

# 4279

To,  
The Registrar  
The National Green Tribunal  
Principal Bench  
New Delhi  
E-mail: [judicial-ngt@gov.in](mailto:judicial-ngt@gov.in)

Date: 24.05.2024

**SUBJECT:** REPORT ON BEHALF OF THE STATE OF UP IN COMPLIANCE OF THE ORDER DATED 15.03.2024 IN O.A. 515 OF 2023 GANGA POLLUTION vs STATE OF UP & ORS.

Respected Sir,

With reference to the above-mentioned subject the report is filed by the Irrigation & Water Resource Department, State of UP in compliance of the order dated 15.03.2024 in O.A. No. 515 of 2023 Ganga Pollution vs State of UP & Ors. The Irrigation & Water Resource Department report is hereby submitted for your kind Perusal and necessary action please.

Enclosure: Comprehensive Report

Yours Sincerely



Sidhartha Kr. Singh  
Chief Engineer  
Irrigation & Water Resource Department  
Varanasi, Uttar Pradesh

**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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Sidhartha Kr. Singh  
Chief Engineer, Sone  
Irrigation and Water Resource Department  
Varanasi, Uttar Pradesh

**COMPREHENSIVE REPORT/RESPONSE ON BEHALF OF THE STATE OF  
UTTAR PRADESH IN COMPLIANCE OF ORDER DATED 15.03.2024**

1. It is submitted that the main issue involved in the petitions revolves around defining the flood plain zones of river Ganga and its tributaries in the state of U.P. and actions by the concerned authorities to protect the flood plain zones.
2. That the matter was listed on 15.03.2024 and the Hon'ble Tribunal was pleased to pass the following order.

*PARA 10 "A perusal of the above clauses clearly reveals that the responsibility lies with the authorities, at the first instance, to determine the flood plain and thereafter to take action for protection of the flood plain and carry out various responsibilities as enumerated in 2016 order. It is not in dispute that till now the flood plains have not been demarcated. So far nothing has been placed on record indicating what parameters and methodology have been adopted for demarcation of the flood plain in terms of the definition of flood plain as provided in the order of 2016. A Standard Operating Procedure (SOP) is required to be prepared for demarcation of flood plain of River Ganga and its tributaries in the districts.*

*PARA 11 "Learned Counsel appearing for State of UP has submitted that the entire stretch from Bijnor to Ballia has been divided in two phases. The first phase is from Bijnor to Unnao and the second phase is from Unnao to Ballia. He submits that the study in respect of ascertainment of flood plain in the first phase has been completed by Central Water Commission and for the second phase it is being conducted by National Institute of Hydrology (NIH), Roorkee. Learned Counsel for the State has also failed to point out as to why the responsibility for defining the flood plain in the second phase has been entrusted to NIH instead of CWC.*

*PARA 12 " In this background Counsel for the State has prayed for Six weeks' time to place on record a comprehensive report by the state disclosing the parameters for determining the flood plain, the action taken by the authorities for defining the flood plain and as to how the district and State Committees formed under 2016 order are discharging their responsibilities to protect the flood plains of river Ganga and its tributaries in the state of UP when even the flood plain has not been defined till now.*

3. It is submitted that Central Water Commission vide letter no. 4/67/2017-FCA-II/56-58 dated 24.02.2020 (**Annexure-1**) informed that directorate has earlier taken up the work of Flood Plain Demarcation for River Ganga from HARIDWAR TO UNNAO (PHASE-I) as per the mandate of Hon'ble National Green Tribunal (NGT). The report has been already submitted to the Ministry. This Flood Plain Demarcation study took more than a year for completion.
4. It is further submitted that by E-mail dt. 19.04.2022, CE UGBO CWC informed that CWC will be providing necessary technical support only to the state government officials for carrying out the flood plain demarcation studies for the 12 River suggested by them. Also, it is suggested that State Govt. may arrange for requisite training for this specific work on own.

