सीतापुर से वाराणसी
12	सई	उन्नाव से जौनपुर

/2022/O/o CE(UGBO)

66

उपरोक्त नदियों में गंगा नदी के ई-फ्लो एवं फ्लड प्लेन जोन का निर्धा[illegible] आपके द्वारा पत्रांक-प्र0एवंमू/लखा/एफ0पी0जेड0(एन0जी0टी0)/2019/1605-1606, दिनांक-18.12.2019 के क्रम में किया जाना है।

यमुना नदी के सहारनपुर से प्रयागराज तक के फ्लड प्लेन जोन एवं ई-फ्लो के निर्धारण की आवश्यकता ओ0ए0संख्या-06/2012 में भी है। इसके अतिरिक्त रामगंगा,बेतवा एवं घाघरा नदियाँ अर्न्तराज्यीय/अर्न्तदेशीय है, इसलिए उत्तर प्रदेश राज्य के अर्न्तगत इनके भी ई-फ्लो एवं फ्लड प्लेन जोन के निर्धारण की आवश्यकता है।

हिन्डन,सरयू,राप्ती,काली नदी पूर्वी,वरूणा,गोमती एवं सई नदियाँ राज्याभ्यन्तर है, इसलिए इनके ई-फ्लो एवं फ्लड प्लेन जोन का निर्धारण सिंचाई विभाग, उत्तर प्रदेश द्वारा किया जायेगा।

अतः उत्तर प्रदेश राज्य की सीमा के अर्न्तगत यमुना, रामगंगा,बेतवा एवं घाघरा नदियों के ई-फ्लो एवं फ्लड प्लेन जोन के निर्धारण करने की कृपा करें। इस कार्य के लिए आवश्यक डाटा सिंचाई एवं जल संसाधन विभाग, उ0प्र0के माध्यम से आपके कार्यालय को उपलब्ध कराया जायेगा।

भवदीय,

(गोपाल सिंह) 12/11/20

मुख्य अभियन्ता(जल संसाधन)

पत्रांकः /मु0अ0(ज0सं0)अनिमं-1/अनिख-3/तदिनांक

प्रतिलिपि निम्नलिखित को सूचनार्थ एवं अग्रिम आवश्यक कार्यवाही हेतु प्रेषित है।

1-प्रमुख सचिव, सिंचाई एवं जल संसाधन अनुभाग-4, उ0प्र0शासन, लखनऊ को इस अनुरोध के साथ प्रेषित है कि उपरोक्त विषयक के सम्बन्ध में सदस्य (नदी प्रबंध)केन्द्रीय जल आयोग, सेवा भवन, रामकृष्ण पुरम्, नई दिल्ली को अपने स्तर से पत्र प्रेषित करने की कृपा करें।

2-प्रमुख अभियन्ता एवं विभागाध्यक्ष, सिंचाई एवं जल संसाधन विभाग, उ0प्र0,लखनऊ।

3-मुख्य अभियन्ता(गंगा),मेरठ/रामगंगा,बरेली को इस आशय के साथ प्रेषित है कि केन्द्रीय जल आयोग से सम्पर्क स्थापित कर फेज-2 के लिए अग्रिम कार्यवाही सुनिश्चित करें तथा कृत कार्यावाही से इस कार्यालय को भी अवगत करायें।

4-मुख्य अभियन्ता(यमुना)/(पूर्वीगंगा)/(बेतवा-परियोजना)/(सरयू-1)को इस आशय के साथ प्रेषित है कि केन्द्रीय जल आयोग से सम्पर्क स्थापित कर अग्रिम कार्यवाही सुनिश्चित करें तथा कृत कार्यावाही से इस कार्यालय को भी अवगत करायें।

(गोपाल सिंह)
मुख्य अभियन्ता(जल संसाधन)

Annexure-05

537/2022/O/o CE(UGBO)

सत्यमेव जयते

पत्रांक - ऊ.गं.बे.सं/G33/2020-2021/1778-79

भारत सरकार
Government of India
केन्द्रीय जल आयोग
Central Water Commission
मुख्य अभियंता कार्यालय
Office of the Chief Engineer
ऊपरी गंगा बेसिन संगठन
Upper Ganga Basin Organization

दूरभाष सं. - 2715832
फैक्स सं.- 2719834
ईमेल- seoblucknow-cwc@nl

नदी सदन, 21/496, इंदिरा नगर,
लखनऊ -226016

दिनांक - 29-07-2020

सेवा में,

राजेश मिश्रा,
अधीक्षण अभियंता,
सिंचाई कार्य मंडल,
कानपुर ।
Email: sciwckanpur@gmail.com, ceramvangakanpur@gmail.com

विषय: माननीय राष्ट्रीय हरित अधिकरण, नई दिल्ली में विचाराधीन ओ.ए. संख्या- 608/2018 के अंतर्गत यमुना, रामगंगा, बेतवा एवं घाघरा नदियों के ई-फ्लो एवं फ्लड प्लेन जोन के निर्धारण के सम्बन्ध में

सन्दर्भ:- १. पत्रांक:- 2994/सिकामंका/कानपुर दिनांक 17.07.2020.
२. CWC, FCA-II Letter No.4/67/2017-FCA-II/56-58 dated 24.02.2020.

महोदय,

In reference to your letter mentioned above (Ref. Sl. No. 1) vide which status of e-flow monitoring and demarcation of flood plain in Yamuna River has been requested, it is to inform that Yamuna River Basin falls under the jurisdiction of Yamuna Basin Organization (YBO), CWC, New Delhi. Therefore, any further communication in this regards may be undertaken with YBO CWC, New Delhi.

Further, it is also informed that Director, FCA-II, CWC, New Delhi, in response to your letter dated 10.01.2020, vide letter under reference at sl. no. 2, has already suggested that State Govt. may arrange for requisite training for this specific work on their own based on report of flood plain demarcation for River Ganga from Haridwar to Unnao. CWC will provide necessary technical support, if required, to the State Govt. Officials for carrying out the above-mentioned study.

This issue with the approval of Chief Engineer, UGBO.

भवदीय

(आशिष कुमार पाल)
अधीक्षण अभियन्ता (संचालन)

Copy to:

1. CE, YBO, CWC, New Delhi, B-5 Kalindi Bhawan, Tara Cresent Road, Qutub Institutional Area, New Delhi-110016. Email: ceybo-cwc@nic.in. Contact no: 011-26868142.

Annexux- 06

अधिशासी अभियन्ता/अधीक्षण अभियन्ता, बाढ़ प्रबन्धन सूचना प्रणाली केन्द्र/मुख्य अभियन्ता, सूचना प्रणाली संगठन/मुख्य अभियन्ता, शारदा सहायक/प्रमुख अभियन्ता (परिकल्प एवं नियोजन), सिंचाई एवं जल संसाधन विभाग, उत्तर प्रदेश, लखनऊ।/अनुभागीय एवं विभागाध्यक्ष

मा0 राष्ट्रीय हरित अधिकरण (NGT) नई दिल्ली में विचाराधीन ओ0 ए0 सं0– 200/2014 एम. सी. मेहता बनाम यूनियन ऑफ इंडिया व अन्य में पारित आदेश 22.07.2022 के अनुपालन में गंगा नदी के Segment B, Phase II (उन्नाव से बलिया) की Flood Plain zone (FPZ) के निर्धारण एवं सीमांकन (Delineation & Demarcation) का कार्य सिंचाई एवं जल संसाधन विभाग, उ0प्र0 द्वारा किया जाना है। प्रमुख अभियन्ता एवं विभागाध्यक्ष, सिंचाई एवं जल संसाधन विभाग, उ0प्र0 के कार्यालय ज्ञाप सं0– 157/प्र0अ0/एनजीटी/एफपीजेड दिनांक: 20.06.2023 से प्राप्त निर्देश "FPZ निर्धारण कार्य की प्रकृति एवं इसके कार्यान्वयन हेतु आवश्यक आधारभूत व्यवस्था, गेज–डिस्चार्ज डाटा, सेटेलाइट इमेजरिंग, लाइडार डाटा तथा विशेषज्ञों की उपलब्धता एवं समान प्रकृति के कार्य के अनुभव के दृष्टिगत FPZ delineation (विभिन्न zones हेतु co-ordinates का निर्धारण) बाढ़ प्रबंधन सूचना प्रणाली केन्द्र (FMISC), केन्द्रीय सूचना संगठन, लखनऊ द्वारा कराया जायेगा।"

प्रमुख अभियन्ता (परि0 एवं नियो0), सिंचाई एवं जल संसाधन विभाग, उ0प्र0 के कार्यालय ज्ञाप सं0– 281/प्र0अ0(परि0 एवं नियो0)/फ्लड प्लेन जोन दिनांक: 23.08.2023 से प्राप्त निर्देश फ्लड प्लेन जोन के निर्धारण के कार्यों हेतु दिये गये आदेशों के क्रम में उक्त कार्यों के द्वितीय चरण में गंगा नदी में उन्नाव से बलिया तक फ्लड प्लेन जोन के कार्यों के प्रगति एंव कार्यवाही की समीक्षा के लिए पत्रावलियों के रख–रखाव हेतु अधीक्षण अभियन्ता (एफ0एम0आई0एस0सी0) को एतद्द्वारा नामित किया गया, जो अधीक्षण अभियन्ता, मुख्य अभियन्ता (शारदा सहायक)/नोडल अधिकारी एंव मुख्य अभियन्ता (सूचना प्रणाली संगठन), सिंचाई एंव जल संसाधन विभाग उत्तर प्रदेश, लखनऊ से समन्वय स्थापित कर कार्य करेंगे।

NHP के प्रशिक्षण कार्यक्रम के अन्तर्गत डा0 लोहानी, वैज्ञानिक G राष्ट्रीय जलविज्ञान संस्थान (NIH), रूड़की का दिनांक: 31.07.2023 से 04.08.2023 तक HEC–HMS और HEC–RAS माडल से सम्बन्धित प्रशिक्षण विभाग के अधिकारियों को प्रदान किया गया है। प्रशिक्षण की अवधि में उच्च अधिकारियों से डा0 लोहानी की फ्लड प्लेन जोन Demarcation के सम्बन्ध में किये गये विमर्श में गंगा के उन्नाव से बलिया के फ्लड प्लेन के समतल होने के दृष्टिगत FPZ के निर्धारण में सटीकता एवं प्रवीणता की आवश्यकता पर बल दिया गया।

राष्ट्रीय जलविज्ञान संस्थान (NIH), रूड़की के वैज्ञानिकों का FPZ delineation एवं इस प्रकार के पूर्व अनुभवों, संस्थान के जल शक्ति मंत्रालय का एक महत्वपूर्ण सरकारी उपक्रम होने तथा National Hydrology Project (NHP) का तकनीकी परामर्शी का दायित्व निभाने के दृष्टिकोण से मा0 राष्ट्रीय हरित अधिकरण (NGT) नई दिल्ली आच्छादित Flood Plain zone (FPZ) निर्धारण का कार्य को राष्ट्रीय जलविज्ञान संस्थान (NIH), रूड़की (ISO 9001:2015), जल शक्ति मंत्रालय, जल संसाधन विभाग से कराया जाना उचित होगा एवं इस संस्थान द्वारा नदी विकास एवं गंगा जीर्णोधार पर भी कार्य किया जाता है।

कृपया उक्त कार्य हेतु राष्ट्रीय जलविज्ञान संस्थान (NIH), रूड़की (ISO 9001:2015), जल शक्ति मंत्रालय, जल संसाधन विभाग से प्रस्ताव (तकनीकी एवं वित्तीय) प्राप्त करने हेतु अनुमोदन प्रदान करना चाहें।

01/09/23
(हरेन्द्र कुमार)
अधिशासी अभियंता
बाढ़ प्रबन्धन सूचना प्रणाली केन्द्र
सिंचाई विभाग, लखनऊ

01/09/23
(देवेश शुक्ला)
अधीक्षण अभियन्ता
बाढ़ प्रबन्धन सूचना प्रणाली केन्द्र
सिंचाई एवं जल संसाधन विभाग, उ0प्र0, लखनऊ

1/9/23

1/9/23
(अशोक कुमार सिंह)
मुख्य अभियन्ता (शारदा सहायक)

1/9/23
प्रमुख अभियन्ता (परि0 एवं नियो0)

04/09/23
(अनिल कुमार)
प्रमुख अभियन्ता एवं विभागाध्यक्ष

 4335 ANNEXURE-7

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH
NEW DELHI

.....

ORIGINAL APPLICATION NO. 200 OF 2014

(C.WRIT PETITION No. 3727/1985)

(M.A. No. 594/2017 & 598/2017)

IN THE MATTER OF:

M.C. Mehta .....Applicant

Versus

Union of India .....Respondents

AND

ORIGINAL APPLICATION NO. 501 OF 2014
(M.A. No. 404 of 2015)

Anil Kumar Singhal .....Applicant

Versus

Union of India & Ors. .....Respondents

AND

ORIGINAL APPLICATION NO. 146 OF 2015

Society for Protection of Environment & Biodiversity & Anr. .....Applicant

Versus

Union of India & Ors. .....Respondents

AND

APPEAL NO. 63 OF 2015

Confederation of Delhi Industries & CEPT Societies (An Organisation of CETP Societies) .....Applicant

Versus

D.P.C.C. & Ors. .....Respondents

40

AND

ORIGINAL APPLICATION NO. 127 OF 2017

J.K. Srivastava .....Applicant

Versus

Central Pollution Control Board & Ors. .....Respondents

AND

ORIGINAL APPLICATION NO. 133/2017

(WRIT PETITION (C) No. 200/2013)

Swami Gyan Swarop Sanand .....Applicant

Versus

Ministry of Home Affairs & Ors. .....Respondents

COUNSEL FOR APPLICANT:

Mr. M.C. Mehta, Advocate in person
Ms. Katyani and Ms. Mehak Rastogi, Advocates
Mr. Gaurav K. Bansal, Advocate
Mr. Ritwick Dutta & Mr. Rahul Chaudhary, Advocates
Mr. S.K. Bhattacharya and Mr. N.B. Paonam, Advocates

COUNSEL FOR RESPONDENTS:

Ms. P.B. Singh, Advocate
Mr. Rahul Verma, AAG with Dr. Bharti Reddy
Mr. Raj Kumar, Advocate
Mr. Abhishek Attrey, Advocate
Mr. Abhishek Yadav, Advocate
Mr. Pradeep Mishra, Advocate
Mr. Raj Panjwani, Senior Advocate
Mr. Mukesh Verma, Advocate
Mr. Kabir S. Bose, Advocate
Mr. Vijay Bahadur Singh, Senior Advocate along with Mr. Ranjit Rao, AAG for State of U.P
Ms. Antima Bazaz, Advocate for AIDA UPSMA
Mr. Sanjeev Ralli, Advocate for GNCTD/DPCC
Mr. A.R. Takkar, Advocate
Mr. Parag Tripathi, Senior Advocate

Mr. Sanjay Upadhyay, Advocate
Mr. B. V. Niren, Advocate for CGWA
Mr. I. K. Kapila, Advocate
Mr. Devashish Bharuka, Advocate
Ms. Yogmaya Agnihotri, Advocate for CECB
Mr. Raman Yadav, Advocate for UP Jal Nigam
Mr. Jayesh Gaurav, Advocate for JSPCB
Mr. Anil Grover, AAG with Mr. Rahul Khurana, Advocate for State of Haryana
Mr. A. K. Prasad, Advocate
Mr. Rajul Shrivastav, Advocate for MPPCB
Mr. Rajiv Nanda, Advocate
Mr. Vibhav Misra, Advocate
Ms. Shagun, Advocate for WBPCB
Ms. Priyanka Sinha Advocate for Jharkhand
Mr. Rudreshwar Singh, Advocate for BSPCB
Ms. Alpana Poddar, Advocate for CPCB
Mr. U. K. Uniyal, AG for Uttarakhand
Mr. Asheesh Jain, Mr. Ritwick Dutta & Mr. Rahul Chaudhary, Advocates
Mr. Suraj Prakash Singh, Advocate for UPSMA
Mr. Atul Batra, Advocate
Ms. Neelam Rathore, Advocate
Mr. Ajay Kumar Mishra, Senior Advocate with Mr. Kumar Anurag Singh, Advocates
Mr. Motish K. Singh, Advocate
Mr. M. Z. Choudhary, Advocate
Ms. Asha Nayyar Basu, Advocate
Mr. S. Wasim A. Qadri, Advocate
Mr.Amit Anand Tiwari, Advocate for State of UK
Mr. Rashid Saeed, Advocate for CETP
Ms. Diya Kapoor, Advocate
Anunaya Mehta, Advocate
Mr. S.A. Zaidi, Advocate
Mrs. Rachna Gupta, Advocate
Mr. Abhishek Paruthi, Advocate
Mr. Narender Pal Singh, Advocate
Mr. D. Rajeshwar Rao, Advocate for R-4
Mr. Krishna Kumar Singh, Advocate for MoEF
Mr. Moni Cinmoy, Advocate for DSIIDC

JUDGEMENT

PRESENT:
HON'BLE MR. JUSTICE SWATANTER KUMAR (CHAIRPERSON)
HON'BLE DR. JUSTICE JAWAD RAHIM (JUDICIAL MEMBER)
HON'BLE MR. JUSTICE R. S. RATHORE (JUDICIAL MEMBER)
HON'BLE MR. BIKRAM SINGH SAJWAN (EXPERT MEMBER)
HON'BLE DR. AJAY A DESHPANDE (EXPERT MEMBER)
HON'BLE DR. NAGIN NANDA (EXPERT MEMBER)

Reserved on: 31st May, 2017
Pronounced on: 13th July, 2017

1. Whether the judgement is allowed to be published on the net?
2. Whether the judgement is allowed to be published in the NGT Reporter?

JUSTICE SWATANTER KUMAR (CHAIRPERSON)

तवजलममलंयेननिपीतंपरमपदंखलुतेनगृहीतम्।
मातर्गङ्गेत्वयियोभक्तः कलतंद्रष्टुंनयमःशक्तः

Ganga is Holy, thus, as stated above, "he who has drunk your pure water, indeed he will obtain the highest abode". This depicts the extent to which millions of Indians and people from abroad have put their faith in Ganga. It is pristine, it is perennial and probably one of the most celebrated river of all times. Ganga is considered sacred by people for providing life-giving and life-sustaining succour for the environment and ecology. Ganga is not an ordinary river. It is a life-line, a symbol of purity and of virtue, for countless people of India. Millions of Ganga devotees and lovers still throng the river just to have a holy dip, Aachman (Mouthful with holy water), and absolve themselves of their sins. We Indians are raised to consider Ganga as a goddess, as sacred. We tell our children and

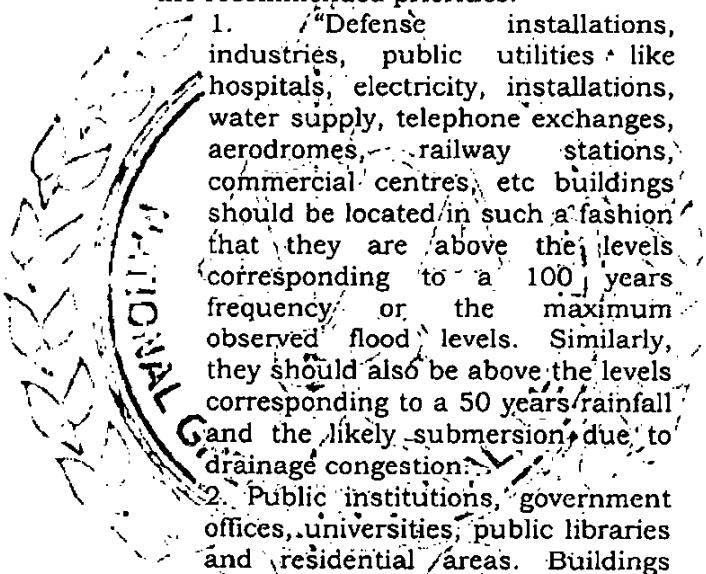
tube-well for extraction of the groundwater.

