(1)

BEFORE THE NATIONAL GREEN TRIBUNAL PRINCIPAL BENCH, NEW DELHI

ORIGINAL APPLICATION NO.477/2022

IN THE MATTER OF:

RAJENDER GANGSARI ...APPLICANT

~VERSUS~

STATE OFUTTARAKHAND & ORS. ...RESPONDENT

AFFIDAVIT ON BEHALF OF RESPONDENT NO. 1 IN COMPLIANCE OF THE ORDER DATED 19.03.2024

I, Gaurav Kumar, aged about 38 years, currently posted as Municipal Commissioner, Municipal Corporation Dehradun, do hereby solemnly affirm and state as under:

1. That I am the duly Authorised Person on behalf of Respondent No.1, as such I am fully conversant with the aforementioned matter as such, I am competent to swear the present affidavit. True copy of the authorization letter is annexed herewith and marked as **Annexure R-1/1.**

2. That the present affidavit is filed in compliance of the order dated 19.03.2024 passed in the present proceedings.

3. It is respectfully submitted that Irrigation Departmentwas called upon to take requisite steps for notifying Flood Plain Zone of all the rivers in the State of Uttarakhand Flood Plain Zone of all river in the state.

4. That the Office of Executive Engineer, Water Scientific Department, Bhadrabad, who were appointed as an authority

(2)

under 2012 Act, vide communication dated 10.07.2024 informed that all data preparation, flood frequency analysis and catchment delineation, hydrological and hydraulic flood flows, report preparation and ground truth verification in respect of flood plain zone of Asan river has been duly completed, enclosing therewith a copy of the report submitted to the said authority by an agency engaged for the said purpose. True Copy of the communication dated 10.07.2024 along with the report is annexed herewith and marked as **Annexure R-1/2** and **R-1/3** respectively.

Deponent

Verification:

Verified on this 22nd day of July, 2024 that the contents of the affidavit are true and correct and nothing material has been concealed therefrom.

Deponent

NOTARY Rajender Singh Negi Advocate Dehradun Reg.No.19(01)2002 GOVT. OF UTTARAKHAND (INDIA)

Sr. No. 38744

This affidavit is sworn before me by Shri ..... who is identified by Shri ..... at Dehradun on .....

(Rajender Singh Negi)
Advocate & Notary, Dehradun

IRR 2-3/3.1/2/2024-II-2-Irrigation and Minor Irrigation Department

/226102/2024

महत्वपूर्ण/समयबद्ध (3)

ई0पत्रावली संख्या–73153

प्रेषक,

डा0 आर0 राजेश कुमार, I.A.S.
सचिव,
उत्तराखण्ड शासन।

सेवा में,

नगर आयुक्त,
नगर निगम, देहरादून।

सिंचाई एवं बाढ़ नियंत्रण अनुभाग–02

देहरादून, दिनांकः 19 जुलाई, 2024

विषयः–मा0 एन0जी0टी0 में योजित मूल आवेदन संख्या–477/2022 श्री राजेन्द्र गंगसारी बनाम उत्तराखण्ड राज्य व अन्य में मा0 एन0जी0टी0 द्वारा पारित आदेश दिनांकः 19.03.2024 का अनुपालन किये जाने के संबंध में।

महोदय,

उपर्युक्त विषयक अवगत कराना है कि प्रश्नगत् वाद में मा0 एन0जी0टी के पारित आदेश दिनांक : 19.03.2024 के अनुपालन में निर्धारित तिथि एवं समय पर मा0 एन0जी0टी0 के समक्ष उपस्थित होकर शासन का पक्ष प्रस्तुत किये जाने हेतु मुख्य सचिव, उत्तराखण्ड शासन के प्रतिनिधि के रूप में आपको नामित किया जाता है।

2– प्रश्नगत् वाद के संबंध में सिंचाई विभाग द्वारा की गयी कार्यवाही के संबंध में प्रमुख अभियंता, सिंचाई विभाग के पत्र संख्याः 2641/प्र0अ0/सि0वि0/नि0अनु0/एन0जी0टी0/477/2022, दिनांकः 18.07.2024 (छायाप्रति संलग्न) द्वारा उपलब्ध करायी गयी सूचना प्रेषित करते हुये मुझे यह कहने का निदेश हुआ है कि कृपया उक्त से अवगत होते हुए प्रकरण में अग्रेत्तर आवश्यक कार्यवाही करने का कष्ट करें।