**Flood Plain Zoning "Delineation & Demarcation of the Flood Plain zone (FPZ) of Ganga River, Segment B, Phase II (Unnao to Ballia)"**

It is submitted that Segment B, Phase II (Unnao to Ballia) of River Ganga in compliance with the order passed on 22.07.2022 in OA No. 200/2014 M.C. Mehta vs. Union of India and others pending in Hon'ble National Green Tribunal (NGT), New Delhi. The work of delineation and demarcation of Flood Plain zone (FPZ) is to be done by the Irrigation and Water Resources Department. The National

Institute of Hydrology (NIH), Roorkee, is entrusted the task for carrying out the modelling for demarcation of flood plain zoning.

National Institute of Hydrology, Roorkee (NIH) is a premier Research and Development organisation in the area of hydrology under Ministry of Jal Shakti, Gov. of India. Central Water Commission and NIH are the sister organisation under the same ministry. NIH is in interaction with CWC for the Flood Plain Zoning Work. As CWC has denied the work because the manpower issue, the work is entrusted to NIH. Further, NIH has carried out FPZ study for two stretches in Uttarakhand and that study was entrusted to NIH by Irrigation Department Govt of Uttarakhand and it was presented to Honourable National Green Tribunal, New Delhi.

### **Scope of Work:**

This project covers the delineation and demarcation of the flood plain zones in 13 districts of Uttar Pradesh, namely: Kanpur Nagar, Unnao, Raebareli, Fatehpur, Pratapgarh, Kausambhi, Prayagraj, Bhadohi, Mirzapur, Varanasi, Chandauli, Ghazipur, and Ballia. A Memorandum of Agreement between National Institute of Hydrology, Roorkee and Irrigation and water resources department UP has been done on dated 22 Dec 2023. The time period given to complete the task in the length of Ganga river approximately 800 kilometre is 12 Month, from the date of Supply of Data and advance payment. The advance payment has been done and the work is in progress.

### **Methodology:**

#### **1. Flood Plain Zones:**

- **Prohibited Zone:** Recurrence interval of 5 years.
- **Regulatory Zone:** 25-year return period flood.
- **Warning Zone:** 100-year return period flood.

#### **2. Flood Frequency Analysis:**

- The flood frequency analysis will be conducted at various gauging sites within the study area.
- Frequency distributions such as 2-Parameter Log Normal, 3-Parameter Log Normal, 2-Parameter Gamma, Log Pearson Type-III, and Gumble will be utilized to estimate floods of return periods: 5, 25 and 100 years.
- Based on this analysis, the floods with return periods of 5 years, 25 years and 100 years will be identified.

#### **3. Flood Plain Demarcation Using Satellite Data/Images:**

- Landsat multispectral satellite images spanning 37 years (1984-2021) have been analysed to determine the recurrence interval of water return.
- The Joint Research Centre-European Commission conducted the analysis using the Google Earth Engine platform.
- The State Remote Sensing Applications Centre, Uttar Pradesh (RSAC-UP) or National Remote Sensing Centre (NRSC) were contacted for flood inundation data before 2017, we are still waiting for their response.

#### **4. Flood Plain Demarcation Using Hydraulic Modelling:**

- The 2019 study by CWC used SRTM 90 m Digital Elevation Model (DEM) with corrections for river profiles for Phase-I of River Ganga from Haridwar to Unnao. This approach will be replicated, using LiDAR DEM (1 meter resolution) which is better than SRTM data.
- The hydrodynamic model for the River Ganga from Unnao to Ballia will be set up using HEC-RAS or Mike Flood for 5, 25 and 100 year return period floods.

#### **Data Used and Work Progress:**

##### **1. Long Term Annual Maximum Discharge Series Data:**

River discharge data at different places in the stretch of the River Ganga from Unnao to Ballia. Total six discharge stations data have been collected. These stations are Kanpur, Bhitaura, Chhatnag, Allahabad, Mirzapur, Varanasi, Buxa. Discharge data of each station is about 50 years discharge data spanning from 1968 to 2023. These data have been processed and checked for the consistency of the data. Further, various distributions have been applied to annual maximum data series of each stations. Best fit distribution for each gauging site have been identified to compute 5, 25 and 100 year return period floods. This is a very important model input data preparation task to carry out flood plain zoning. This task is completed.