DEMARCATION OF FLOOD PLAINS, DUMPING OF MUNICIPAL SOLID WASTE, BIO-MEDICAL WASTE AND E-WASTE

142. Being an integral part of the river, floodplain of the river requires protection. Floodplains play significant role in maintaining the bio-diversity and aquatic life of the river. It's significance cannot be overlooked, in terms of environment and ecology. There are numerous dimensions involved while identifying the floodplains. It is required to categorize it into different zones, namely, No Development Zone, Regulated Zone and a Free Zone for development. The principle of Sustainable Development itself justifies the classification of floodplains into such zones for protecting the river. This Tribunal in the case of *Manoj Misra* (supra) had the occasion to deal with the concept of floodplain, its zoning and management. The Tribunal held as under:

> "79. Development and regulation of floodplain of Rivers falls within the purview of the State. Floodplain is an integral part of River system even though it is used only occasionally to pass down flood flows. When floodplain is not occupied by water it forms part of the land system providing possibilities of carrying on some restricted activity. It is not possible to provide uniformity in the extent of floodplains with respect to different Rivers as well as its various reaches.
>
> 80. Floodplain zoning has been accepted as an important nonstructural strategy for flood management. The basic concept of floodplain zoning is to regulate land use of floodplains to restrict damage caused due to floods. The floodplain zoning, therefore, aims at

determination of locations so that flood damages are reduced to minimum. A very restrictive activity can be allowed in that area. It is not only to protect the areas from damage resulting from floods and failure of water protective measures, but is also useful in reducing the damage caused due to drainage congestion, particularly in urban areas. The Commission claims to have prepared a model bill relating to floodplain zoning. This model bill provides for different categories based of priorities in floodplain. Following are the recommended priorities:



1. "Defense installations, industries, public utilities like hospitals, electricity, installations, water supply, telephone exchanges, aerodromes, railway stations, commercial centres, etc buildings should be located in such a fashion that they are above the levels corresponding to a 100 years frequency or the maximum observed flood levels. Similarly, they should also be above the levels corresponding to a 50 years rainfall and the likely submersion due to drainage congestion.
2. Public institutions, government offices, universities, public libraries and residential areas. Buildings should be above a level corresponding to a 25 year flood or a 10 year rainfall with stipulation that all buildings in vulnerable zones should be constructed on columns or stills as indicated above.
3. Parks and playgrounds. Infrastructure such as playgrounds and parks can be located in areas vulnerable to frequent floods. Since every city needs some open areas and gardens, by restricting building activity in vulnerable areas, it will be possible to develop parks and play grounds, which would provide a proper environment for the growth of the city."

permission from CGWA. The CGWA should also regulate extraction of groundwater for agriculture and other purposes as per State policy. The permission shall be granted subject to such terms and conditions as may be necessary for the purpose of preventing and controlling the pollution on the one hand and ensuring maintenance of depletion in the groundwater projects as well as ensuring measures for recharging of the groundwater levels.

4. We direct the CGWA to carry out the study and notify the areas in Segment-B of Phase-1 which are Overexploited, Critical, Semi-critical and Safe zone. There shall be complete prohibition on extraction of groundwater in the critical areas. Further, in relation to other two areas, the CGWA shall also publicize the fundamental conditions subject to which the extraction of groundwater would be permitted and the extent thereof and if necessary would require people to fix the flow meters who are using the borewell or tube-well for extraction of the groundwater.

DEMARCATION OF FLOOD PLAINS AND CONNECTED DIRECTONS

182.3 We pass the following directions for compliance:

i) We direct and constitute a Special Committee

consisting of representatives from MoWR, Senior Officer from Department of Irrigation, State of Uttar Pradesh, Revenue Department of Uttar Pradesh and Central Water Commission which shall identify and demarcate the floodplains of river Ganga in Segment B of Phase-I on one in twenty five years cycle.

ii) Till the said identification and demarcation of floodplain is completed, we direct that 100 meters from the edge of the river would be designated as no development/construction zone in Segment B of Phase-I i.e. Haridwar to Unnao, Kanpur.

iii) The Special Committee would also identify no development/construction zone, regulatory zone and the activities that can be/cannot be carried on in the regulatory zone of the floodplain.

iv) There shall be a complete prohibition on disposing of MSW, E-waste or bio-medical waste on the floodplain or in river Ganga or its tributaries falling in Segment B of Phase-I.

v) As directed in our order dated 11th April, 2017, for each default, the defaulter would be liable to pay Environmental Compensation of Rs. 50,000/- per default for such dumping and/or throwing the

and, there should be no occasion to construct oxidation ponds/wet lands. This study should be completed within six weeks from the date of passing of this order.

183. The Registry of the Tribunal is directed to upload this judgement on the website of NGT today itself. Further, the Ld. Registrar General of NGT should send a personal communication to all the stakeholders, including the Secretaries of the concerned Ministries, Chief Secretary of the State of UP, NMCG and the heads of the local authorities and bodies and the Members of the Committee under this judgement, informing them that the period to be reckoned under the judgement triggers from the date of pronouncement itself and in the event of default or non-compliance, they would be liable to be proceeded against, in accordance with law.

184. In any event, the State, its instrumentalities, local authorities and all other public servants would extend their full cooperation for effectively implementing and executing the directions contained in this judgement. If any officer/official is found to be causing unnecessary impediments in compliance of the judgement, the officer/official concerned shall be liable to be proceeded against, in accordance with law including action for Contempt of Court and payment of personal costs as well.

185. We not only express a pious hope but we are confident that

all stakeholders will work in tandem and extend full cooperation to each other to implement this judgement. They shall make a concerted effort to achieve the object of this national project of cleaning and rejuvenation of river Gang and its tributaries. There is no scope for waiting any further. Stakeholders have to take both effective and remedial measures to restore the pristine nature of the holy river Ganga and its tributaries, now, atleast.

186. Ergo we dispose of the above applications and appeal to the limited extent with the directions and orders as afore-stated, while leaving the respective parties to bear their own costs.

Swatanter Kumar
Chairperson

Jawad Rahim
Judicial Member

Raghuvendra S. Rathore
Judicial Member

Bikram Singh Sajwan
Expert Member

Ajay A Deshpande
Expert Member

Nagin Nanda
Expert Member

New Delhi
13th July, 2017

Annexure-08

T-12/2017-18/268/NMCG
National Mission for Clean Ganga
Ministry of Water Resources, River Development & Ganga Rejuvenation

1st Floor,
Major Dhyan Chand National Stadium
India Gate, New Delhi-110002
Dated: 1st August, 2017

OFFICE MEMORANDUM

Subject: Constitution of Special Committee in the matter of O.A. No. 200 of 2014 – M.C. Mehta Vs Union of India & Ors before the Hon'ble NGT, New Delhi.

****

In pursuance to the directions contained in the judgment passed by Hon'ble NGT on 13th July 2017 in respect of Phase-I, Segment 'B' of River Ganga (Haridwar to Unnao), a Special Committee is hereby constituted as below:

(i)	Sh. S Masood Husain, Member (WP&P), Central Water Commission	Chairman
(ii)	Commissioner (FM), Ministry of Water Resources, River Development & Ganga Rejuvenation	Member
(iii)	Chairman, Ganga Flood Control Commission	Member
(iv)	Additional Chief Secretary, Revenue Department, Uttar Pradesh	Member
(v)	Principal Secretary, Irrigation & Water Resources Department, Government of Uttar Pradesh	Member
(vi)	Executive Director (Technical), National Mission for Clean Ganga	Member
(vii)	Director, National Institute of Hydrology	Member
(viii)	Sr. Joint Commissioner (PP), Ministry of Water Resources, River Development & Ganga Rejuvenation	Member Secretary

The scope of the Special Committee shall be as follows:

a. Identify and demarcate the flood plains of river Ganga in Segment B of Phase I on one in twenty five years cycle or appropriately.
b. Identify no development/construction zone, regulatory zone and the activities that can be/cannot be carried on in the regulatory zone of the floodplain.

This issues with the approval of Competent Authority.

01/8/2017

(Nityananda Ray)
Deputy Secretary

To:

1. Sh. S Masood Husain, M (WP&P), Central Water Commission, Sewa Bhawan (S), R.K. Puram, New Delhi- 110066
2. Commissioner (FM), Ministry of Water Resources, River Development & Ganga Rejuvenation, Shram Shakti Bhavan, Rafi Marg, Sansad Marg Area, New Delhi- 110001
3. Chairman, Ganga Flood Control Commission, Ministry of Water Resources, Govt. of India. 3rd Floor, Sinchai Bhawan, Patna, Bihar - 800 015
4. Additional Chief Secretary, Revenue Department, Lucknow, Uttar Pradesh-226001
5. Principal Secretary, Irrigation & Water Resources Department, Government of Uttar Pradesh, Cantt Road, Udaiganj, Lucknow, Uttar Pradesh - 226001
6. Executive Director (Technical), National Mission for Clean Ganga, Ist Floor, Major Dhyan Chand National Stadium, India Gate, New Delhi-110002
7. Director, National Institute of Hydrology, Roorkee- 247667, Uttarakhand, India.
8. Sr. Joint Commissioner (PP), Ministry of Water Resources, River Development & Ganga Rejuvenation, Shram Shakti Bhavan, Rafi Marg, Sansad Marg Area, New Delhi- 110001

Copy for kind information to:

1. PPS to Secretary, Ministry of Water Resources, River Development & Ganga Rejuvenation, Shram Shakti Bhavan, Rafi Marg, Sansad Marg Area, New Delhi -110001
2. PS to Joint Secretary (PP), Ministry of Water Resources, River Development & Ganga Rejuvenation, Shram Shakti Bhavan, Rafi Marg, Sansad Marg Area, New Delhi -110001
3. PS to Director General, NMCG
4. PS to Deputy Director General, NMCG
5. PS to ED (Project/Finance/Admin), NMCG

Annexure-09

No. L-25011/11/2017- PP
भारत सरकार
Government of India
जल संसाधन ,नदी विकास एवं गंगा संरक्षण मंत्रालय
Ministry of Water Resources, River Development & Ganga Rejuvenation

629, Shram Shakti Bhawan, Rafi Marg,
New Delhi-110001,

Dated: 13th December, 2017

To

As per list.

Subject: Minutes of 1st meeting of the Special Committee constituted in pursuance to the directions contained in the judgment passed by Hon'ble NGT on 13th July, 2017 in respect of Phase-I, Segment 'B' of River Ganga (Haridwar to Unnao).

Sir.

The 1st meeting of the Special Committee, constituted to (i) Identify and demarcate the flood plains of river Ganga in Segment B of Phase I (Haridwar to Unnao) on one in twenty five years cycle or appropriately and (ii) Identify no development/construction zone, regulatory zone and the activities that can be/cannot be carried on in the regulatory zone of the floodplain, was held on 5th December 2017 in the Committee Room, CWC, Sewa Bhawan, R. K. Puram, New Delhi.

In this regard, minutes of 1st meeting of the Special Committee is enclosed for information and necessary action.

Yours faithfully,

13/12/17

(Bhupesh Kumar)
Sr. Joint Commissioner (PP) &
Member-Secretary of the Committee

To:

1. Chairman, Ganga Flood Control Commission, Govt. of India, 3rd Floor, Sinchai Bhawan, Patna, Bihar - 800 015.
2. Additional Chief Secretary, Revenue Department, Lucknow, Uttar Pradesh-226001.
3. Principal Secretary, Irrigation & Water Resources Department, Government of Uttar Pradesh, Cantt Road, Udaiganj, Lucknow, Uttar Pradesh – 226001.
4. Commissioner (FM), Ministry of Water Resources, River Development & Ganga Rejuvenation, CGO Complex, Lodi Road, New Delhi- 110003.
5. Engineer-in-Chief, Irrigation & Water Resources Department, Cantt Road, Udaiganj, Lucknow, Uttar Pradesh – 226001.
6. Executive Director (Technical), National Mission for Clean Ganga, Ist Floor, Major Dhyan Chand National Stadium, India Gate, New Delhi-110002
7. Director, National Institute of Hydrology, Roorkee - 247667, Uttarakhand.
8. Dr. K H V Durga Rao, Head, Disaster Management Support Division, National Remote Sensing Centre, Balanagar Hyderabad - 500 042.
9. Dr. V.M. Chowdary, Scientist/Engineer 'SG', ISRO, Plot No.7, Planning Area Centre, Joseph Tito Marg, Sadiq Nagar, New Delhi-110049.
10. Chief Engineer, Upper Ganga Basin Organization, CWC, Jahnavi Sadan, 21/496, Indira Nagar, Lucknow-226 016.
11. Chief Engineer (EMO), CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.
12. Superintending Engineer, Ganga Nahar Sanchalan Mandal, Uttar Pradesh Irrigation & Water Resources Department, Pallavpuram Phase-I, Meerut.
13. Director (FM-II), 9th Floor, CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.
14. Director (FCA-II), CWC, West Block-2, Wing -1, Sector-1, R. K. Puram, New Delhi-110066.
15. Director (RDC-II), CWC, West Block-1, Wing -4, Sector-1, R. K. Puram, New Delhi-110066.
16. Senior Joint Commissioner-II, NHP, MoWR,RD&GR, CGO Complex, Lodi Road New Delhi with a request to provide the status of development of DEM of river Ganga from Haridwar to Unnao under National Hydrology Project.
17. Director, Ganga Flood Control Commission, 103, 1st Floor, Dr. Ram Manohar Lohia Parikalp Bhawan, Teli Bag, Lucknow 226 025.
18. Sh. Pratul Srivastava, AGM, RMSI Pvt. Limited, A-8 Block, Sector 16, Noida, Uttar Pradesh-201 301.

Copy for information to:

19. PPS to Director General, NMCG, 1st Floor, Major Dhyan Chand National Stadium, India Gate, New Delhi-110002.
20. PPS to Member (WP&P), CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.
21. PPS to Joint Secretary (PP), Ministry of Water Resources, River Development & Ganga Rejuvenation, Shram Shakti Bhavan, Rafi Marg, Sansad Marg Area, New Delhi -110001.

21.09.2017

Minutes of 1st meeting of the Special Committee, constituted to identify and demarcate the flood plains of river Ganga in respect of Phase-I, Segment 'D' of River Ganga (Haridwar to Unnao)

The first meeting of the Committee constituted to identify and demarcate the flood plains of river Ganga in Segment D of Phase I (Haridwar to Unnao) was held under the chairmanship of Shri S. Masood Husain, member (WP&P), CWC on 21.09.2017 at 15.00 Hrs. in CWC Committee Room, Sewa Bhawan, R.K. Puram, New Delhi. The List of participants of the meeting is enclosed at Annex-I.

2. At the outset, Chairman of the Committee welcomed the participants of the Committee. After a brief introduction of the participants, the following agenda items were taken up for discussion:-

(2.1) After the initial comments of the Chairman, Member-Secretary of the Committee gave a brief background of the above Committee constituted in pursuance of the NGT order dated 13th July 2017.

(2.2) Dr. V.M. Chowdary, Scientist/Engineer 'SG', National Remote Sensing Centre, New Delhi made a brief presentation on the aggregated flood inundated areas from Haridwar to Unnao based on historical satellite observations during the years from 2003 to 2013. The satellite based flood inundated area from Haridwar to Unnao as on 14th August 2017 was also shown by him.

(2.3) Thereafter, representative of RMSI Pvt. Limited made a presentation on the study carried out on flood risk assessment in Ganga Basin using SRTM 90 m. In the presentation, flood hazard maps generated for 2, 5, 10, 25, 50, and 100 year return period events were shown. He explained that data with better resolution, embankment details, land use/land cover, discharge data, etc would be required for further refinement and more accuracy of the results.

(2.4) The officers of Irrigation & Water Resources Department, Govt. of Uttar Pradesh, presented a map of flood inundation in the study reach of river Ganga, corresponding to the maximum flood event of 18th June 2013. The map has been prepared by the Remote Sensing Agency, Govt. of Uttar Pradesh.

(2.5) Sh. Ritesh Khattar, Director (FCA-II), CWC made a presentation explaining the limitations of using the existing satellite imageries or study conducted by RMSI Pvt. Ltd. to identify and demarcate the flood plains of river Ganga from Haridwar to Unnao. He projected the requirement of 2D modeling for this work with high resolution DEM.

(2.6) Chief Engineer (UGBO), CWC, intimated that the work of development of Digital Elevation Model (DEM) with higher resolution has been given to Survey of India under National Hydrology Project (NHP), which may be useful for this work. It was decided to get the status of development of DEM of river Ganga from Haridwar to Unnao under National Hydrology Project from the concerned officials of NHP.

(2.7) After detailed discussion, it was decided to constitute a Core Group having the following composition to identify and demarcate the flood plains of river Ganga from Haridwar to Unnao, as per the details given below:-

Composition of the Core Group:

a) Shri Ritesh Khattar, Director, FCA-II Dte, CWC, New Delhi (He will act as a coordinator of the group).
b) Director, River Data Compilation-II Dte, CWC, New Delhi.
c) Dr. K H V Durga Rao, Head, Disaster Management Support Division, NRSC, Balanagar Hyderabad. (Dr. V.M. Chowdary, Scientist/Engineer 'SG', NRSC, who is locally available at New Delhi, may also be associated as per requirement)
d) Superintending Engineer, Ganga Nahar Sanchalan Mandal, Irrigation & Water Resources Department, Govt. of U.P., Pallavpuram Phase-I, Meerut.
e) Director, GFCC, Lucknow.

Tentative details of the work to be carried out by Core Group are given at Annex-II.

3. Chairman of the Committee advised that the Core Group should work in a time bound manner and report its progress to the Committee within a month. The next meeting of the Committee will be held after one month.