संलग्नक : यथोक्त।

भवदीय,
Signed by R. Rajesh Kumar
Date: 19-07-2024 17:29:12
(डॉ0आर0 राजेश कुमार)
सचिव।

ई0 पत्रावली संख्याः 73153 तद्दिनांक।

प्रतिलिपिः– निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित–

1. वरिष्ठ प्रमुख निजी सचिव, मुख्य सचिव, उत्तराखण्ड शासन को उप सचिव, शहरी विकास विभाग के पत्र संख्याः 101/IV(3)-2024-12(1 N.G.T.)2022, दिनांकः 18.07.2024 के क्रम में मुख्य सचिव महोदया के संज्ञानार्थ।
2. निजी सचिव, प्रमुख सचिव, वन एवं पर्यावरण विभाग, उत्तराखण्ड शासन को प्रमुख सचिव महोदय के संज्ञानार्थ।
3. निजी सचिव, सचिव, शहरी विकास विभाग, उत्तराखण्ड शासन को सचिव महोदय के संज्ञानार्थ।
4. निदेशक, शहरी विकास निदेशालय, देहरादून।
5. प्रमुख अभियन्ता, सिंचाई विभाग, उत्तराखण्ड, देहारादून को उनके पत्र2641/प्र0अ0/सि0वि0/नि0अनु0/ एन0जी0टी0/477/2022, दिनांकः 18.07.2024 के क्रम में।

NOTARY Rajender Singh Negi Advocate Dehradun District Reg.No.19(01)2002 GOVT. OF UTTARAKHAND (INDIA)

आज्ञा से,
Signed by Jai Lal Sharma
Date: 19-07-2024 17:33:19
(जे0एल0 शर्मा)
संयुक्त सचिव।

(4)

प्रेषक,

प्रमुख अभियन्ता,
सिंचाई विभाग,
उत्तराखण्ड, देहरादून।

सेवा में,

सचिव ,
शहरी विकास विभाग,
देहरादून।

पत्रांकः– 2641/प्र0अ0/सिं0वि0/नि0अनु0/NGT/477/2022, दिनांकः– 18 जुलाई, 2024

विषयः–मा0 राष्ट्रीय हरित अधिकरण, नई दिल्ली में योजित वाद संख्या 477/2022 श्री राजेन्द्र गन्सारी बनाम उत्तराखण्ड राज्य में जनपद देहरादून के अन्तर्गत आसन नदी के फ्लड प्लेन जोन के निर्धारण के सम्बन्ध में आख्या।

महोदय,

कृपया उपरोक्त विषयक अपने पत्र संख्याः 210123/IV(3)/2024-1291 NGT)22, दिनांक 13.05.2024 का संदर्भ ग्रहण करने का कष्ट करें, जिसके द्वारा उपरोक्त विषयक मा0 राष्ट्रीय हरित अधिकरण, नई दिल्ली में योजित वाद संख्या 477/2022 श्री राजेन्द्र गंगसारी बनाम उत्तराखण्ड राज्य में जनपद देहरादून के अन्तर्गत आसन नदी के फ्लड प्लेन जोन के निर्धारण के सम्बन्ध में दिनांक 30.04.2024 को आहूत बैठक के कार्यवृत्त में दिये गये निर्देशों के कम में की गयी अग्रेत्तर कार्यवाही सूचनार्थ प्रेषित है।

संलग्नः उपरोक्तानुसार।

भवदीय,

(जयपाल सिंह)
प्रमुख अभियन्ता

पत्रांकः– / प्र0अ0/सिं0वि0/नि0अनु0/एन0जी0टी0/तद्दिनांक।

प्रतिलिपि निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषितः–

1. सचिव, उत्तराखण्ड शासन, सिंचाई एवं बाढ़ नियंत्रण अनुभाग–02 को उनके ई–पत्रावली संख्या–73153 दिनांक 07.06.2024 के कम में।
2. मुख्य अभियन्ता, सिंचाई विभाग, देहरादून।