##### **2. River Cross-Section Data:**

River Cross-section and Digital elevation model (DEM) is another important input for the model. Digital elevation model of 1 m resolution have been collected and processed. It was found that the available DEM is missing in some of the places. Surveying is being initiated by the Water Resources & Irrigation department UP for those places. At 37 places cross-section in river Ganga is available. These cross-section data and DEM data were processed. Further, more Cross-Section are needed for the model study. Water Resources & Irrigation department UP has initiated the work of cross-section survey for the identified places. After, the cross-section survey the DEM and cross-section data will be further processed to make it ready for Model setup.

##### **3. Flood Inundation Extent from Satellite Data:**

- Available data from 2017 to 2023 monsoon seasons. Historic inundation data requests were made to RSAC-UP & NRSC, Hyderabad.

##### **4. Flood Extent Based on Water Recurrence Using Satellite data:**

- Multi Satellite Remote Sensing Data has been used to derive the flood extent in the study reach.

##### **5. Combined Demarcation Results:**

- A hybrid approach will combine results from satellite analysis and hydraulic modelling, accounting for the limitations of each method.

#### **Conclusion:**

5. This comprehensive approach, combining flood frequency analysis, satellite data, and hydraulic modelling, will ensure accurate delineation and demarcation of the Flood Plain Zones for Segment B, Phase II (Unnao to Ballia) of the River Ganga, in compliance with the Hon'ble Tribunal's directives. It is submitted that the entire process for the earmarking of the flood plain zone would be completed by the December, 2024 by NIH as per MOA which is executed between the State Govt. and National Institute of Hydrology.

The above Report is filed for your kind consideration and further order.

  
 Sidhartha Kr. Singh  
 Irrigation & Water Resource Dep.  
 Varanasi, Uttar Pradesh

U537/2022/O/o CE(UGBO)

## ANNEXURE 1

No. 4/67/2017-FCA-III/ 56 - 58  
 भारत सरकार  
 Government of India  
 केंद्रीय जल आयोग  
 Central Water Commission  
 बाढ़ नियंत्रण अनुप्रयोग निदेशालय  
 Flood Control Applications-II Directorate

Telephone 011-26103548, 01126101321  
 Fax- 011-26101321  
 Email- dirfca-cwc@nic.in

Wing-2, 2<sup>nd</sup> Floor,  
 West Block-2, R.K. Puram,  
 New Delhi-110066  
 Dated 2<sup>nd</sup> 02.2020

To  
 Chief Engineer,  
 Upper Ganga Basin Organisation,  
 Central Water Commission,  
 Lucknow

Subject: Request for e-Flow and Floodplain Demarcation study of River Yamuna, Ramganga, Betwa and Ghaghra w.r.t. NGT OA No. 606/2018

Ref:

- पत्रांक: प्र. एवं मू. स्वरूप/क. पी. लेटर. (एन. सी. टी.)/2019/135-37 दिनांक 15.01.2020
- पत्रांक: 17/मु० अ० (ज० सं०) अतिम-1/अतिम-3, लखनऊ: दिनांक 10.01.2020 ✓

Sir,

Kind reference is invited to the letters mentioned above (enclosed) requesting Central Water Commission (CWC) for carrying out e-flow and floodplain demarcation studies for following twelve (12) river reaches, marked critically polluted in state of Uttar Pradesh.

S.No.	River Name	Critical Polluted Stretch
1	Hindon	Saharanpur to Ghaziabad Ajgarpur to Etawah
2	Yamuna	Shapur to Prayagraj Kannauj to Varanasi
3	Ganga	Muradabad to Kannauj
4	Ram Ganga	Hamirpur to Waggura
5	Betwa	Barhalganj to Deoria
6	Ghagnara	Domingarh to Rajghat
7	Rapti	Ayodhya to Ititfatganj
8	Sarayu	Muzaffarnagar to Gulavati
9	East Kali River	Rameshwar to Varanasi
10	Varuna	Sitapur to Varansi
11	Gomti	Unnao to Jaunpur
12	Sai	

उपरोक्त पत्रांक

2/10/2020

1.02.20

1537/2022/O/o CE(UGBO)

This is to inform that this directorate had earlier taken up the work of Floodplain Demarcation for River Ganga from Haridwar to Unnao as per the mandate of Hon'ble National Green Tribunal (NGT), the report of which has been already submitted to the Ministry. This floodplain demarcation study took more than a year for completion.