4. The meeting ended with a vote of thanks to the Chair.

Annex-I

1st meeting of the Special Committee constituted to identify and demarcate flood plains of river Ganga in Segment B of Phase I (Haridwar to Unnao) held on 5th December 2017 at 03:00 PM

List of Participants

1. Sh. S. Masood Husain, Member (WP&P), CWC, New Delhi – In chair.
2. Sh. Arun Kumar Sinha, Chairman, GFCC, Patna.
3. Sh. J. Chandrashekhar Iyer, Commissioner (FM), MoWR, RD & GR, New Delhi.
4. Sh. Ajay Kumar Singh, Engineer-in-Chief, Irrigation & Water Resources Department, Uttar Pradesh, Lucknow.
5. Sh. Ajay Kumar Bansal, Chief Engineer (Water Resources), Irrigation & Water Resources Department, Uttar Pradesh, Lucknow.
6. Sh. V.K. Mishra, Superintending Engineer, Ganga Nahar Sanchalan Mandal, Uttar Pradesh Irrigation & Water Resources Department, Pallavpuram Phase-I, Meerut.
7. Sh. Bhopal Singh, Chief Engineer, Upper Ganga Basin Organization, CWC, Lucknow.
8. Sh. Yogesh Paithankar, Chief Engineer (EMO), CWC, New Delhi.
9. Dr. V.M. Chowdary, Scientist/Engineer 'SG', National Remote Sensing Centre, New Delhi.
10. Dr. V.P. Mishra, Deputy Collector, Bulandsahar, Uttar Pradesh.
11. Sh. Bhupesh Kumar, Senior Joint Commissioner (PP), MoWR, RD & GR, New Delhi.
12. Sh. Vineet Gupta, Director (WP&P), CWC, New Delhi
13. Sh. Ram Jeet Verma, Director (RDC-2), CWC, New Delhi
14. Sh. Ritesh Khattar, Director (FCA-II), CWC, New Delhi
15. Sh. Manoj Kumar, Director (FM-II), CWC, New Delhi
16. Dr. Pradeep Kumar, Scientist 'C, National Institute of Hydrology, Roorkee.
17. Dr. Muralikrishna. M, DGM, RMSI Pvt. Limited, Sector 16, Noida, UP.
18. Sh. Pratul Srivastava, AGM, RMSI Pvt. Limited, Sector 16, Noida, U.P.
19. Sh. Vishnu, Senior Flood Modelor, RMSI Pvt. Limited, Sector 16, Noida U.P.

Annex-II

Tentative details of the work to be carried out by the Core Group

I. Data collection and compilation of available information

- Shape files of hazard maps from RMSI, Noida corresponding to 2, 5, 10, 25, 50, 100 return period events
- HECRAS & HECHMS models files from RMSI, Noida
- Flood frequency analysis done by RMSI, Noida in the study reach
- River cross-sections for the CWC HO sites in the study reach
- Flood frequency analysis done by IIT Roorkee for the Morphological studies of river Ganga for CWC
- River cross-sections of the river Ganga in the study reach, available with the Irrigation & Water Resources Deptt., Govt. of U.P.
- Digital layers of inundation extent in the study reach corresponding to the flood events of 23rd Sep 2010 & 18th June 2013, available with the Irrigation & Water Resources Deptt., Govt. of U.P.
- Digital layers of hazard zones/aggregated (2003-13)/Historical events from NRSC
- Details of Embankment, roads, water bodies, hydraulic structure, residential areas, agriculture fields, monuments, etc. from the Irrigation & Water Resources Deptt., Govt. of U.P.

II. Identification of flood events dates corresponding to 2, 5, 10, 25, 50, 100 return period events and supplying the same to NRSC for further analysis.

III. Processing of collected information

- Overlay of Flood extent boundaries based on information provided by the State Govt. of U.P., NRSC and RMSI
- Overlay of district and block layer
- Overlay of embankment, roads, water bodies, hydraulic structure, residential areas, agriculture fields, monuments, etc.

No. L-25012/11/2017- PP -170+188

भारत सरकार

Government of India

जल संसाधन ,नदी विकास एवं गंगा संरक्षण मंत्रालय

Ministry of Water Resources, River Development & Ganga Rejuvenation

629, Shram Shakti Bhawan, Rafi Marg,
New Delhi-110001,

Dated: 16th February, 2018

To

As per list.

Subject: Minutes of 2nd meeting of the Special Committee constituted in pursuance to the directions contained in the judgment passed by Hon'ble NGT on 13th July, 2017 in respect of Phase-I, Segment 'B' of River Ganga (Haridwar to Unnao).

Sir,

The 2nd meeting of the Special Committee, constituted to (i) Identify and demarcate the flood plains of river Ganga in Segment B of Phase I (Haridwar to Unnao) on one in twenty five years cycle or appropriately and (ii) Identify no development/construction zone, regulatory zone and the activities that can be/cannot be carried on in the regulatory zone of the floodplain, was held on 30th January 2018 in the Committee Room, CWC, Sewa Bhawan, R. K. Puram, New Delhi.

In this regard, minutes of 2nd meeting of the Special Committee is enclosed for information and necessary action.

Yours faithfully,

16/2/18

(Bhupesh Kumar)
Sr. Joint Commissioner (PP) &
Member-Secretary of the Committee

To:

1. Chairman, Ganga Flood Control Commission, Govt. of India, 3rd Floor, Bhaiini Bhawan, Patna, Bihar - 800 015.
2. Additional Chief Secretary, Revenue Department, Lucknow, Uttar Pradesh-226001.
3. Principal Secretary, Irrigation & Water Resources Department, Government of Uttar Pradesh, Canal Road, Udaiganj, Lucknow, Uttar Pradesh - 226001.
4. Commissioner (FM), Ministry of Water Resources, River Development & Ganga Rejuvenation, CGO Complex, Lodi Road, New Delhi- 110003.
5. Engineer-in-Chief, Irrigation & Water Resources Department, Canal Road, Udaiganj, Lucknow, Uttar Pradesh – 226001.
6. Executive Director (Technical), National Mission for Clean Ganga, Ist Floor, Major Dhyan Chand National Stadium, India Gate, New Delhi-110002
7. Director, National Institute of Hydrology, Roorkee - 247667, Uttarakhand.
8. Dr. K H V Durga Rao, Head, Disaster Management Support Division, National Remote Sensing Centre, Balanagar Hyderabad - 500 042.
9. Dr. G. Sreenivasan, OM (I/C) & Scientist 'SG' RRSC-North, NRSC, Plot No.7, Planning Area Centre, Joseph Tito Marg, Sadiq Nagar, New Delhi-110049.
10. Chief Engineer, Upper Ganga Basin Organization, CWC, Jalnayi Sadan, 21/496, Indira Nagar, Lucknow-226 016.
11. Chief Engineer (EMO), CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.
12. Superintending Engineer, Ganga Nahar Sanchalan Mandal, Uttar Pradesh Irrigation & Water Resources Department, Pallavpuram Phase-I, Meerut.
13. Director (FM-II), 9th Floor, CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.
14. Director (FCA-II), CWC, West Block-2, Wing -1, Sector-1, R. K. Puram, New Delhi-110066.
15. Director (RDC-II), CWC, West Block-1, Wing -4, Sector-1, R. K. Puram, New Delhi-110066.
16. Director, Ganga Flood Control Commission, 103, 1st Floor, Dr. Ram Manohar Lohia Parikalp Bhawan, Tell Bag, Lucknow 226 025.

Copy for information to:

17. PPS to Chairman, CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.
18. PPS to Director General, NMCG, 1st Floor, Major Dhyan Chand National Stadium, India Gate, New Delhi-110002.
19. PPS to Member (WP&P), CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.
20. PPS to Joint Secretary (PP), Ministry of Water Resources, River Development & Ganga Rejuvenation, Shram Shakti Bhavan, Rafi Marg, Sansad Marg Area, New Delhi -110001.

Minutes of 2nd meeting of the Special Committee, constituted to identify and demarcate the flood plains of river Ganga in respect of Phase-I, Segment 'II' of River Ganga (Haridwar to Unnao)

The second meeting of the Committee constituted to identify and demarcate the flood plains of river Ganga in Segment II of Phase I (Haridwar to Unnao) was heldunder the chairmanship of Shri S. Masood Husain, Chairman & Member (WP&P), CWC on 30th January 2018 at 16.00 Hrs. in CWC Committee Room, Sewa Bhawan, R.K. Puram, New Delhi. The List of participants of the meeting is enclosed at Annex-I.

2. At the outset, Chairman of the Committee welcomed the participants of the Committee. Thereafter, Director (FCA-II), CWC made a presentation on the status of information collected from different agencies by the Core Group constituted to identify and demarcate the flood plains of river Ganga from Haridwar to Unnao along with analysis and modelling done on the basis of the available data / technology / model. Information collected so far by the Core Group from different agencies was presented before the Committee. The envelope of flood extent corresponding to two satellite imageries 23 Sep 2010 and 18 June 2013 was digitised manually using corresponding WMS layer provided by NRSC. To overcome the limitations of 1D modelling and better utilize the DEM data, two dimensional modelling using 90 m SRTM free DEM data was taken up, which was latter compared with satellite information of NRSC and RMSI, Noida studies.

3. Discussions were also held on different aspects of DEM data and the satellite imageries. NRSC informed about the Cartosat DEM data which has better resolution. NRSC was requested to provide Cartosat data and aggregated layer (2003-13) derived from satellite imageries to further check the analysis.

4. After the detailed discussion, it was decided that Core Group may prepare a report on the basis of the analysis done so far mentioning the assumption made and/or limitations of the study. This draft report may be circulated to Committee members / other experts for their comments. After receipt of the comments on the report, Core Group may examine the feasibility of incorporation of these comments in their report and present the draft report in the next meeting.

5. In respect of other TOR of the committee i.e. identify no development/construction zone, regulatory zone and the activities that can be/cannot be carried in the regulatory zone of the floodplain, it was decided that core group may explore and analyze the reports/notes/international practises already available in respect of flood plain zoning and the activities that can be/cannot be carried in the regulatory zone of the flood plain and present in the next meeting.

6. The meeting ended with a vote of thanks to the Chair.

13

Annex-I

2nd meeting of the Special Committee constituted to identify and demarcate flood plains of river Ganga in Segment B of Phase I (Haridwar to Unnao) held on 30th January, 2018

List of Participants

1. Sh. S. Masood Husain, Chairman & Member (WP&P), CWC, New Delhi - In chair.
2. Sh. D.P. Mathuria, Executive Director, NMCG, New Delhi.
3. Sh. L.K. Taneja, Member (C), GFCC, Patna.
4. Sh. V.K. Mishra, S.E. Irrigation & Water Resources Department, Uttar Pradesh, Lucknow.
5. Dr. Sanjay Kumar Jain, Scientist 'G, National Institute of Hydrology, Roorkee.
6. Dr. G. Sreenivasan, GM (L/C) & Scientist 'SG' RRSC-North , NRSC, New Delhi.
7. Sh. Bhupesh Kumar, Senior Joint Commissioner (PP), MoWR, RD & GR, New Delhi.
8. Shri Rakesh Toteja, Senior Joint Commissioner (FM), MoWR, RD & GR, New Delhi.
9. Sh. Vineet Gupta, Director (WP&P), CWC, New Delhi
10. Sh. Ritesh Khattar, Director (FCA-II), CWC, New Delhi
11. Shri Vivek Pal, Director, GFCC, Lucknow.
12. Sh. Manoj Kumar, Director (FM-II), CWC, New Delhi
13. Sh. Shiv Prakash, S.E. (Coord), Upper Ganga Basin Organization, CWC, Lucknow.
14. Sh. Pankaj Kumar Singh, Dy. Commissioner (FM), MoWR, RD & GR, New Delhi.

No. L-25012/11/2017-PP-Hon'ble NGT/1120
भारत सरकार
Government of India
जल संसाधन, नदी विकास एवं गंगा संरक्षण मंत्रालय
Ministry of Water Resources, River Development & Ganga Rejuvenation

629, Shram Shakti Bhawan, Rafi Marg,
New Delhi-110001.

Dated: 31st May, 2018

To

As per list.

Subject: Minutes of 3rd meeting of the Special Committee constituted in pursuance to the directions contained in the judgment passed by Hon'ble NGT on 13th July, 2017 in respect of Phase-I, Segment 'B' of River Ganga (Haridwar to Unnao).

Sir,

The 3rd meeting of the Special Committee, constituted to (i) identify and demarcate the flood plains of river Ganga in Segment B of Phase I (Haridwar to Unnao) on one in twenty five years cycle or appropriately and (ii) identify no development/construction zone, regulatory zone and the activities that can be/cannot be carried on in the regulatory zone of the flood plain, was held on 23rd April 2018 in the Committee Room, CWC, Sewa Bhawan, R. K. Puram, New Delhi.

In this regard, minutes of 3rd meeting of the Special Committee is enclosed for information and necessary action.

Yours faithfully,

(Bhupesh Kumar)
Sr. Joint Commissioner (PP) &
Member-Secretary of the Committee
011-23719503

To:

1. Chairman, Ganga Flood Control Commission, Govt. of India, 3rd Floor, Sinchai Bhawan, Patna, Bihar - 800 015.
2. Additional Chief Secretary, Revenue Department, Lucknow, Uttar Pradesh-226001.
3. Principal Secretary, Irrigation & Water Resources Department, Government of Uttar Pradesh, Cantt Road, Udaiganj, Lucknow, Uttar Pradesh – 226001.
4. Commissioner (FM), Ministry of Water Resources, River Development & Ganga Rejuvenation, CGO Complex, Lodi Road, New Delhi- 110003.
5. Engineer-in-Chief, Irrigation & Water Resources Department, Cantt Road, Udaiganj, Lucknow, Uttar Pradesh – 226001.
6. Chief Engineer (WR), UP Irrigation & WR Deptt, Cantt Road, Udaiganj, Lucknow Uttar Pradesh – 226001.
7. Chief Engineer (Ganga), UP Irrigation & WR Deptt, Saket, Meerut.
8. Executive Director (Technical), National Mission for Clean Ganga, Ist Floor, Major Dhyan Chand National Stadium, India Gate, New Delhi-110002.
9. Director, National Institute of Hydrology, Roorkee - 247667, Uttarakhand.
10. Dr. K H V Durga Rao, Head, Disaster Management Support Division, National Remote Sensing Centre, Balanagar Hyderabad - 500 042.
11. Dr. Vinod Kumar Sharma, Scientist 'SG' RRSC-North, NRSC, Plot No.7, Planning Area Centre, Joseph Tito Marg, Sadiq Nagar, New Delhi-110049.
12. Chief Engineer, Upper Ganga Basin Organization, CWC, Jahnavi Sadan, 21/496, Indira Nagar, Lucknow-226 016.
13. Chief Engineer (EMO), CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.
14. Chief Engineer (HSO), CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.
15. Director (FM-II), 9th Floor, CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.
16. Director (FCA-II), CWC, West Block-2, Wing -1, Sector-1, R. K. Puram, New Delhi-110066.
17. Director (RDC-II), CWC, West Block-1, Wing -4, Sector-1, R. K. Puram, New Delhi-110066.
18. Director, Ganga Flood Control Commission, 103, 1st Floor, Dr. Ram Manohar Lohia Parikalp Bhawan, Teli Bag, Lucknow 226 025.

Copy for information to:

19. PPS to Chairman, CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.
20. PPS to Member (WP&P), CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.
21. PPS to Member (D&R), CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.

Minutes of 3rd meeting of the Special Committee, constituted to identify and demarcate the flood plains of river Ganga in respect of Phase-I, Segment 'B' of River Ganga (Haridwar to Unnao)

The third meeting of the Committee constituted to identify and demarcate the flood plains of river Ganga in Segment B of Phase-I (Haridwar to Unnao) was held on 23.04.2018 at CWC, Sewa Bhawan, New Delhi. The List of participants of the meeting is enclosed at Annex-I.

2. At the outset, Chairman of the Committee welcomed the participants of the Committee. The Member Secretary of the Committee intimated that the draft report to identify and demarcate the flood plains of river Ganga in Segment B of Phase I (Haridwar to Unnao) was circulated to the committee members for submission of comments, if any, by 16th April, 2018. In response, NRSC conveyed few comments on the report, which were forwarded to Director (FCA-II) for examining the feasibility of incorporation of the comments of NRSC.

3. Thereafter, Director (FCA-II), CWC made a presentation on the draft report to identify and demarcate the flood plains of river Ganga in Segment B of Phase I (Haridwar to Unnao). Director (FCA-II), CWC intimated that subsequent to conversion of vertical datum of Cartosat 30 m from WGS to EGM (2008) as suggested by NRSC, the difference between SRTM and CARTO DEMs has narrowed down to acceptable limits.

4. The Chief Engineer, Irrigation Department, Govt. of UP intimated that the average width of flood plain corresponding to various flood return period (2 years to 100 years) is ranging from 11.30 km to 12.80 km, which appears to be on higher side. He requested to review the studies carried out in this regard.

5. Director, FCA-II intimated that average width based on available satellite images provided by NRSC was 8.80 Km. The model results for various return periods were higher due to non inclusion of existing protection measures in the flood plain and other factors, which have been clearly stated in draft interim report.

6. Director FCA-2 also stated that extent of flood plain cannot be calculated accurately using one dimensional approach as suggested by few members, since accounting of flow in lateral direction is equally important in determination of flood plain, which can be done by two dimensional modeling using DEM & river bathymetry, if available. Member (D&R) stated that reasonable results from a coarser model are better than absurd results like 11 km width in 2 years return period from a finer 2D model with all conditions, all limitations and all assumptions.

7. The Chief Engineer, Irrigation Department, Govt. of UP also requested to incorporate location and details of bunds/embankments and cross-sections of river in the study for better results. In response, it was intimated that as decided during the first meeting of the Committee, the details of Embankment, roads, water bodies, hydraulic structure, residential areas, agriculture fields, monuments, etc. were sought from the Irrigation & Water Resources Deptt., Govt. of U.P. The details are awaited from the Govt. of U.P.

8. Director, GFCC, Lucknow made a presentation in respect of other TOR of the committee i.e. identify no development/construction zone, regulatory zone and the activities that can be/cannot be carried in the regulatory zone of the floodplain. During the presentation, various provisions proposed (i) in the Model Bill for Flood Plain Zoning circulated by CWC

to States/UTs in 1975, (ii) by an Expert Committee constituted by MoWR,RD&GR for identification of Flood Prone Area on scientific basis and (iii) Concept paper on River Conservation Zone by MoEF (2012) were elaborated.

9. After the detailed discussion, the following was decided.

- Irrigation Department, Govt. of UP will provide the details of Embankment, bunds, water bodies, hydraulic structure, residential areas, agriculture fields, monuments, etc., at the earliest
- Irrigation Department, Govt. of UP will provide the cross-sections of the river (from Haridwar to Unnao) at 5 km interval (or at closer interval where topography demands) upto 1 metre above HFL.
- Flood frequency analysis may be got examined by Hydrological Studies Organization, CWC, New Delhi.
- In view of the above, study may be validated again incorporating the above details taking technical assistance of D&R Wing.
- Flood plain zoning may be firmed up after finalization of flood plain extent as per the study.

10. The meeting ended with a vote of thanks to the Chair.

Annexure

3rd meeting of the Special Committee constituted to Identify and demarcate flood plains of River Ganga in Segment B of Phase I (Haridwar to Unnao) held on 23rd April, 2018

List of Participants

1. Shri N. K. Mathur, Member (D&R), CWC – In Chair.
2. Shri A.K. Sinha, Chairman, GFCC, Patna.
3. Shri Bhopal Singh, Chief Engineer, UGBO, CWC, Lucknow.
4. Dr. Vinod Kumar Sharma, Scientist 'SG' RRSC-North , NRSC, New Delhi.
5. Shri Ajay Bansal, Chief Engineer (WR), UP Irrigation & WR Deptt, Lucknow.
6. Shri K.K. Jain, Chief Engineer (Ganga), UP Irrigation & WR Deptt, Meerut.
7. Shri Dineshwar Shukla, Chief Engineer (Yamuna), UP Irrigation & WR Deptt, Okhla.
8. Dr. Sanjay Kumar Jain, Scientist 'G', National Institute of Hydrology, Roorkee.
9. Shri S.K. Juneja, Scientist D, CGWB, Faridabad.
10. Shri Rishi Srivastava, Director, Remote Sensing, CWC, New Delhi.
11. Shri N. N. Roy, Director, Hydrology (S), CWC, New Delhi.
12. Shri Bhupesh Kumar, SJC (PP), MoWR, RD & GR, New Delhi.
13. Shri Ritesh Khattar, Director (FCA-II), CWC, New Delhi.
14. Shri Vivek Pal, Director, GFCC, Lucknow.

No. L-25012/11/2017- PP- 100+118

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जल संसाधन ,नदी विकास एवं गंगा संरक्षण मंत्रालय

Ministry of Water Resources, River Development & Ganga Rejuvenation

629, Shram Shakti Bhawan, Rafi Marg,
New Delhi-110001.

Dated: 24th April, 2019

To

As per list.

Subject: Minutes of 4th meeting of the Special Committee constituted in pursuance to the directions contained in the judgment passed by Hon'ble NGT on 13th July, 2017 in respect of Phase-I, Segment 'B' of River Ganga (Haridwar to Unnao).

Sir,

The 4th meeting of the Special Committee, constituted to (i) Identify and demarcate the flood plains of river Ganga in Segment B of Phase I (Haridwar to Unnao) on one in twenty five years cycle or appropriately and (ii) Identify no development/construction zone, regulatory zone and the activities that can be/cannot be carried on in the regulatory zone of the flood plain, was held on 22nd April 2019 at CWC, Sewa Bhawan, New Delhi.

In this regard, minutes of 4th meeting of the Special Committee is enclosed for information and necessary action.

Yours faithfully,

24/4/19

(Bhupesh Kumar)
Sr. Joint Commissioner (PP) &
Member-Secretary of the Committee
011-23719503

ISSUE
25/4

To:

1. Chairman, Ganga Flood Control Commission, Govt. of India, 3rd Floor, Sinchai Bhawan, Patna, Bihar - 800 015.
2. Additional Chief Secretary, Revenue Department, Lucknow, Uttar Pradesh-226001.
3. Principal Secretary, Irrigation & Water Resources Department, Government of Uttar Pradesh, Cantt Road, Udaiganj, Lucknow, Uttar Pradesh – 226001.
4. Commissioner (FM), Ministry of Water Resources, River Development & Ganga Rejuvenation, CGO Complex, Lodi Road, New Delhi- 110003.
5. Engineer-in-Chief, Irrigation & Water Resources Department, Cantt Road, Udaiganj, Lucknow, Uttar Pradesh – 226001.
6. Chief Engineer (WR), UP Irrigation & WR Deptt, Cantt Road, Udaiganj, Lucknow Uttar Pradesh – 226001.
7. Chief Engineer (Ganga), UP Irrigation & WR Deptt, Saket, Meerut.
8. Superintending Engineer, Ganga Nahar Sanchalan Mandal, Uttar Pradesh Irrigation & Water Resources Department, Pallavpuram Phase-I, Meerut (UP).
9. Executive Director (Technical), National Mission for Clean Ganga, Ist Floor, Major Dhyan Chand National Stadium, India Gate, New Delhi-110002.
10. Director, National Institute of Hydrology, Roorkee - 247667, Uttarakhand.
11. Dr. Vinod Kumar Sharma, Scientist 'SG' RRSC-North, NRSC, Plot No.7, Planning Area Centre, Joseph Tito Marg, Sadiq Nagar, New Delhi-110049.
12. Chief Engineer, Upper Ganga Basin Organization, CWC, Jahnavi Sadan, 21/496, Indira Nagar, Lucknow-226 016.
13. Director (Remote Sensing), CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.
14. Director (FCA-II), CWC, West Block-2, Wing -1, Sector-1, R. K. Puram, New Delhi- 110066.
15. Director, Ganga Flood Control Commission, 103, 1st Floor, Dr. Ram Manohar Lohia Parikalp Bhawan, Tell Bag, Lucknow 226 025.
16. Director (RDC-II), CWC, West Block-1, Wing -4, Sector-1, R. K. Puram, New Delhi- 110066.

Copy for information to:

17. Justice Arun Tandon, Chairman, Monitoring Committee.
18. Dr. Anita Roy, Member, Monitoring Committee.
19. PPS to Member (WP&P), CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.

Minutes of 4th meeting of the Special Committee, constituted to Identify and demarcate the flood plains of river Ganga in respect of Phase-I, Segment 'B' of River Ganga (Haridwar to Unnao)

The fourth meeting of the Committee constituted to identify and demarcate the flood plains of river Ganga in Segment B of Phase I (Haridwar to Unnao) was held on 22.04.2019 at CWC, Sewa Bhawan, New Delhi. The list of participants of the meeting is enclosed at Annex-I.

2. At the outset, Chairman of the Committee welcomed the participants of the Committee. Thereafter, Director (FCA-II), CWC made a presentation on the identification and demarcation of the flood plains of river Ganga in Segment B of Phase I (Haridwar to Unnao). During the meeting, it was intimated that the draft report to identify and demarcate the flood plains of river Ganga in Segment B of Phase I (Haridwar to Unnao) was circulated to the members of special committee in April 2018 for comments. During the 3rd meeting of special committee, the Chief Engineer, Irrigation Department, Govt. of UP intimated that the average width of flood plain corresponding to various flood return period (2 years to 100 years) appears to be on higher side. He requested to re-view the studies carried out in this regard. Accordingly, Govt. of UP was requested to provide details of bunds/embankments and cross-sections of river for better results and it was decided that the study may be reviewed again incorporating the additional input received from the Govt. of UP. However, the requisite information is still awaited from the Govt. of UP.

3. The committee was briefed about the further actions taken subsequent to the 3rd meeting, which are as under.

i. HSO, CWC has examined the flood frequency analysis and revised the return period flood for different years.
ii. Satellite datasets of JRC (Joint Research Centre-European Commission) have been used to generate flood extent corresponding to higher recurrence interval like 2 to 5 years i.e. No development zone
iii. Model studies have also been refined by using lean season satellite images and available cross-sections and then reconditioning the original SRTM 90 m DEM with it.
iv. Activities to be identified under flood plain zones have also been identified by referring concept paper prepared by MOEF&CC.

4. During the meeting, the following options for flood demarcation were presented before the committee.

a. Flood Plain Demarcation fully based on Satellite Images (No Development Zone : area 1483 Sq Km & average width 2.3 Km, Regulatory Zone : area 5643 Sq Km & average width = 8.8 -2.3 = 6.5 Km)

b. Model based Flood Plain Demarcation with revised flood frequency analysis (No Development Zone : Area 1920 Sq Km & Average width = 2.97 Km, Regulatory Zone : area 4756 Sq Km & average width = 7.37- 2.97 = 4.4 Km)

c. Model based Flood Plain Demarcation with revised flood frequency analysis and gap filling (No Development Zone: Area 2580 Sq Km & Average width = 4 Km, Regulatory Zone: area 6118 Sq Km & average width = 9.48-4.0 = 5.48 Km)

d. Hybrid based Flood Plain Demarcation combining results of satellite imageries and model with gap filling (No Development Zone: area 3176 Sq Km & average width = 4.92 Km, regulatory zone: area 7281 Sq Km & average width = 11.28-4.92 = 6.36 Km)

5. After the detailed discussion, the following decisions were made:

- Hybrid based Flood Plain Demarcation combining results of satellite imageries and model with gap filling will be sent to Irrigation Department, Govt. of UP for ground truth verification near all important cities/municipalities/major habitations

- Considering urgency of the matter, Irrigation Department, Govt. of UP will complete the exercise of ground truth verification within 45 days in consultation with core group / officers in field offices of CWC/GFCC

- Activities that can be/cannot be carried in the No Development Zone/Regulatory zone of the flood plain may be further reviewed and presented during the next meeting.

6. The meeting ended with a vote of thanks to the Chair.

4th meeting of the Special Committee constituted to identify and demarcate flood plains of River Ganga in Segment B of Phase I (Haridwar to Unnao) held on 22nd April, 2019

List of Participants

1. Shri S.K. Haldar, Member (WP&P), CWC – In Chair.
2. Shri A.K. Sinha, Chairman, GFCC, Patna.
3. Justice Arun Tandon, Chairman, Monitoring Committee.
4. Dr. Anita Roy, Member, Monitoring Committee.
5. Dr. Vinod Kumar Sharma, Scientist 'SG' RRSC-North, NRSC, New Delhi.
6. Shri D.P. Mathuria, Executive Director (Technical), NMCG, New Delhi
7. Shri T.C. Sharma, Chief Engineer, UP Irrigation & WR Deptt., Meerut.
8. Shri Vinod Kumar Mishra, Supdt. Engineer, UP Irrigation & WR Deptt, Meerut.
9. Dr. Sanjay Kumar Jain, Scientist-G, National Institute of Hydrology, Roorkee.
10. Shri Bhopal Singh, Chief Engineer, UGBO, CWC, Lucknow.
11. Shri Ravi Shankar, Chief Engineer (P&D), CWC, New Delhi
12. Shri Rishi Srivastava, Director (Remote Sensing), CWC, New Delhi.
13. Shri Bhupesh Kumar, SJC (PP), MoWR, RD & GR, New Delhi.
14. Shri Rakesh Toteja, Sr. Joint Commissioner (FM), MoWR, New Delhi
15. Shri Ritesh Khattar, Director (FCA-2), CWC, New Delhi
16. Shri Vivek Pal, Director, GFCC, Lucknow.
17. Shri Mohd. Faiz Syed, Dy. Director (FCA-2), CWC, New Delhi
18. Shri Nikol, Assistant Director (FCA-2), CWC, New Delhi

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No. L-25012/11/2017- PP

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जल संसाधन ,नदी विकास एवं गंगा संरक्षण मंत्रालय

Ministry of Water Resources, River Development & Ganga Rejuvenation

629, Shram Shakti Bhawan, Rafi Marg,
New Delhi-110001.

Dated: 2nd September, 2019

To

As per list.

Subject: Minutes of 5th meeting of the Special Committee constituted in pursuance to the directions contained in the judgment passed by Hon'ble NGT on 13th July, 2017 in respect of Phase-I, Segment 'B' of River Ganga (Haridwar to Unnao).

Sir,

The 5th meeting of the Special Committee, constituted to (i) Identify and demarcate the flood plains of river Ganga in Segment B of Phase I (Haridwar to Unnao) on one in twenty five years cycle or appropriately and (ii) Identify no development/construction zone, regulatory zone and the activities that can be/cannot be carried on in the regulatory zone of the flood plain, was held on 29th August 2019 at CWC, Sewa Bhawan, New Delhi.

In this regard, minutes of 5th meeting of the Special Committee is enclosed for information and necessary action.

Yours faithfully,

2/9/201

(Bhupesh Kumar)
Sr. Joint Commissioner (PP) &
Member-Secretary of the Committee
011-23719503

To:

1. Chairman, Ganga Flood Control Commission, Govt. of India, 3rd Floor, Sinchai Bhawan, Patna, Bihar - 800 015.
2. Additional Chief Secretary, Revenue Department, Lucknow, Uttar Pradesh-226001.
3. Special Secretary, Revenue Department, Lucknow, Uttar Pradesh-226001.
4. Principal Secretary, Irrigation & Water Resources Department, Government of Uttar Pradesh, Cantt Road, Udaiganj, Lucknow, Uttar Pradesh – 226001.
5. Commissioner (FM), Ministry of Water Resources, River Development & Ganga Rejuvenation, CGO Complex, Lodi Road, New Delhi- 110003.
6. Engineer-in-Chief, Irrigation & Water Resources Department, Cantt Road, Udaiganj, Lucknow, Uttar Pradesh – 226001.
7. Chief Engineer (Ganga), UP Irrigation & WR Deptt, Saket, Meerut.
8. Chief Engineer (West), UP Irrigation & WR Deptt, Saket, Meerut.
9. Superintending Engineer, Ganga Nahar Sanchalan Mandal, Uttar Pradesh Irrigation & Water Resources Department, Pallavpuram Phase-I, Meerut (UP).
10. Executive Director (Technical), National Mission for Clean Ganga, Ist Floor, Major Dhyan Chand National Stadium, India Gate, New Delhi-110002.
11. Director, National Institute of Hydrology, Roorkee - 247667, Uttarakhand.
12. Dr. V. M. Chowdary, Scientist 'SG' RRSC-North, NRSC, Plot No.7, Planning Area Centre, Joseph Tito Marg, Sadiq Nagar, New Delhi-110049.
13. Chief Engineer, Upper Ganga Basin Organization, CWC, Jahnavi Sadan, 21/496, Indira Nagar, Lucknow-226 016.
14. Chief Engineer (P&D), CWC, Sewa Bhawan, R. K. Puram, New Delhi- 110066.
15. Director (FCA-II), CWC, West Block-2, Wing -1, Sector-1, R. K. Puram, New Delhi- 110066.
16. Director, Ganga Flood Control Commission, 103, 1st Floor, Dr. Ram Manohar Lohia Parikalp Bhawan, Teli Bag, Lucknow 226 025.

Copy for information to:

17. PPS to Member (WP&P), CWC, Sewa Bhawan, R.K. Puram, New Delhi-110066.

Minutes of 5th meeting of the Special Committee, constituted to identify and demarcate the flood plains of river Ganga in respect of Phase-I, Segment 'B' of River Ganga (Haridwar to Unnao)

The fifth meeting of the Committee constituted to identify and demarcate the flood plains of river Ganga in Segment B of Phase I (Haridwar to Unnao) was held on 29.08.2019 at CWC, Sewa Bhawan, New Delhi. The list of participants of the meeting is enclosed at Annex–I.

2. At the outset, Chairman of the Committee welcomed the participants of the Committee. The member secretary of the Committee intimated that as decided during the 4th meeting, the Hybrid based Flood Plain Demarcation combining results of satellite imageries and model with gap filling were shared with I&WRD, Govt. of UP, regional offices of CWC/GFCC for ground truth verification jointly near all important cities/municipalities/major habitations. Subsequent to completion of exercise of ground truth verification, the team submitted its report in June 2019.

3. The Chief Engineer (UGBO), CWC, who was available during the meeting through video conferencing, briefed the committee about the major recommendations of the team. He intimated that on ground truth verification, no development zone demarcated by satellite data was found to be more accurate compared to the Hybrid approach. Therefore, outer extent of satellite data based zone can be considered for no development zone. At some places, if the outer extent based on satellite data is less than the embankment or vice-versa, the same may be extended to or curtailed at the embankment. The team recommended that it would be appropriate if no development zone is clearly demarcated on the ground using pillars at a suitable interval say at 200 m interval in city/ inhabited area and at 500 m interval in other places. The outer extents of regulatory zones are extending well beyond the river banks and could not be ascertained during the exercise of ground truth verification.

4. Thereafter, Director and Deputy Director (FCA-II), CWC made a presentation on the draft report revised on the basis of the recommendations of the joint team constituted for ground truth verification. The average widths of no-development zone and regulatory zone were worked out to be 3.15 km and 10.12 km respectively. The figure of 3.15 Km has been arrived through refining the previous No-Development zone by incorporating the findings of ground truth verification report such as gap-filling, smoothening the outer edges, and extending the No-Development zones upto the embankment line where ever applicable. This resulted in increase of area from 1483 sq. km to 2032 sq. km., thus, increasing the average width from 2.3 Km to 3.15 Km.

Similarly, the figure of 10.12 Km has been arrived through refining the previous Restricted Zone by taking the union of satellite area provided by NRSC and the newly defined No-Development Zone and smoothening the outer edges. This has again resulted in increase of area from 5643 sq. km. to 6530 sq. km., thus, increasing the average width from 8.8 Km to 10.12 Km.

5. During the meeting, the prohibited & regulated activities in No Development Zone and Regulatory zone were also deliberated in detail. The following prohibited & regulated activities in No Development Zone and Regulatory zone were finalized for incorporation in the report.

(a) **No Development Zone**

Prohibited activities in No Development Zone:

All activities except mentioned under the regulated activities in no-development zone.

Regulated Activities in No Development Zone:

i. Temporary constructions, if absolutely necessary, in exceptional circumstances like natural calamities or religious events at traditional locations, with prior permission of the National Mission for Clean Ganga acting through the State Ganga Committee and the District Ganga Committee

ii. Regulated Sand/ Stone/ sediment/ river borne material mining may be allowed as per MoEF&CC guidelines

iii. Repair/renovation of protected monuments, temples, boating jetties, parks, ghats and crematorium

iv. Existing structure, whether permanent or temporary for residential or commercial or industrial or any other purposes in the River Ganga, Bank of River Ganga or in active flood plain area of River Ganga or its tributaries provided that such construction has already been completed, shall be reviewed by the National Mission for Clean Ganga so as to examine as to whether such constructions are causing interruption in the continuous flow of water or pollution in River Ganga as per provisions under para [6(3)] of Ministry of Water Resources, River Development and Ganga Rejuvenation notification no. S.O. 3187(E), dated the 7th October 2016 (as amended from time to time) (copy enclosed) regarding constitution of an authority, namely, the National Mission for Clean Ganga for Rejuvenation, Protection and Management of River Ganga.

v. Organic farming by owners/lease holders

vi. Plantation of native trees / shrubs (for commercial use)

vii. Measures for control of erosion and floods, maintenance or de-silting of river ways, waterways and channels

viii. Repair of breaches in embankments

ix. Laying of unpaved paths for access to the river for cultural, religious or any other purposes

x. Various activities such as engineered diversion and storage of water in River Ganga, construction of bridges and associated roads and embankments over the River Ganga or at its River Bank or its flood plain area, construction of Ghats or extension of any existing Ghat, construction of jetties, construction of permanent hydraulic structures for storage or diversion or control of waters or channelization of River Ganga, etc., shall be governed as mentioned under para (42) of Ministry of Water Resources, River Development and Ganga Rejuvenation notification no. S.O. 3187(E), dated the 7th October 2016 (as amended from time to time) regarding constitution of an authority, namely, the National Mission for Clean Ganga for Rejuvenation, Protection and Management of River Ganga

xi. Navigation, Water Sports, Water Transport related activities.