CWC will be providing necessary technical support to the state government officials for carrying out the floodplain demarcation studies for the 12 River reaches suggested by them.

Also, it is suggested that State Govt. may arrange for requisite training for this specific work on their own.

It issues with the approval of Member (RM), CWC.

Encl.: As above

21/02/2022  
24/02/2022  
(Sharad Chandra)  
Director, FCA-II

Copy for information to:

- i) Chief Engineer (P&D), CWC
- ii) Director (M&CC), CWC

कार्यालय मुख्य अभियन्ता (शारदा सहायक)  
सिंचाई एवं जल संसाधन विभाग, उत्तर प्रदेश,  
गंगा सिंचाई भवन, तेलीबाग, लखनऊ।

डाकरी संख्या 597 / ज०स०अनु०  
दिनांक 21/02/24

पत्रांक 1533 / मु०अ०शा०सहा० / एनजीटी

दिनांक लखनऊ फरवरी 16, 2024

विषय-मा० राष्ट्रीय हरित अधिकरण, नई दिल्ली द्वारा ओ०ए० संख्या-200/2014(C.W.P.No. 3727/1985) एम०सी०मेहता बनाम यूनियन ऑफ इण्डिया व अन्य में पारित आदेश दिनांक 04.12.2023 के अनुपालन के सम्बन्ध में।

सन्दर्भ-आपका पत्रांक 37 / मु०अ०(ज०स०) / अनिम-1 / अनिख-3, दिनांक 23.01.2024

मुख्य अभियन्ता (जल संसाधन), सिंचाई एवं जल संसाधन विभाग, उ०प्र०, लखनऊ

उपरोक्त विषयक सन्दर्भित पत्र का अवलोकन करने का कष्ट करे जिसके साथ संयुक्त सचिव, सिंचाई एवं जल संसाधन अनुभाग-4, उ०प्र० शासन के पत्र सं० 22/24-27-सि०-4-7(रिट) एन०जी०टी०/16 टी०सी०सीएन-1703480, दिनांक 09.01.2024 व तत्संलग्नकों की छाया प्रति संलग्न करते हुये, मा० राष्ट्रीय हरित अधिकरण, नई दिल्ली द्वारा ओ०ए० संख्या-200/2014 एम०सी०मेहता बनाम यूनियन ऑफ इण्डिया व अन्य में पारित आदेश दिनांक 04.12.2023 में मा०एन०जी०टी० के पूर्व आदेश दिनांक 24.11.2023 के प्रस्तर-1 में उल्लिखित 07 बिन्दुओं पर निर्धारित संलग्न प्रारूप में सूचना तत्काल उपलब्ध कराये जाने की अपेक्षा की गई है।

उक्त सम्बन्ध में अधीक्षण अभियन्ता, बाढ़ प्रबन्धन सूचना प्रणाली केन्द्र, लखनऊ ने अपने पत्रांक 24/अधी०अभि० / FMISC/FPZ, दिनांक 08.02.2024 (छाया प्रति संलग्न) द्वारा निम्नानुसार अवगत कराया है:-

संलग्न प्रारूप में मांगी गई सूचना Hotels/Ashrams, Municipal Solid Waste Disposal, Construction and Demolition waste and Industrial Effluent Discharge से सम्बन्धित है।

उक्त के अतिरिक्त मा०एन०जी०टी० के आदेश दिनांक 24.11.2023 में 07 बिन्दु निम्नानुसार है:-