(b) **Regulatory Zone**

Prohibited Activities in Regulatory Zone:

Red category of industries as mentioned in CPCB guidelines (as amended from time to time)

Regulated Activities in Regulatory Zone:

- Construction of residential/ Institutional/ commercial buildings, school, dispensaries, recreational facilities with certain stipulations as mentioned in NDMA guidelines (as amended from time to time) such as prohibition of basement in buildings, construction on stilts (columns), plinth level above the flood lines, provision of stairway in single storey building, roof level of single storey or first floor level above 100 years flood level/HFL, preferably utilizing ground floor for non-residential purposes.

- Various activities such as engineered diversion and storage of water in River Ganga, construction of bridges and associated roads and embankments over the River Ganga or at its River Bank or its flood plain area, construction of Ghats or extension of any existing Ghat, construction of jetties, construction of permanent hydraulic structures for storage or diversion or control of waters or channelization of River Ganga, etc., shall be governed as mentioned under para (42) of Ministry of Water Resources, River Development and Ganga Rejuvenation notification no. S.O. 3187(E), dated the 7th October 2016 (as amended from time to time) regarding constitution of an authority, namely, the National Mission for Clean Ganga for Rejuvenation, Protection and Management of River Ganga

- Setting up of non-polluting cottage industries.

- Construction / expansion/ modernization of bridges, roads and similar facilities that may affect ND Zone

- Creation of navigational facilities involving dredging, mechanised ferries, jetties etc.

- Green and Orange category of industries as mentioned in CPCB guidelines (as amended from time to time)

- Water Sports, Water Transport related activities

- Stone crushing plants etc.

6. After the detailed discussion, it was decided that the final draft report may be prepared on the basis of the discussion held during the meeting and circulated to committee members for comments, if any. Considering the urgency of submission of the report to NGT, it was decided that the committee member may convey their comments, if any, within 5 days of circulation of the report.

7. The meeting ended with a vote of thanks to the Chair.

5th meeting of the Special Committee constituted to identify and demarcate flood plains of River Ganga in Segment B of Phase I (Haridwar to Unnao) held on 29th August, 2019

List of Participants

1. Shri S.K. Haldar, Member (WP&P), CWC – in Chair
2. Shri C.K.L. Das, Chairman, GFCC, Patna
3. Shri Radhey Shyam Mishra, Special Secretary, Revenue Deptt., Govt. of U.P.
4. Dr. V. M. Chowdary, Scientist 'SG' RRSC-North, NRSC, New Delhi
5. Shri T.C. Sharma, Chief Engineer (Ganga), UP Irrigation & WR Deptt., Meerut
6. Shri Anil Kumar, Chief Engineer, UP Irrigation & WR Deptt.
7. Shri Vinod Kumar Mishra, Supdt. Engineer, UP Irrigation & WR Deptt, Meerut
8. Shri Sanjay Kumar, Scientist-E, National Institute of Hydrology, Roorkee
9. Shri Bhopal Singh, Chief Engineer, UGBO, CWC, Lucknow
10. Shri Ravi Shankar, Chief Engineer (P&D), CWC, New Delhi
11. Shri Bhupesh Kumar, SJC (PP), MoWR, RD & GR, New Delhi
12. Shri R. R. Sambharia, Sr. Joint Commissioner (FM), MoWR, New Delhi
13. Shri Ritesh Khattar, Director (FCA-2), CWC, New Delhi
14. Shri A. K. Sinha, Director (Morphology), CWC, New Delhi
15. Shri Abhay Kumar, Director, GFCC, Lucknow
16. Shri Mohd. Faiz Syed, Dy. Director (FCA-2), CWC, New Delhi
17. Shri Nikol, Assistant Director (FCA-2), CWC, New Delhi

Annexure-10

Memorandum of Agreement (MoA)

Between

National Institute of Hydrology (NIH),

(Roorkee)

And

Irrigation & Water Resources Department

Uttar Pradesh

Dated: Dec 22, 2023

MoA for Flood Plain Zone (FPZ) between National Institute of Hydrology (NIH)), (Roorkee) and Irrigation & Water Resources Department (IWRD), Uttar Pradesh, Lucknow

1. INTRODUCTION:

Flood Plain Zoning is a very comprehensive work uses modern technology like statistical hydrology model, satellite imagery, LiDAR DEM, GIS, high end computers etc. the reach from Unnao to Ballia of river Ganga (nearly 800 km) has a flat flood plain requires lot of precision and secondary verification in delineation of Flood Plain Zone (FPZ).

Broad classification of Flood Plain Zone (FPZ):

- No development zone- For a flood of 2 years return period.
- Regulatory zone- For a flood of 25 years return period.
- Warning zone- For a flood of 100 years return period

2. BACKGROUND:

The National Green Tribunal (NGT) in New Delhi in accordance with the orders passed in the case of M.C. Mehta vs. Union of India and others (O.A. No. 200/2014), has stated that Flood plain zone delineation and demarcation from Unnao to Ballia" (Approximated length 800 km) has to be done by the Irrigation and Water Resources Department of Uttar Pradesh.

As per direction issued by The Engineer in Chief & Head of the Department Irrigation and Water Resources Department, Uttar Pradesh, Lucknow Office Oder No. 157/C.E/NGT/FPZ) dated 20/06/2023 that "Nature of FPZ determination work and necessary infrastructure for its implementation, gauge-discharge data, satellite imaging, LiDAR data and experts and experience of work of similar nature, FPZ delineation (Determination of co-ordinates for different zones) will be carried out by Flood Management Information System Centre (FMISC), Information System Organisation (ISO), Lucknow.

3. PURPOSE:

The main purpose of the MoA between National Institute of Hydrology (NIH) and Irrigation & Water Resources Department (IWRD), Uttar Pradesh is the study of Flood Plain Zone (FPZ)) at both banks of river Ganga from Unnao to Ballia (segment-B, Phase-II,) by carrying out demarcation and delineation.

4. SCOPE OF THE WORK:

The scope of the proposed work includes:

a. Identify and demarcate the flood plains of river Ganga in segment B of Phase-II on one in twenty five year's cycle or appropriately.

b. Identify no development / construction zone, regulatory zone and the activities that can be/ cannot be carried on in the regulatory zone of the flood plain.

c. Digital Elevation Model

In the previous study by CWC, SRTM 90 m DEM is used with correction of river profile below the water surface based on available cross-sections. Same approach will be used. In addition, the FABDEM (Forest and Buildings removed Copernicus DEM) will also be compared. It is a global elevation map that removes building and tree height biases from the Copernicus GLO 30 Digital Elevation Model (DEM). Furthermore, DEM data provided by the Survey of India to Irrigation and Water Resources Department UP under NHP will be used.

d. Hydraulic Modelling

Using the corrected DEM and the outputs of flood frequency analysis, the hydrodynamic Model Coupled 1-D & 2D or full 2D will be setup using HEC-RAS or Mike Flood. Steady state analysis will be performed to model the extent of floodplain for various return period floods. The HEC-RAS model will be setup using:

- Upstream branch to provide constant flood magnitude equal to the given return period at upstream boundary (Unnao).
- Downstream boundary as flow/water level at Balia.
- Flood plain bathymetry for routing the flows between Unnao and Balia.
- Different locations (G&D sites and barrages) in 2D model for maintaining constant river flows equal to the given return period flood magnitude.

e. Hybrid Approach

The results of satellite analysis and modelling have their own limitation. Satellite may not cover the full flood event and model results are subjected to DEM quality. Therefore, hybrid approach will combine both the results by taking union of the areas obtained from both the results.

5. THE STUDY AREA

The study area for the present study is the both bank s of river Ganga from Unnao to Ballia. under which 15 districts (Unnao, Kanpur Nagar, Raebareli, Fatehpur, Pratapgarh, Kaushami, Prayagraj, Bhadohi, Mirzapur, Varanasi, Chandauli, Ghazipur and Ballia.) are covered in which total length of river ganga is approximately 800 km.

6. STUDY & METHODOLOGY:

As per National Institute of Hydrology (NIH) proposal, the said study will be carried out with the same methodology as used by Central Water Commission (CWC) in the study for river Ganga from Haridwar to Unnao.

According to given National Institute of Hydrology (NIH) proposal, a brief methodology is proposed in which three types of approaches will be used for the identification of No Development zone and Regulatory zone of the said stretch using various methods.

Three Types of Approaches will be used for flood plain zoning

- Satellite
- Hydraulic Model - HEC RAS/MIKE FLOOD
- Hybrid

a. **Flood Frequency Analysis**

The flood frequency analysis will be carried out for various gauging sites in the study reach using various frequency distributions viz. 2-Parameter log Normal, 3-Parameter log Normal, 2-Parameter Gamma, Log Pearson Type-III and Gumble to estimate floods of different return periods viz. 2, 5, 10, 25, 50, 100 years. The annual maximum discharge series at various gauging will be provided to National Institute of Hydrology (NIH) by the sponsoring agency. Based on the flood frequency analysis the recent year as close as 25 year return period flood will be identified.

SN	Flood plain zone	Description
1	No Development Zone	recurrence interval of 2, 3 & 5 years
2	Regulatory Zone	25 year return period flood

b. Satellite Data Analysis

The Joint Research Centre-European Commission has analyzed Landsat multispectral satellite images of the past 37 years (1984-2021) for deriving the frequency with which water returns from year to year i.e. recurrence interval. The same will be used in the study through the Google Earth engine platform. The State Remote Sensing Applications Centre, Uttar Pradesh (RSAC-UP) or National Remote Sensing Centre (NRSC) will be contacted through sponsoring agency to provide available flood inundation extent corresponding to years identified as close to 5-year and 25-year return flood period.

7. DATA REQUIRED

S.No	Data	Source	Responsibility
1.	Long term Annual Maximum discharge series	Central Water Commission, (CWC) Water Resources Department,(WRD Uttar Pradesh)	Sponsoring agency IWRD,Uttar Pradesh
2.	Hourly stage/ discharge data for selected event	Central Water Commission, (CWC) Water Resources Department,(WRD Uttar Pradesh)	Sponsoring agency IWRD,Uttar Pradesh
3.	River Cross-section	Central Water Commission, (CWC) Water Resources Department,(WRD) Uttar Pradesh	Sponsoring agency IWRD,Uttar Pradesh
4.	Structures bridge, barrage, embankment etc.	Central Water Commission (CWC-UP)	Sponsoring agency IWRD,Uttar Pradesh
5.	Flood inundation extent from satellite data for selected years	National Remote Sensing Centre (NRSC) Remote Sensing Applications Centre (RSAC-UP)	Sponsoring agency (National Institute of Hydrology (NIH) will identify the year and period)
6.	Flood extent based on water recurrence using Landsat	Joint Research Centre JRC-(1984-2021)	National Institute of Hydrology (NIH)
7.	DEM	Shuttle Radar Topography Mission (SRTM), Copernicus Digital Elevation Model (DEM) of UP prepared by Survey of India under National Hydrology Project (NHP) and available with Water Resources Department (WRD), UP	National Institute of Hydrology (NIH)

8. DURATION AND TIME SCHEDULE

The study will be completed in Twelve months from the date of supply of data and advance payment.

9. COST AND PAYMENT SCHEDULE:

The Total cost of the study will be Rs. 140 Lakh plus Goods and Services Tax (GST) charges as applicable as per the details given below:

	Financial aspects	Amount (Rs.)
a)	Man-days	1,840,000
b)	Consumables / Components	Rs.1,00,000
c)	Services/utilities	Rs.1,40,000
	Overheads (25% of b &c)	Rs. 60,000
d)	Equipment /computer usages	Rs. 70,000
e)	(Project staff/Consultant, Workshop, computer-peripherals, stationary etc.)	Rs.40,00,000
f)	TA/DA	Rs.5,00,000
g)	Contingencies	Rs.2,00,000
h)	Intellectual Fees	Rs.70,90,000
	Total Project Charges	Rs. 1,40,00,000
	GST (@ 18% or as applicable)	Rs.25,20,000
	Total Consultancy charges including GST	Rs. 1,65,20,000

10. PAYMENT TERMS:

- The payment has to be made in two installments. First installment of 70% is to be made along with the award of work and the second installment of the cost 30% is to be paid on the submission of the final report of the study.
- As per the notification of CBDT, Ministry of Finance, Govt. of India no 36/2017 (F. No. 203/24/2016/IT A-II), the National Institute of Hydrology (NIH)) is exempted from tax deduction from source, therefore, tax deduction on source will not be applicable on any payment to National Institute of Hydrology (NIH)) .

Bank details for on-line money transfer/RTGS

Account name : National Institute of Hydrology (NIH) consultancy Project
A/C No : 31125916862
Bank name : State Bank of India
Branch : IIT Roorkee Branch
IFSC Code : SBIN0001069
MICR Code : 247002094

Seal of Parties:

In witness where of the parties here to have signed this agreement on Day, Month and Year mentioned here in before

PARTIES

For and on behalf of Irrigation& Water Resources Department, Uttar Pradesh.	For and on behalf of National Institute of Hydrology, Roorkee
Signature: 22/12/2023	Signature:
Name: Devesh Shukla	Name: Dr. A.K. LOHANI
Designation: S.E., FMISC	Designation Scientist G
(देवेश शुक्ला) अधीक्षण अभियन्ता लघु प्रवाहित सूचना प्रणाली मंडल सिंचाई एवं जल संसाधन विभाग, उ.प्र. शासन	डॉ. ए.के. लोहनी वैज्ञानिक 'जी' एवं प्रभागाध्यक्ष सतही जलविज्ञान प्रभाग, रुड़की Dr. A.K. Lohani Sc. G. & Head Surface Water Hydrology Division Roorkee
Seal	Seal

Witness: (Name & Address)	Witness: (Name & Address)
1. 22/12/2023 Harendra Kumar EE FMISC, ISO, Lucknow	1. J. P. Patra, Scientist E, NIH Roorkee
2. 22/12/2023 Pawan Kumar AE, FMISC	2. Chandra Prakash Chandra Prakash Scientist B, SWHD. NIH, Roorkee

Signed on the 22 Day of December 2023

Annexure – II

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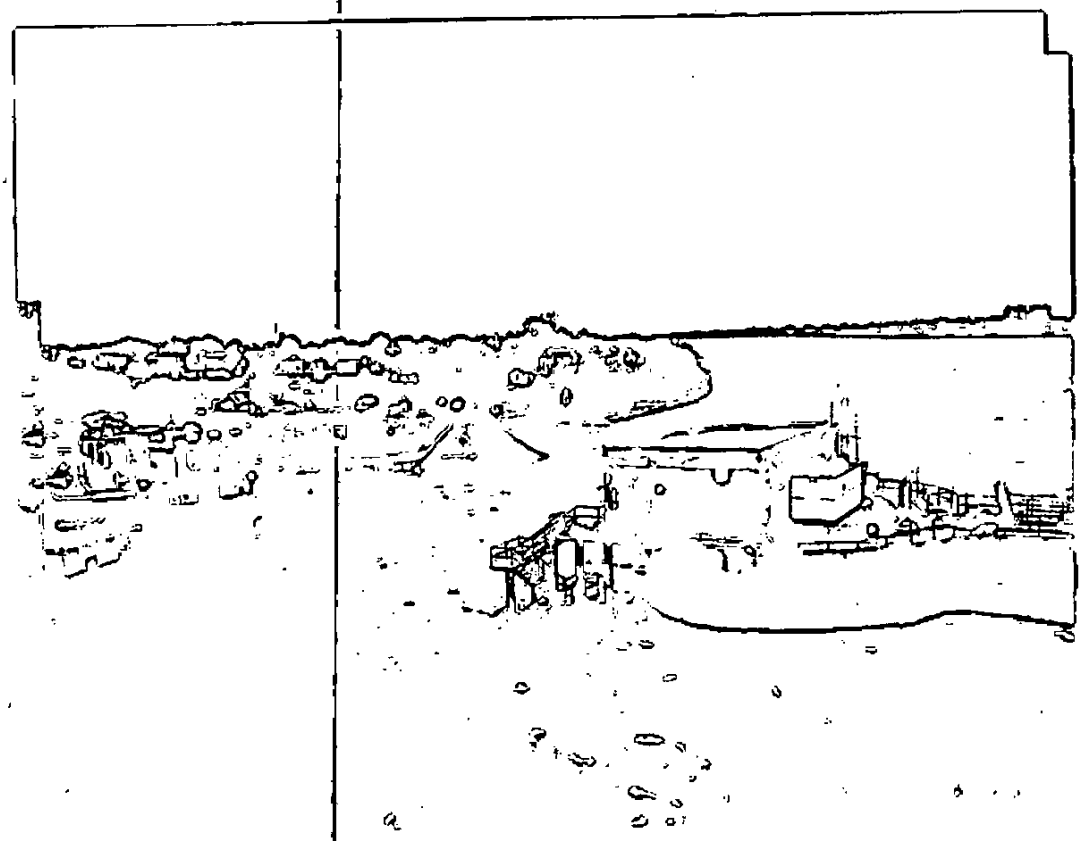
Government of India
Ministry of Jal Shakti
Department of Water Resources,
River Development and Ganga Rejuvenation
Central Water Commission



Technical Guidelines

on

Flood Plain Zoning

May 2023

4381

सत्यमेव जयते

Government of India
Ministry of Jal Shakti
Department of Water Resources,
River Development and Ganga Rejuvenation
Central Water Commission

Technical Guidelines
on
Flood Plain Zoning

May 2023

ABBREVIATIONS

FPZ	Flood Plain Zoning
ULBs	Urban Local Bodies
ZP	ZillaParishads
DEM	Digital Elevation Model
NRSC	National Remote Sensing Centre
DoWR, RD & GR	Department of Water Resources, River Development and Ganga Rejuvenation
CWC	Central Water Commission
CGWB	Central Ground Water Board
NDMA	National Disaster Management Authority
HFL	Highest Flood level
EPA	Environment Protection Act
EIA	Environmental Impact Assessment
RBA	RashtriyaBarhAyog
RCZ	River Conservation Zone
FEMA	Federal Emergency Management Agency
SFHA	Special Flood Hazard Area
AEP	Annual Exceedance Probability
NGT	National Green Tribunal
URDPFI	Urban Regional Development Plans Formulation and Implementation
MSW	Municipal Sewage Waste
FIRM	Flood Insurance Rated Maps
MoHUA	Ministry of Housing & Urban Affairs
MoUD	Ministry of Urban Development
MoEF&CC	Ministry of Environment, Forest & Climate Change
STP/ETP	Sewage Treatment Plant/Effluent Treatment Plant

GLOSSARY

1.	Flood Plain	Land adjoining a river or a channel which is inundated only during Floods
2.	Flood Plain Zoning	demarcating zones or areas likely to be affected by floods of different magnitude or frequencies and probability levels and specify the types of permissible developments in these zones, so that whenever floods occur, the damage can be minimised
3.	Alluvial plain	A plain formed by the deposition of sediment from the periodic flooding of a river
4.	Flood Insurance	Insurance covering loss or damage to property arising from a flood, flood tide of the like
5.	Bank Infiltration	Infiltration of surface water, mostly from a river system into a groundwater system induced by water abstraction close to the surface water
6.	Ecosystem	a geographic area where plants, animals, and other organisms, as well as weather and landscape, work together for life sustenance
7.	Encroachment	any entry into an area not previously occupied
8.	Aquifer	a layer of rock or soil that can take in and hold water
9.	Run-off	the part of the water cycle that flows over land as surface water instead of being absorbed into groundwater
10.	Water table	the level below which the ground is saturated with water
11.	Storm water drainage	the system of publicly or privately operated rivers, creeks, ditches, drainage channels, pipes, basins, street gutters, and lakes within the city through which or into which storm water runoff, surface water or subsurface water is conveyed or deposited
12.	Water logging	saturate with water
13.	Spawning ground	a place where animals (such as fish or frogs) go to lay eggs
14.	Return period	an average time or an estimated average time between events
15.	Active Flood plain	an area on either side of a stream/river which is regularly flooded on a periodic basis
16.	Embankment	a raised structure (as of earth or gravel) used specially to hold back the water
17.	1% chance of flooding	for every year, there is a 1% chance (a 1 in 100 chance) that the event will be equalled or exceeded
18.	1 in 500-year flood	A '1-in-500-year flood' refers to a flood height that has a long-term likelihood of occurring once in every 500 years
19.	Rating Curve	graph of discharge versus stage for a given point on a stream, usually at gauging stations, where the stream discharge is measured across the stream channel.

20.	Wetland	areas where water covers the soil or is present either at or near the surface of the soil all year or for varying periods of time during the year
21.	Erosion	the geological process in which earthen materials are worn away and transported by natural forces such as wind or water
22.	Desilting	Process of removal of silt from a body of water
23.	Landfills	an area of land where large amounts of waste material are buried
24.	Volatile material	Substances which have the capability to go into the vapour phase with or without heating
25.	Highest Flood Level	the maximum level to which a river or stream could rise due to rainwater and runoff during a flooding event
26.	Urban Local Bodies	small local bodies that administer or governs a city or a town of specified population
27.	ZillaParishad	the top tier of the PanchayatiRaj system in a district.
28.	Watersheds	an area of land in which all the incoming precipitation drains to the same place – toward the same body of water or the same topographic low area
29.	Biosphere reserve	protected areas meant for the conservation of plants and animals
30.	Endangered species	a species of animal or plant that is seriously at risk of extinction
31.	Organic Farming	An agricultural process that uses biological fertilisers and pest control acquired from animal or plant waste
32.	Hazardous waste	a waste with properties that make it dangerous or capable of having a harmful effect on human health
33.	Environmental Impact Assessment	assessment of the environmental consequences of a plan, policy, program, or actual projects prior to the decision to move forward with the proposed action

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Foreword

Floods constitute one of the major national calamities faced by India almost every year resulting in substantial loss of life, large scale damage to property, disruption of community lifelines besides entailing untold misery to the millions. Concerted efforts have been made over the years to reduce the damage due to floods and mitigate the sufferings of the people. Various structural flood control measures were taken-up in the past including construction of reservoirs, embankments, drainage channels, etc. It is however, now realised that absolute and permanent protection to all flood prone areas and for all magnitudes of floods by structural measures alone may not be possible and nor economically viable.

The emphasis has therefore been rightly shifted to non-structural measures like Flood Plain Zoning and regulation, flood forecasting etc. to effectively supplement the structural measures for providing sustainable protection to flood affected areas. Non-structural strategies are increasingly adopted by many countries including United States of America, Canada, and United Kingdom.

Natural floodplains provide flood risk reduction benefits by slowing runoff and storing flood water. They also provide other benefits of considerable economic, social, and environmental value that are often overlooked when local land-use decisions are made.Flood Plain Zoning has been recognized as an effective non-structural measure for flood management. Flood-plain zoning measures aim at demarcating zones or areas likely to be affected by floods of different magnitude or frequencies and probability levels and specify the types of permissible developments in these zones, so that whenever floods actually occur, the damage can be minimised. The action for demarcation of flood plain areas and regulating the activities therein, is to be undertaken by respective state governments.

Flood risk zoning regulates land-use or zoning policies which in turn regulates construction in high-risk areas. This reduces the economic exposure and its vulnerability to flood events.

Ministry of Jal Shakti has continuously impressed upon the States the need to adopt flood plain zoning approach. A model draft bill for flood plain zoning legislation was also circulated by Central Water Commission in 1975 to all the States. This bill envisages zoning of flood plain of a river according to flood frequencies and defines the type of use of flood plain. The States of Manipur, Rajasthan, Uttarakhand, and erstwhile State of Jammu & Kashmir had enacted the legislation.

However, delineation and demarcation of flood plains is yet to be undertaken. National Mission for Clean Ganga (NMCG) has also time to time advised all states in Ganga basin for demarcation, delineation and notification of river flood plains and removal of encroachment from riverbed/floodplain of the river Ganga and its tributaries in adherence to the River Ganga (Rejuvenation, Protection and Management) Authorities Order, 2016.

A study regarding Report and Guidelines on Flood Plain Zoning has been carried out based on which this document has been prepared. Chapters 1-5 present a report on the study carried out and Chapter 6-8 contain a list of guidelines which have been developed based on this study. These sections also classify the nature of activities and development regulations that would be needed to protect sensitive regions.

1. Introduction

A river is defined as a natural stream of flowing water. Rivers are found on every continent on Earth and on nearly every kind of land. The Indian sub-continent is also blessed with several large and small rivers, which are all distinct in terms of their hydrology and sediment transport.

A river shifts in its shape, size, flow pattern of water, silt, nutrients, and biota, in fact all its variables seem to change with time and space. The perceptions differ as one move from mountains to plains and to the deltas. The same stream displays a wide variance of characteristics that depend upon the land it flows through and the microclimate along its banks. Rivers many a times seem to mirror the local flavor of the land they flow through.

Usually, a river system is composed of the following parts:

1. Source (Mouth)
2. Tributaries
3. Confluences
4. Channels
5. Riverbanks
6. River/Flood Plains
7. Mouth (Outfall)

Indian rivers are deeply embedded into the economic, social, political as well as cultural fabric of the country. Ever since ancient times, most of the civilizations have developed on the banks of rivers. Rivers form the backbone of any economic activity.

They serve as a vital component not only for agriculture, industry, and transportation but also for forestry, recreation, and environment. Rivers also ‘contain’ many other embedded ecosystems (both terrestrial and aquatic) and most of the times play hosts to rare flora and fauna.

The below map of India substantiates the vast network of rivers and tributaries flowing through the Indian sub-continent, covering majority of the geographical area.

Figure 1: Indian River System

However, due to rapid urbanization and development, and climate change which further aggravates the extreme events, the plains of rivers are being encroached upon in an unsustainable manner negatively impacting the 'state' and 'health' of rivers. Despite its inevitable necessity for subsistence and varied uses, the water resources, particularly rivers are in woeful conditions.

Box 1:Flood Plain Zoning Bill 1975

- ✓ A Model Flood Plain Zoning Bill, prepared by CWC in 1975, was circulated to States for enactment of legislation. So far, Manipur, Rajasthan, Uttarakhand and erstwhile State of Jammu & Kashmir has enacted the bill. However, no efforts have been made by any of the states except Uttarakhandfor demarcation of flood plain till date
- ✓ No efforts made by any major flood prone state of the country
- ✓ Thick population density, Lack of alternative settlement, Implementation difficulty etc have been cited as major impediments in implementation of flood plain zone

1.1. Indian River System

The major river systems in the country can be broadly classified into two groups viz., rivers of the Himalayan region and rivers of peninsular India. The Himalayan rivers are fed by the melting snows and glaciers of the great Himalayan range during spring and summer, and from rains during monsoon. They are often uncertain and capricious in their behavior. They carry significant flows during the dry weather due to snow melt and carry minimum flows, during winter. On the other hand, the peninsular rivers originate at much lower altitudes, flow through more stable areas and are more predictable in their behavior. Their flow is characterized by heavy discharges during the monsoon followed by very low discharges during the rainless months.

From the point of view of the flood problem, the rivers can also be grouped under the four regions as below:

- ✓ Central India & Deccan region.
- ✓ Brahmaputra region;
- ✓ Ganga region;
- ✓ Northwest region;

1.2. Types of Rivers

A river is termed 'flashy' if floods in the river rise and fall in a very short period of time. Apart from North Eastern States & Hilly States, some of rivers of Rajasthan, Gujarat etc are flashy in nature.

A 'virgin' river is one which completely dries up before its outfall into the sea or another river. These are common in desert areas like the Kutch and Rajasthan where due to percolation and evaporation losses, the river disappears after flowing some distance from the source. Further, a river whose water resources potential has not been exploited at all is also termed as a virgin river.

A river is said to meander when it adopts a tortuous course, swinging from one side to another in alternating bends.

It is said to be braided when the bed becomes wide and shallow, with the flow composed of many interlaced channels, causing numerous islands and bars of silt deposits in the bed of the river.

Generally, a river forms delta of various patterns, when it approaches the sea.

1.3. The River Course

Usually, a river traverses three types of topography viz., the upper reach in the hilly regions, the middle reach in the alluvial plains and the deltaic/estuarine reach near its outfall into the sea.

1.3.1. The upper reaches

These can be of two types viz., 'incised' and `boulder'. The incised rivers have well-defined banks which are resistant to erosion. The bed of the river is also resistant to erosion despite the steepness of the slope and the swiftness of the current. The boulder rivers are also characterized by steep slopes, but the beds consist of a mixture of boulders, gravel, shingle, and sands.

The Boulder Rivers tends to have straight courses with wide shallow beds. At the time of floods, the high velocity flow moves both boulders and gravel downstream. But when the floods subside and the flow slackens, bed materials pile up in heaps. The flow channels with reduced velocity are unable to move these heaps and so

trying to go round them, tend to wander in new direction, attacking the banks and widening the bed thereby

1.3.2. The middle reach

Rivers in the middle reaches are usually in the alluvial plains. These have the characteristic of meandering freely from one bank to the other on account of the erodible nature of the beds and banks. These rivers are classified as aggrading, degrading or stable rivers. If it is building up its bed, it is called an aggrading river. If its bed is getting scoured, it is called a degrading river. If river carries down sediments which it receives without either depositing the silt or scouring the bed, it is called a stable river. It is pertinent to point out here that, depending on the silt load and the discharge, the same river may exhibit characteristics of an aggrading, degrading or stable river indifferent reaches.

1.3.3. Estuarine/Deltaic reach

In its last reach, before its outfall into another river or sea, the river may be called estuarine. In the latter case, periodic changes in water levels occur due to tides and, therefore, in this reach, it is called a tidal river. Here, sea water enters the river with the high tide and empties out with the ebb tide. The distance up to which the tidal effect is felt depends upon the slope of the river, the tidal range, the flood discharge, configuration of the river, etc. Near its outfall to the sea, such a river is called a deltaic/ estuarine river. In this reach, it is distinguished by the many branches the parent river has thrown as it approaches the sea.

(Source: Rashtriya Barh Ayog, Volume-I, 1980)

1.4. Indian River Basin

India has been divided into the following 20 hydrological basins by Central Water Commission (CWC) for the purpose of river management:

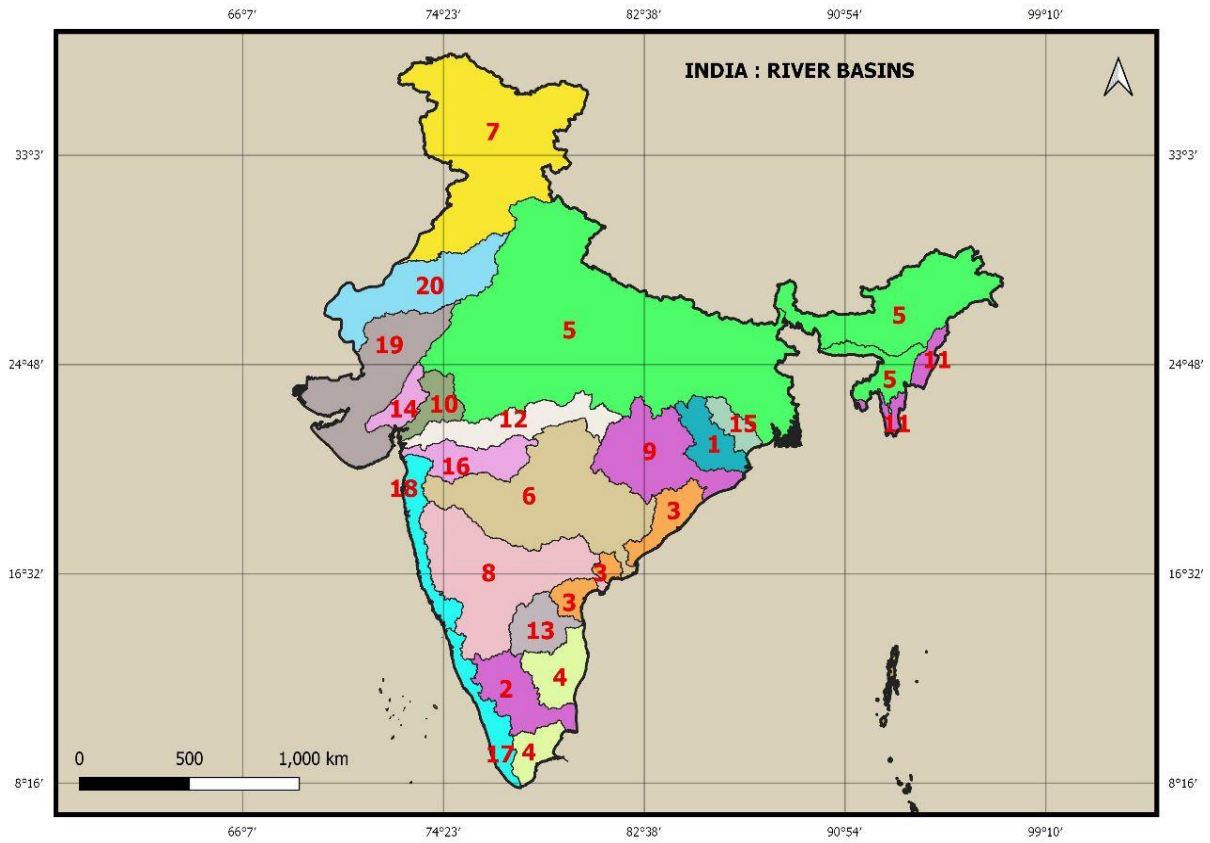

Figure 2: Indian River Basins

The same in terms of referencing is listed below for your reference:

1. Brahmani-Baitarni
2. Cauvery
3. East Flowing rivers between Mahanadi and Pennar
4. East Flowing rivers between Pennar and Kanyakumari
5. Ganga/Brahmaputra/Meghna-Barak
6. Godavari
7. Indus
8. Krishna
9. Mahanadi
10. Mahi
11. Minor rivers draining into Myanmar and Bangladesh
12. Narmada
13. Pennar
14. Sabarmati
15. Subarnarekha
16. Tapi
17. West Flowing rivers from Tadri to Kanyakumari
18. West Flowing rivers from Tapi to Tadri
19. West Flowing rivers of Kutch and Saurashtra including Luni
20. Areas of Inland drainage in Rajasthan

(Source: River Basin Atlas of India, CWC (2012)

2. Flood Plains

A river's floodplain is the low-lying land adjacent to a river and is usually prone to flooding when higher than normal discharges occur. These areas are typically flat stretches of land stretch all the way to the edge of the valley that contains the waterway. Hydrologically, a river's flood plain is defined as the landform subject to periodic flooding (based on return period). Though there are other definitions based on topography, geo-morphology and modelling purposes, the hydrologicaldefinition is used throughout this document for the purpose of flood plain zoning.

As per the notifications of River Ganga (Rejuvenation, Protection and Management) Authorities Order, 2016, para 3 (l), Flood plain means such area of River Ganga or its tributaries which comes under water on either side of it due to floods corresponding to its greatest flow or with a flood of frequency once in hundred years.

2.1. Importance of River Flood Plains

Flood plains are necessary for a healthy riverine system. It provides the opportunity for water to spread out and slow down, reducing erosion and flooding of other areas. Flood plains support biological diversity, and recharges ground water.

Flood plains provide a buffer space between a river and inhabited areas at risk of floodie, when water rises above the banks, the speed of flow reduces as it spread out across the flood plain, and overall peak of the water is slower. This can limit the destructive impact of floods. The following are some of the other benefits of flood plains:

a) Improving water quality

Floodplains act as natural filters, absorbing harmful chemicals and other pollution, making rivers healthier for drinking and swimming, and for plants and animals.

b) Creating fertile soil for crops

Rivers deposit sediment and nutrients in floodplains, making them very productive areas for growing crops

Box 2: National Green Tribunal Order 2017

- ✓ Identification and demarcation of floodplains of river Ganga in Segment B of Phase-I on one in twenty-five years' cycle
- ✓ Till the said identification and demarcation of floodplain, 100 meters from the edge of the river to be designated as no development/construction zone in Segment B of Phase-I i.e., Haridwar to Unnao, Kanpur
- ✓ Identification of no development/construction zone, regulatory zone and the activities that can be/cannot be carried on in the regulatory zone of the floodplain
- ✓ Complete prohibition on disposing of Municipal Sewage Waste (MSW), E-waste or Bio-medical waste on the floodplain or in river Ganga or its tributaries falling
- ✓ No dumping or landfill sites for any kind of waste irrespective of any technology for waste processing, within 500 meters from the edge of the river Ganga and/or its tributaries

c) Nurturing biotic ecosystem

Floodplains are a productive environment for plants and wildlife and serve as nurseries for many species of fish. They provide vital habitat and are important for maintaining the web of life.

d) Providing recreation

Flood plains also provide ideal places for hiking, paddling, fishing, exercising, and connecting with the beauty of nature

e) Recharging Ground water

The layered sediments of many floodplains can create important aquifers. Clay, sand, and gravel filter the water as it seeps downward. Water purification systems often take advantage of this natural phenomenon in a process called bank filtration. In bank filtration, water is deliberately filtered through the banks or floodplain of a river or lake. Nearby wells then collect the filtered water, which is then ready for more intense purification processes.

Box 3:Floods in the UT of Jammu & Kashmir (2014)

- ✓ During the initial week of September 2014, Jammu & Kashmir encountered one of its worst hit flood events in its north western part. Unprecedented rains that lasted for 5 days led to an increased runoff from the tributaries of river Jhelum.The flood affected nearly 2million people and caused huge damage to property and lives as well as economy of the state.
- ✓ Although heavy rainfall was the triggering factor of floods in the Kashmir valley, the impact of the disastrous event was aggravated by other factors, including the rapid urbanization in the valley, encroachment of waterbodies and land adjoining river banks, the disappearance of wetlands, etc. which has blocked the natural drainage patterns making the situation worse. Extremely urbanized and mismanaged flood plains gave an impetus to the situation which attained disastrous dimensions due to prolonged and extremely heavy rainfall.