- I. Sewage
- II. Municipal Solid Waste Disposal
- III. Construction and Demolition waste
- IV. Industrial Effluent Discharge
- V. Regulation of Flood Plain Zone
  - f) If the flood plain zone has been demarcated and the extent of encroachment on the flood plain zone in the District
  - g) The details of direct discharge of pollutants by the encroachers by the side of the river Ganga and its tributaries in the District
- VI. Bio medical Waste
- VII. Mining

उपरोक्त 07 बिन्दुओं में बिन्दु संख्या 05 Regulation of Flood Plain Zone के सम्बन्ध में अवगत कराना है कि प्रमुख अभियन्ता एवं विभागाध्यक्ष के कार्यालय डाक संख्या 157/दिनांक 20.06.2023 के माध्यम से बाढ़ प्रबन्धन सूचना प्रणाली केन्द्र को गंगा नदी के Segment B, Phase-II (उन्नाव से बलिया) की Flood Plain Zone (FPZ) के निर्धारण एवं सीमांकन (Delineation & Demarcation) हेतु नामित किया गया है। यह कार्य राष्ट्रीय जल विज्ञान संस्थान, रुड़की द्वारा सम्पादित किया जा रहा है। कार्य के पूर्ण होने की अवधि दिसम्बर-2024 तक है। तत्संलग्नक: उपरोक्तानुसार।

( प्रभाकर प्रसाद )

मुख्य अभियन्ता (शारदा सहायक)

पत्रांक: / मु०अ०शा०सहा० / एनजीटी / तदिनांक

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

1. मुख्य अभियन्ता (नध्य) स्तर-1, सिंचाई एवं जल संसाधन विभाग, उ०प्र०, लखनऊ।
2. मुख्य अभियन्ता (परिवाद) सिंचाई एवं जल संसाधन विभाग, उ०प्र०, लखनऊ।
3. अधीक्षण अभियन्ता, FMIS केन्द्रीय सूचना संगठन, लखनऊ को उनके पत्रांक 24/अधी०अभि० / FMISC/FPZ, दिनांक 08.02.2024 के सन्दर्भ में।
4. अधीक्षण अभियन्ता, अष्टदशम मण्डल सिंचाई कार्य, प्रयागराज।

( प्रभाकर प्रसाद )

मुख्य अभियन्ता (शारदा सहायक)

श्री/श्रीमती S.E.F. / ज०स०अनु०

200/2014

श्री/श्रीमती S.E.F. / ज०स०अनु०  
20/2/24 (ज०स०)

श्री/श्रीमती S.E.F. / ज०स०अनु०  
20/2/24

File No. C-1258 IPC-11CAMP  
Date: 21/02/2024

File

EXEN  
I/P-Div 3

SE  
2/12

**ANNEXURE 2****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 Hydro, gy (NIH), (Roorkee) and Irrigation & Water Resources Department (IWRE), 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 twentyfive 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 banks of river Ganga from Unnao to Ballia, under which 13 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
	<b>Total Project Charges</b>	<b>Rs. 1,40,00,000</b>
	GST (@ 18% or as applicable)	Rs.25,20,000
	<b>Total Consultancy charges including GST</b>	<b>Rs. 1,65,20,000</b>

### 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 : SBINO001069  
MICR Code : 247002094

Seal of Parties:

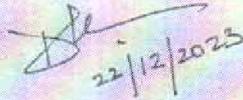
In witness where of the parties here to have signed this agreement on Day, Month and Year mentioned here in before

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  
वायु प्रवहन सूचना प्रणाली केंद्र  
सिद्धांत एवं नवा संसाधन विभाग, उत्तर प्रदेश, कानपुर

Seal

डॉ. ए.के. लोहानी  
वैज्ञानिक जी एवं प्रभानाध्यक्ष  
सतही जलविज्ञान प्रभाग, रुड़की  
Dr. A.K. Lohani  
Sc. G. & Head  
Surface Water Hydrology Division Roorkee  
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.   
20/12/2023  
Parmanu Kumar  
AE, FMISC

2. Chandra Prakash  
Chandra Prakash  
Scientist B, SWHD  
NIH, Roorkee

Signed on the 22 Day of December 2023