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3. Need of Flood Plain Zoning

To have reasonable degree of protection, floods need to be managed through both structural & non-structural measures to reduce the losses. Non-structural measures are planned activities to modify susceptibility due to flood related damages. These are meant to keep people away from floods. Flood Plain Zoning is one of the main non-structural measures for management of flood worldwide. However, this has not yet been taken up in India as an effective measure to manage the flood though flood is one of the major natural calamities in India and almost every year, there is substantial loss of life, large scale damage to property apart from suffering of millions of people due to recurrence of flood in India.

Box 4: FPZ in Uttar Pradesh

- ✓ Notification issued by State of UP dated 4th September 2020 for identification & demarcation of flood plain on River Ganga from Haridwar to Unnao by way of Executive order
- ✓ Demarcation completed on field
- ✓ Demarcation pillars being installed all along the riverbank.
- ✓ Activities being regulated accordingly
- ✓ Steps underway to identify

The concept of Flood Plain Zoning recognizes the basic fact that the flood plain of a river is essentially its domain and any intrusion into or developmental activity therein must recognize the river's 'right of way'. Flood plain zoning involves regulation of land use in flood plains of a river. It is considered as an effective non-structural means for flood management. It aims at demarcating zones or areas likely to be affected by floods of different magnitudes or frequencies and specify the types of permissible developments based on probabilistic analysis in these zones, so that whenever floods occur, the damage can be minimized, if not avoided.

Increased level of urbanization in the country is putting pressure on urban flood plains. Encroachment or unplanned development of such area may prove disastrous for people affected as well as for river in the long run. Flood Plain Zoning, therefore, envisages limitations on indiscriminate development and encroachment of flood plains of a river.

Box 5: Mumbai Floods (2005)

- ✓ On 26th July 2005, the Mumbai Suburban Area was stuck with a heavy storm. Indian Meteorological Department (IMD) reported a 944 mm of rain for the 24 hours. The incident caused extreme water logging in the city area. About 200 km of road length was submerged in flood waters and the traffic was standstill on all internal roads, major roads and corridors of traffic. The incident also caused widespread damage to property and life.
- ✓ The impacts of human activities and the developmental works involving physical, topographic changes etc affecting the natural hydrological process was felt during the event. This led to a thinking that Infrastructure planning in urban areas should require careful attention to urban hydrological characteristics and how the urban conditions affect the rainfall-runoff relationships in this area.

Floodplain zoning is not only necessary in the case of management of floods by rivers but is also useful in reducing the damage caused by drainage congestion, particularly in urban areas. It has acquired urgency in the context of increasing variability in rainfall as a result of climate change.

Over the years, the cascading rate of increasing population and the increasing urbanization and industrialization has put a toll upon the health of river systems in India as these anthropogenic pressures brings about changes in the river system and causes alterations in river morphology by changing flow patterns,

sedimentation, and siltation properties of rivers. Floodplain development also impacts the riparian ecosystem.

This has further increased the probability of urban floods, showing an increasing trend as a phenomenon, and posing great challenge to city administration and town planners. The lack of protection of river floodplains from damaging impacts like encroachment and diversion for 'developmental projects' is a tragedy that affects both the river as well as those who encroach it adversely. The river suffers as it is unable to occupy and transport flood waters downstream during high rainfall events (monsoon in particular).

The river is also unable to recharge aquifers, wet the lands along its banks or provide life-sustaining conditions to plant and animal habitats along the river margins and banks. Based upon flood plain zoning demarcation, Flood Insurance, and other non-structural measures, could also be promoted & initiated in India.

The various alterations susceptible in the river flood plains and its possible impacts are summarized in the table below: -

Table 1: Alterations susceptible in the river flood plains and its possible impacts

Alterations	Impact
Increase in impervious surfaces	Decreases infiltration and increases run-off which leads to: - • Decrease in lag time • Increase in peak discharge • Production of run-off from small storms • Reduction in flood plain recharge and decreased water table
Development on and near flood plains	• Disrupts migration and spawning cues for fish and marine biodiversity • Unplanned development leads to prolonged water logging • Constricts channel flow and capacity
Construction of storm water drainage systems	• Decreased lag time and increase in peak discharge owing to increased run-off entering the river
Filling up of water bodies	• Disrupts spawning grounds for fishes • Reduced space for flood waters
Construction of embankments and expansion of agriculture	• Change in soil moisture regime of flood plains • Water logging in flood plains due to reduced capacity of water to naturally flush outwards • Reduction in lateral movement of river channel

4. Early Efforts for Flood Plain Regulations in India

Efforts for regulating the development on floodplains can be traced to the River Conservancy Act of 1884 that provided for appointment of 'River Conservators', directed for conducting surveys and defined limits for the river which was termed "river-bed." Any construction or plantation within the riverbed for the area covering the present States of Tamil Nadu and Andhra Pradesh was to be permitted by Conservator of Rivers.

In 1989, Tamil Nadu Pollution Control Board passed an order stating that no industry causing serious water pollution will be permitted within 1 km of reservoirs, rivers, and public drinking water sources. Maharashtra Pollution Control Board also framed a River Regulation Zone Policy for the State in 2000 (revised in 2009) based on the designated best use as per water quality for rivers, high flood line and categorizing industry based on their pollution levels.

Box 6:Building Bye Laws, Bihar

- ✓ Government of Bihar modified the Building Bye Laws in 2022 to restrict the development in flood plain of Rivers
- ✓ No construction allowed within 25 m from outer boundary of river Ganga
- ✓ Limit reduced to 15 m for City of Patna
- ✓ No construction allowed within 30 m from outer boundary of rivers other than Ganga

However, this was later withdrawn based on a resolution passed by the State government dated 3rd February 2015.

With floodplains, it is also important to look at relevant land use legislations which come under the ambit of States. State Town and Country Planning Acts were enacted by the States based on Model Town and Country Planning Laws in 1962 (later revised in 1985).

The National Water Policy, 2012 includes a section on conservation of rivers and 4 river corridors. It also prohibits encroachments and diversion of water bodies, and restoration must be promoted to the extent feasible.

Central Water Commission (CWC) has continuously impressed upon the states the need to take action to implement the flood plain zoning approach in development. A model draft bill for Flood plain zoning legislation was circulated by the Union Government in 1975 to all the States. The states of Manipur, Rajasthan, Uttarakhand, and erstwhile State of Jammu & Kashmir had enacted the legislation.

However, delineation and demarcation of flood plains is yet to be undertaken. So far, no action has been taken by any of major flood prone states & others including Uttar Pradesh, Bihar, West Bengal, Assam etc. for enactment of legislation. Many States have expressed their reservations on implementing floodplain zoning due to reasons like high population density, non-availability of sufficient land for relocating the people occupying flood plains, etc. Government of India has repeatedly advised State/ Union Territories Governments the need for enactment of an appropriate legislation for delineation & demarcation of flood plain zones on the notified stretches of rivers of the State/UT and regulating the activities therein.

In February 2016, Ministry of Environment, Forests and Climate Change (MOEF & CC) had come out with a draft notification for River Regulation Zones wherein it proposed to prohibit or regulate the developmental activities on riverfronts and floodplains. The draft notification has been circulated to all the States and UTs. The draft notification, under the Environment Protection Act (EPA), 1986, intended to regulate developmental and industrial activities upto 5 kms from the banks of the river stretches having floodplains and an equivalent area for

mountain/ hill stretches under 3 River Conservation Zones (RCZ) demarcated with reference to the Highest Flood Level (HFL) with a 100-year return period.

The Prohibited Activity Zone (RCZ-PA) in the immediate vicinity of the river will be offered the highest protection since existing activities and constructions within the zone should adhere to the notification. Attention has been paid to regulate new developments within three zones. The RRZ draft policy also defined the area for protection from further encroachments as the “active flood plain”, which will be marked by the high flood line. This, in entrenched stretches will be the available space in the valley. In embanked stretches, this would be the area between two embankments or roads along a river acting as an embankment. In other stretches of the river, the active flood plain will be the 100-year flood line, the land which gets flooded during a 100- year storm. The idea was to establish a no-development zone not less (in area) than the active floodplain.

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5. International Experiences in Flood Plain Management

5.1. Flood Plain Management in United States

Floodplain zones are geographic areas that the Federal Emergency Management Administration (FEMA) has determined to be at flood risk to nearby communities and property. FEMA rates these zones for their severity of risk and identifies them as low-to-moderate risks, high risks, coastal areas, and undetermined risks. Each zone designation reflects the seriousness of flooding most likely in the specified area.

On the Flood Insurance Rate Maps, the FEMA defines flood zones as geographic areas that have different levels of flooding. They are as under:

- ✓ **High-risk**-"Special Flood Hazard Area (SFHA)", - an area with a 1% or 1 in 100 chance of experiencing a flood during any given year.
- ✓ **Moderate risk** - 1 in 500 chances of flooding occurring each year
- ✓ **Least risk-** have less than a 1 in 500 chance of occurring in any given year

5.2. Flood Plain Management in United Kingdom

Flood zones have been created by the Environment Agency to be used within the planning process as a starting point in determining how likely somewhere is to flood. However, they only refer to flood risk from rivers or the sea, and not all rivers are included.

The following classification of flood zones are divided: -

- ✓ **Flood Zone 1- Low Probability:** Areas having less than 0.1% chance of flooding in any year
- ✓ **Flood Zone 2- Medium Probability:** Areas to have flooding risk between 0.1% – 1% chance from rivers in any year or between 0.1% – 0.5% chance of flooding from the sea in any year
- ✓ **Flood Zone 3a- High Probability:** Areas at 1% or greater probability of flooding from rivers or 0.5% or greater probability of flooding from the sea
- ✓ **Flood Zone 3b- The Functional Floodplain:** Flood zone 3b is classified as functional floodplain and is deemed to be the most at-risk land of flooding from rivers or the sea. Areas at significant risk of flooding are classified to be within flood zone 3b

5.3. Flood Plain Management in New Zealand

Flood Protection Engineers and Hydrologists in New Zealand describe floods using Annual Exceedance Probabilities (AEP) or Return Periods. For example, a 1% AEP or 1 in 100-year return period flood means that there is a 1% or 1 in 100 chance in any given year that a flood of this size or greater will occur. Accordingly, flood plain areas have been defined:

Table 2: Flood Plain classification based on Average Period of Return

Flood Awareness map Likelihood Area	Average period between occurrences of a given flood event
High likelihood area	1 in 50 year
Medium likelihood area	I in 100 year
Flood sensitive area	1 in 100 year
Low likelihood area	1 in 440 year

5.4. Flood Plain Management in Canada

The Department of Environment and Climate Change of the province of Newfoundland Labrador in Canada envisages the following classifications for their flood plains as mentioned in their provincial website as listed below:

i. **Flood way:** The portion of a flood plain where the most frequent flooding occurs. This area is determined based on the 1 in 20 years (1:20) return period flood.
ii. **Floodway Fringe:** The portion of a flood plain where less frequent flooding occurs. This area is where flooding occurs up to 1 in 100 years (1:100) on average.
iii. **Climate Change Flood Zone:** Based on extension of the floodway fringe, this is the area which is likely to be impacted due to the latest forecasted effects of climate change.
iv. **Other Flood Risk Area**: An area where flooding is known or has some probability to occur due to unique or unusual circumstances such as areas subject to shoreline recession, areas downstream of dams or areas adjacent to watercourses potentially prone to ice jams.

It has given the list of permitted and non-permitted activities in each of these flood plains.

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6. Present Status of Flood Plain Zoning

India is the worst affected country in the World after Bangladesh and accounts for one-fifth of the global death count due to floods. India's high risk and vulnerability for floods is highlighted by the fact that over 40 million hectares out of total geographical area of 329 million hectares is prone to floods. On an average every year, 75 lakh hectares of land gets affected. According to the RashtriyaBarhAyog (RBA) an average of 18.6 million hectares of land gets affected annually.

RashtriyaBarhAyog (RBA) was set up by the Ministry of Agriculture and Irrigation in 1976, to study India's flood-control measures after the projects launched under the National Flood Control Programme of 1954 failed to achieve much success.

In 1980, the RBA made 207 recommendations and four broad observations.

First, it said there was no increase in rainfall in India and, thus, the increase in floods was due to anthropogenic factors such as deforestation, drainage congestion and badly planned development works.

Second, it questioned the effectiveness of the methods adopted to control floods, such as embankments and reservoirs, and suggested that the construction of these structures be halted till their efficacy was assessed. However, it did say that embankments could be constructed in areas where they were effective.

Third, it said there must be consolidated efforts among the states and the Centre to take up research and policy initiatives to control floods.

Fourth, it recommended a dynamic strategy to cope with the changing nature of floods. An analysis of the report suggested that the problem began with the methods of estimating flood-prone areas of the country.

Box 7: Uttrakhand Journey to FPZ

- Enacted the bill in 2012,
- Notification of limit of Flood Plain Area being done in phases:

1. Haridwar (ChandiGhat to Laksar)
2. Uttarkashi (Gangori to BadethiChungi)
3. Devprayag (Vyas Ghat) to Haridwar (Bhimgoda Barrage)
4. Srinagar (Dungripath) to Devprayag (Vyas Ghat)

In a 2011 meeting of the working group on flood management for the 12th Five-Year Plan, of Flood Management Programme, Central Water Commission (CWC), acknowledged that scientific criteria needed to be adopted to assess flood-prone areas. It was recommended that there should be effective monitoring based on frequency of flooding and period of inundation as gauged by contour maps and satellite imagery.

As per Niti Ayog's Report of the Committee constituted for formulation of Strategy for Flood Management Works in the entire Country and River Management Activities and works related to Border Areas (2021-26), annually 7.17 Mha. of area is affected with floods in India, of which 3.94 Mha. is cropped area. On an average, floods claim 1654 human and 618248 cattle life annually. Report further reiterates Flood Plain Zoning as an integral non-structural flood management measure. Under section 4 Major Flood Events: Case Studies and Lessons Learnt, it was mentioned that the severity of the floods in India, in most of the cases are enhanced manifold by anthropogenic activities. The major take away in such cases is the strict implementation of Flood Plain Zoning Act, regulating construction within the flood plain of a river.

The RBA report also recognized the need for timely evaluation of flood management projects. It entrusted state irrigation and flood control departments, CWC, Ganga Flood Control Commission and the Brahmaputra Board with the task of adopting or discarding them based on their performance. But this has not been the case.

Box 8:Floods in Kerala (2018)

- ✓ Unprecedented rains lashed parts of Kerala from 8th to 18th of August, 2018 causing widespread damages toall major sectors of the state. Many human lives were lost, thousands of houses damaged, over a million and half people were moved to relief camps, large stretches of major roads got washed away and many bridges got damaged.
- ✓ Other than unprecedented rainfall in an ecologically sensitive zone such as Kerala, it was not just urbanization; it was the unscientific use of its land and water resources that added to the severity of damage. The other issue was management of river and its flood plain. The numerous dams across these rivers have reduced the flow into the rivers during most of the time. With passage of time, their floodplains have shrunk, and people have occupied these floodplains for cultivation and construction. Unchecked tourism and illegal constructions, mostly related to tourism was another triggering factor that was accentuated by incessant rains.

Despite a series of disastrous floods in recent times such as in Kedarnath (2013), Srinagar (2014) and Kerala (2018) apart from regular flooding in Assam, Bihar, Uttar Pradesh & West Bengal resulting from constraints in river floodplains, the nation is still without a legally mandated prohibition on such ingress into and violation of river's integrity.

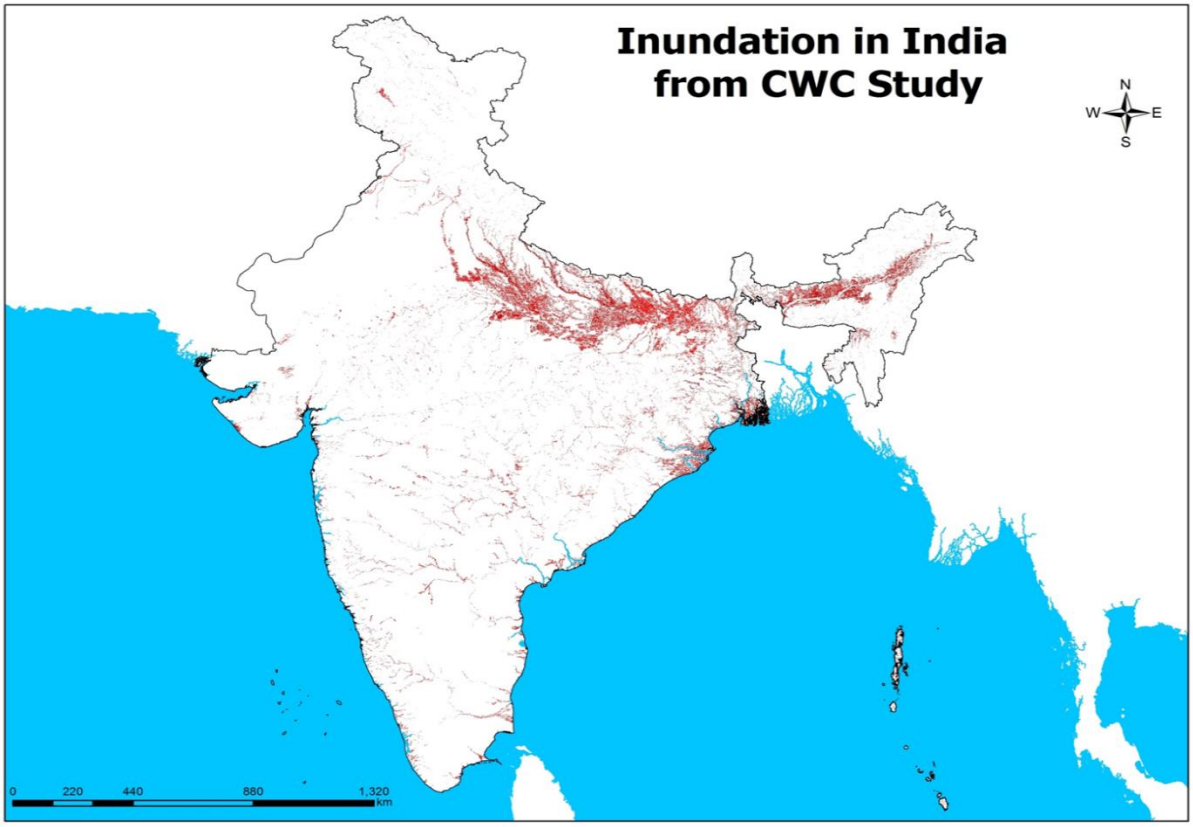


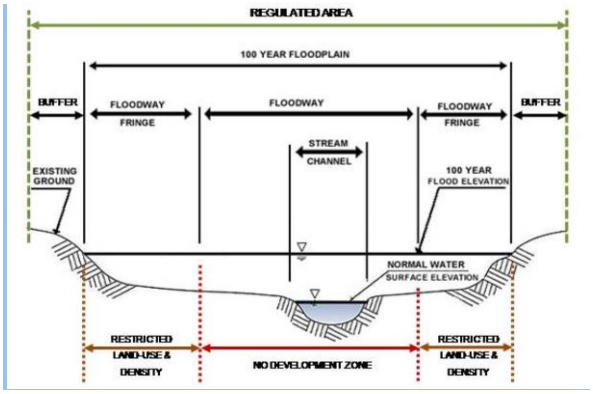
Figure 3- Flood Inundation map of India

Keeping in view the fact that the problem is becoming more and more severe, and losses are mounting every year, the subject of flooding has been recognized at the national level. Thereafter, action for demarcation of flood plain areas and regulating the activities therein, is to be undertaken by respective state governments.

National Green Tribunal (NGT) has also advised the State Government to take necessary

Box 9:Godavari Flood Plain

- ✓ Classification of flood plain of River Godavari into different zones by Nashik MahanagarPalika. List of permissible and prohibited activities have been envisaged under Floodplain Planning & Development Guidelines for River Godavari, Nashik Region. A list of planning guidelines & developmental controls including permissible restorative activities and recommended approach are also given.



- ✓ The document also says about the design aspects to be taken care of while building structures such that they are built on stilts allowing free flow of water below around the structures, as per the flood protection guidelines.

steps in this direction from time to time. NGT in its order dated 13.07.2017 in the matter of O.A. No. 200 of 2014 – M C Mehta Vs Union of India & Others had directed demarcation of flood plain for river Ganga from Haridwar to Unnao in Uttar Pradesh. In the matter of restoration of river Yamuna, the NGT vide its order/judgment dated 13th January 2015, had directed the state to adopt a precautionary principle by directing various steps which are required to be taken by the authorities, including prohibitory orders in relation to dumping and throwing of waste of any kind in the drains in the River Yamuna, which is lethal for the environment.

In this regard, there is a need for drafting a set of guidelines, to be followed by State Governments while taking up any developmental activities in the flood plain of any rivers.

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7. Guidelines for Flood Plain Zoning

Based upon draft Flood Plain Zoning Bill of DoWR, RD & GR, direction of Hon'ble NGT through its Order, draft RRZ by MoEF&CC, a broad Guidelines for identifying the Flood Plain Zone in different types of rivers of India and activities to be considered in various zones of such flood plains are given below as a guiding principle to preserve and improve the riverhealth.

7.1. Broad Guidelines

- Considering implementation of Guidelines rests with respective State Governments, States should first prioritize the rivers on which flood plain zoning is required. States may further decide to implement these guidelines on tributaries & sub-tributaries of such rivers
- As a general principle, zoning may be first taken up for main river and then its major tributaries
- Zoning exercise may be taken up as a whole or reach-wise in rivers depending upon location and prioritization by respective State governments
- Respective State Governments may declare the Nodal Agency for implementation of FPZ Guidelines
- The Water Resource Department of the respective State Government shall work in close coordination with the nodal agency, if any other department/ organization is declared as Nodal agency, to ensure that the Flood plains are managed as per the guidelines
- The flood plain areas which have already been urbanized/developed shall be identified and inventories of such areas would be maintained.The nodal agency should ensure that future development takes place as per guidelines and proper convergence with the existing and proposed developmental plans should be done. Further, the people settled in the river's active floodplain should be warned periodically to move in safer places in phased manner. Concerned Government agency may initiate some schemes for relocation of such settlements.
- The basic requirements to be taken care of before implementing flood plain zoning are as follows:
    - Broad demarcation of areas vulnerable to floods
    - Preparation of a large-scale maps (1:10,000/1:15,000) of area vulnerable to floods with contours at an interval of 0.3 m or 0.5 m

Box 10: Uttarakhand Floods, 2013

In the month of June 2013, the region suffered its worst disaster with huge loss of lives and wide spread destruction. The disaster coincided with the peak tourist and pilgrimage season, considerably enhancing the number of the causalities with adverse impact on the immediate rescue and relief operations.

The nature's fury was most pronounced in the Mandakini valley of the Rudraprayag district. Torrential rains coupled with the collapse of the Chorabari Lake led to flooding at the Kedarnath Shrine and the adjacent areas of Rambara, Agastyamuni, Tilwara, and Guptakashi.

There were extensive damages to the housing, both in urban and rural areas, as settlements were mostly concentrated along the rivers i.e. flood plain of the rivers.

- Marking of reference river gauges with respect to which, the areas likely to be inundated for different magnitudes of floods will be determined
- Demarcation of areas liable to inundation by floods of different frequencies, e.g., like one in 2, 5, 10, 25 and 100 year

- The following steps are involved in demarcation of flood plain zoning, which have to be undertaken at different frequencies**:**
  - Processing of Satellite Images
  - DEM for the river stretches for which FPZ is intended
  - Cross Section of the river deduced from DEM as well as collected from the survey conducted in the river reach for carrying out hydrodynamic study: - to determine flood level as well as spread at various frequencies
  - Water Level and River Flow Discharge Data/ Rating Curve at gauging sites to estimate water level corresponding to given flood magnitude
  - Field Visits for ground truthing and demarcation of flood plain zones
  - Satellite image for superimposing layers for different flood plain zones
- The maps prepared by the nodal agency shall be placed on suitable portals for information of public.
- Nodal agency shall demarcate and mark the flood plain in the pristine location too.
- Nodal Agency shall decide the land use in flood plain.
- Joint regular monitoring of demarcated flood plain zone shall be done by the Nodal agency in association with municipal/ panchayat bodies and State Disaster Management Authority (SDMA) to prevent any further encroachment in the flood plain.
- A No-objection certificate from the nodal agency of respective State will be required for carrying out any activity in Flood Plain.
  - Before issue of license to any firm/ entity by concerned department of State Govt. for Sand and gravel mining, the firm/ entity will submit NOC from Flood Plain Zone Nodal Agency with respect to quantity of mining and location.
  - For all new construction (individual house to any infrastructure), permit system may be incorporated by the concerned municipal/ panchayat body in consultation with Flood Plain Zone Nodal Agency which will need to be enforced strictly.
- Till the said identification and demarcation of floodplain is completed, no further activity to be allowed within 100 meters from the edge of the river, designated as no development/construction zone. However, if any State Government has already notified no development/construction zone which may be contravening of this provision, the concerned State Government shall be encouraged to move towards this provision in phased manner.
- Prohibition on direct disposing of Municipal Sewage Waste (MSW), E-waste or Bio-medical waste on the floodplain or in river.
- No dumping or landfill sites for any kind of waste irrespective of any technology for waste processing, within 500 meters from the edge of the river. The nodal agency in consultation with municipal/ panchayat body may seek removal of existing dump fills areas, if any, from the river's active floodplain.
- Nodal agency in association with municipal/ panchayat bodies and SDMAshallframe guidelines for safety of existing structures and to increase the Flood Resilience within the identified flood plain and implement other existing guidelines., National Framework for Sediment Management, Sustainable Sand Mining Guidelines, 2016 and 2020 of MoEF&CC.

- Appropriate precautionary measures in respect of safety of nuclear plants, aerodrome etc., lying in the designated flood plain zones shall be taken by the respective department depending upon the zone where those are lying.
- Demarcation of flood plain zones, downstream of dam/ barrages, shall be done as per para 7.2.3 (c) of this guideline. Mapping of existing encroachment in the downstream area vis-à-vis demarcated flood zones shall be done by the Nodal agency. Action plan shall be prepared for removal of such encroachment in a phased manner in consultation with district administration/ SDMA. Regular interaction and awareness programme among the residents of such areas shall be carried out by the Nodal agency. Government, if desire, may declare itself free of any responsibility for any flooding and subsequentloss to life& property to encourage people to move towards safer places.

Box 11: West Bengal Floods: 2013 & 2015

- ✓ In 2013, heavy rainfall in the catchment of DamodarValley led to flooding in the flood plains of districts of Paschim&PurbaMedinipur, Howrah, Hooghly, Bardhaman and Bankura causing widespread damage of life and properties.
- ✓ In 2015, the unprecedented rainfall due to the effect of cyclone 'Komen' caused flood in the state of West Bengal. Suitable precautionary measures in the form of advance flood forecasting based reservoir operating system, along with Flood Plain Zoning is the need of the hour in such areas.

7.2. Implementation Guidelines

As per definition, river's floodplain is the low-lying land adjacent to a river and is prone to flooding and generally conforms to flood of frequency once in hundred years. To minimize the damages due to floods and to protect the pristine nature of river, there is need to regulate the activities in flood plain of river. However, the entire zone corresponding to flood of 100 years return period can't be declared as protected zone. Instead, the area needs to be divided in different zones depending upon settlement in the area i.e. rural, or urban.

Box 12: Surat, Gujarat Floods: 2006

In Aug 2006, heavy rainfall in the catchment was responsible for heavy inflow in the Ukai reservoir and 3 Lacs to 9 Lacs Cusecs were released from Ukai Dam. The flood situation in Surat city worsened due to such large spill over from Ukai dam. Almost whole Surat were submerged and almost all communication channels were failed. The people of Surat were badly affected by this flood.

Irrespective of zoning, as prescribed below, followings are pre-requisite to be undertaken by the Nodal Agency for effective implementation of regulation of flood plain zoning:

a) Mapping of vulnerability risk of structures to keep flood hazards at minimal
b) Development of robust warning system

7.2.1. Rural Areas

There will be 2 zones of the identified flood plains in the rural area. The same is listed below for reference:

a. **Prohibited Zone –**It may also be called Active Flood Zone and will be vulnerable to most frequent floodingevents. This area may correspond to floods of 5-year return period. No activities/ construction will be allowed in this zone except those specified in section 8.2
b. **Regulatory Zone –** The activities in this zone are regulated. The area falling between floods of return period 5 years and return period of 25 years are termed as regulatory zone.

7.2.2. Urban Areas

There will be 3 zones of flood plain in urban area. The same is listed below for reference:

a. **Prohibited Zone –** This is Active Flood Zone and subjected to most frequent flooding. This area may correspond to floods of 5-year return period. No activities/ construction will be allowed in this zone except those specified in section 8.2.
b. **Regulatory Zone –**The area of flood plain falling between floods of 5-year and 25-year return period will be termed as Regulatory Zone. The activities in this zone will be regulated. The severity of flood in this area will be lesser than protected zone.
c. **Warning Zone –** It is the outermost zone in which most of the activities can be permitted by mapping their vulnerability such that risk flooding hazards remain minimal. This part of flood plain corresponds to area falling between floods of 25-year return period and 100-year return period.

Box 13: Joshimath Land Subsidence

On account of the recent events happening at Joshimath, Uttarakhand, due to land subsidence and sinking at various parts of the area, it is imperative that utmost priority be accorded to, on reducing infrastructure development in ecologically sensitive areas, and where necessary, then building sustainable, climate-change-adapted, disaster-resilient housing and infrastructure that specifically recognizes environmental concerns.

Table 3:Demarcation areas and associated Flood Frequency Intervals

S. No.	Demarcation of areas	Flood Frequency Interval
1	Prohibited Zone (both rural and urban areas)	5 years
2	Regulatory Zone (both rural and urban areas)	5-25 year
3	Warning Zone (only in urban areas)	25-100 year

7.2.3. Other developmental regulations

a. For protected reaches where embankments exist within a prohibited or regulated zone, the outer boundary of active flood plain will be upto the embankment or the line corresponding to 5year return period, whichever is more.

Figure 4- River plain without embankments

Figure 5 - River plain with embankments

b. In case the Flood Plain Zone of one river overlaps with that of another, within a region, the entire area between the two rivers should be considered for regulation of various activities.

c. In case of existing storage structure on river, the demarcation of flood plains is to be done carefully, after taking into consideration factors such as maximum discharging capacity of the spillway, maximum release since construction that may be routed in the channel downstream of the reservoir etc.The maximum flood level at different points d/s may also be considered and flood plains may be marked suitably.

d. **Mountain Rivers and Hill Streams :**River Plain Zones should be delineated as per the slope of the hill towards the river, as follows:

Prohibited Zone

Table 4: Extend of Prohibited Zone along the slope of hill

Sl. No	Slope of the hill towards the river	Extend of Prohibited Zone
1.	> 30 degrees	Shall be upto5m from the highest recorded flood level in the valleyalong the slope
2.	> 10 degrees and < 30 degrees	Shall extend upto 15m from the HFL along the slope
3.	< 10 degrees*	Shall extend upto 50 m from the HFL along the slope

(*When the slope is <10 degrees and under such circumstances of conflict whether a terrain is hilly or plain, the prohibited and regulatory zones may be decided taking into consideration the criteria mentioned in table 2, wherein prohibited/regulatory zone shall extend upto a distance maximum of the 2 of the above (table 2 and 3))

Regulatory Zone: This zone should extend upto100 malong the slope or the crest of the hill, whichever is less, beyond the boundary of Prohibited Zone. There will be no warning zone

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8. Regulation of Activities

8.1. List of prohibited activities

The list of prohibited activities in the demarcated flood pains are tabulated below for reference:

Sl. No	Zone	List of Activities
1.	**Prohibited Zone**	i. All kinds of permanent construction, ii. Construction of new embankments, iii. Any construction disturbing the natural course of the river channel except the ones for necessary services such as gas pipelines, Power line transmission pylons, pipeline for water supply, bridge/barrages etc., iv. Dumping of solid waste/creation of landfills v. Storage of highly volatile, inflammable, explosive, toxic materials, vi. Any addition in floor area or elevation of any existing structure of any kind
2.	**Regulatory Zone**	i. Residential settlement ii. Critical Defence Installations iii. Prohibition for construction of basements and minimum levels of approach roads etc.
3.	**Warning Zone**	i. Hazardous waste producing chemical industries, ii. Nuclear plants, iii. Aerodromes

8.2. List of Permissible Activities

The list of permissible activities in the demarcated flood pains are tabulated below for reference:

Sl.No	Zone	List of Activities
1.	**Prohibited Zone**	i. Traditional organic & natural farming, without use of any agrochemical or heavy machinery ii. Parks, playground, garden, recreational activities etc. not requiring construction/ erection of any permanent structures. iii. Traditional fisheries activities without use of chemicals, toxins, motorized boats and electro fishing iv. Traditional grazing by domestic animals v. Ground water withdrawal by hand pumps for local use vi. Discharge of domestic wastewaters from cities or towns after treatment to prescribed effluent standards vii. Religious and socio-cultural activities (such as Kumbhmela, puja, rituals etc.) and related temporary structures for limited period viii. Temporary structures for exceptional circumstances like natural calamities etc. ix. Construction of paved Ghats/riverfronts shall be permitted
2.	**Regulatory Zone**	i. Public Institutions, government offices, universities, public libraries, sewage treatment plants ii. Building should be above a level corresponding to a 25-

		year-old flood with stipulation that all buildings in vulnerable zones should be constructed on columns or stilts (subject to earthquake safety) minimum plinth levels iii. In urban areas, there should be double storied buildings. iv. Ground floors could be utilized for schools and other non - residential purposes
3.	**Warning Zone**	i. Industries, residential buildings, public utilities like hospitals, electricity installations, water supply, telephone exchanges, railway stations, commercial centres, etc. ii. Buildings minimum plinth levels should be in such a fashion that they are safe corresponding to a 100- year flood frequency.

Till such time the States scientifically demarcate flood plains, as an interim measure, certain buffer zones (defined specifically in the NGT directions) must be notified as no construction zones and regulatory zones to prevent encroachments into riverine flood plains and to maintain a baseline. This interim measure shall cease upon scientific demarcation and notification thereof of floodplains by the States.

ANNEXURE

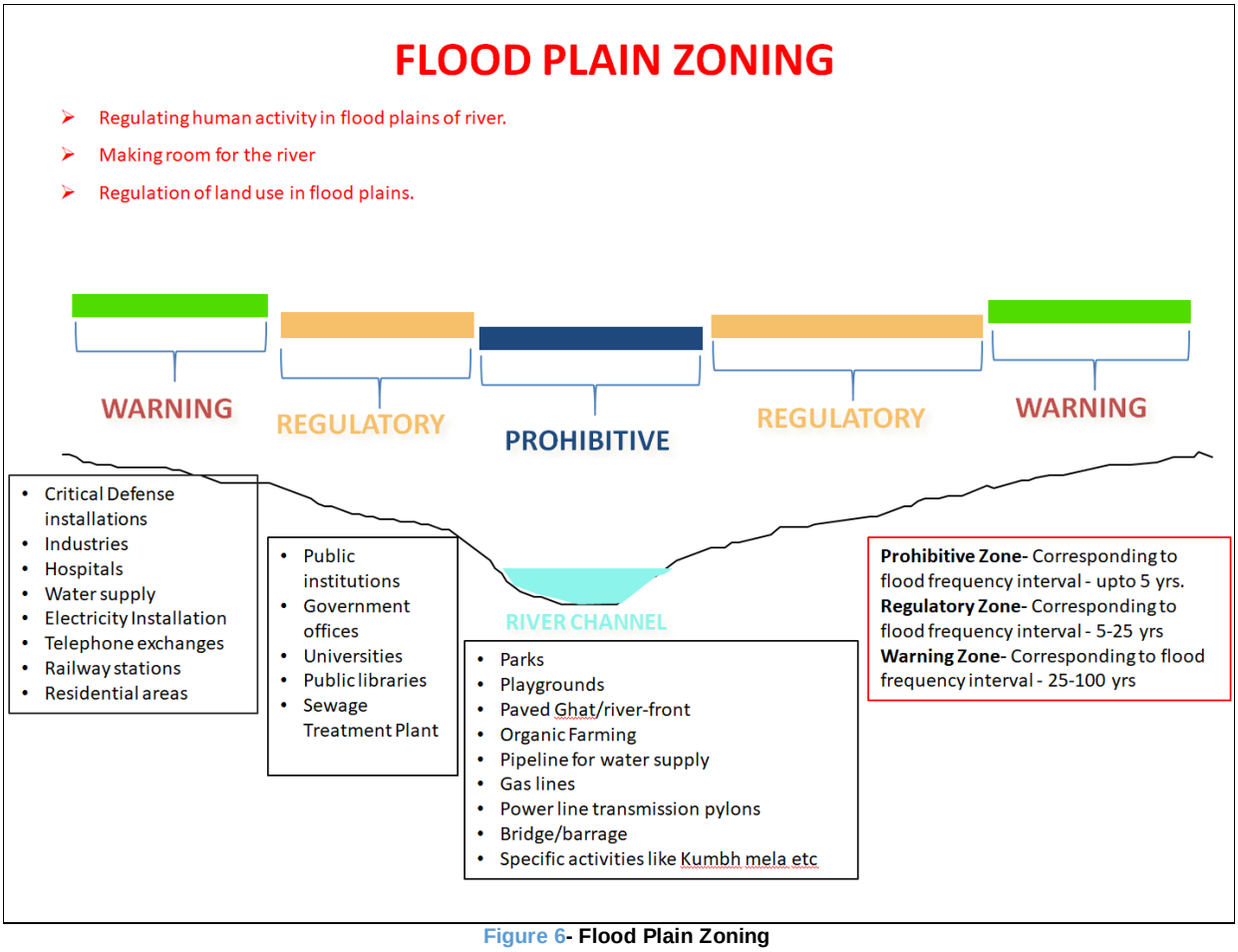

Figure 6- **Flood Plain Zoning**

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