संलग्नः– उपरोक्तानुसार।

NOTARY Rajender Singh Negi Advocate Dehradun District Reg.No.19(01)2002 GOVT. OF UTTARAKHAND (INDIA)

प्र0अ0

(जयपाल सिंह)
प्रमुख अभियन्ता

(5)

मा0 राष्ट्रीय हरित अधिकरण, नई दिल्ली में योजित मूल आवेदन संख्या–477/2022 राजेन्द्र गंगसारी बनाम उत्तराखण्ड राज्य व अन्य के संबंध में बाढ़ मैदान परिक्षेत्रण (Flood Plane Zoning) से संबंधित बिन्दुओं की अद्यतन स्थिति दिनांक 15.07.2024।

(A) Final Notification has been issued

S. No.	Name of River	Length (in Km)	Name of the District	Remark
1	Bhagirathi- Gangotri to Devprayag.	133.35	Uttarkashi 110 km Tehri Garhwal 23.35 Km	Final Notification has been issued (Enclosed)
2	Ganga River- From Devprayag to Rishikesh.	138.00	Tehri Garhwal Right bank 60 km Paudi Garhwal Left Bank 84 km Dehradun Right bank 19 km Haridwar Right bank 5 km Haridwar Both bank 55 Km	
3	Ganga River- From Rishikesh to Chadi Pul, Left Bank.			
4	Ganga River- Chandi Bridge, Haridwar to Kalsia Village in Lakasar Haridwar District			
5	Bhilangana river	68	Tehri Garhwal 68 Km	
6	Alaknanda River -Badrinath to Devprayag.	198.35	Chamoli 104 km Rudraprayag 30 km Tehri Garhwal Right Bank 40 km Paudi Garhwal Left Bank 40 km	
7	Mandakini River - Kedarnath to Rudraprayag.	76.9	Rudraprayag 76.9 km	
	Total Length	**614.60**		

(B) Survey and hydrological Study Work Completed & Notification Under Progress

S. No.	Name of River	Length (in Km)	Name of the District	Remark
1	Gola- up to border of Uttarakhand	80	Nainital 50 km U S Nagar 30 Km	Study work has been completed. Notifications is in under progress, which is likely to be completed by Dec. 2025
2	Kosi – up to border of Uttarakhand	176	Almora 52 km Almora Right Bank 40 Km Nainital Left Bank 40 Km Nainital Both Bank 58 Km U S Nagar 24 Km	
3	Suswa River	24.25	Dehradun 24.25 Km	
4	Song	69	Tehri Garhwal 6 Km both bank and 10 Km Right Bank Dehradun 53 Km Both bank and 10 Km Left Bank	
5	Baldi	12	Dehradun	
	Total Length	**361.25**		

NOTARY Govt. of Uttarakhand Dehradun Advocate Reg. No. 19(01)2002

(6)

(C) Survey and hydrological Study Work is in Progress

S. No.	Name of River	Length (in Km)	Name of the District	Remark
2	Asan and tributaries	106	Dehradun 106 Km	Survey, Hydrological and Hydraulic modelling has been completed. Report and its map preparation work is in progress and subsequently notification of said rivers is likely to be completed by March 2026.
3	Jhakhan/Ranipokhri	28	Dehradun 28 Km	
4	Chandrabhaga	8	Tehri Garhwal 4 Km and Dehradun 4 Km	
5	Yamuna	145	Uttarkashi 53 Km Both Bank & Left Bank 21 Km Tehri Garhwal Left Bank 27 Km Dehradun Right Bank 48 Km Dehradun Both Banks 18 Km Dehradun Left Bank 29 Km Himanchal Pradesh Right Bank 29 Km	
6	Pindar River	106	Bageshwar 17 Km Chamoli 89 Km	
7	Dhauliganga River	87	Chamoli 87 Km	
8	Nandakini River	36	Chamoli 87 Km	
9	Solani	70	Haridwar 70 Km	
10	Malin	3.4	Paudi Garhwal	
11	Ratmau	42	Haridwar 42 Km	
12	Nandhaur	38	Nainital 12 Km U S Nagar 26 Km	
13	Ladhiya	64	Nainital 10 Km Champawat 54 Km	
14	Ram Ganga W River	114	Chamoli 26 Km Almoda 88 Km	
	Total Length	847.4		

NOTARY Rajender Singh Negi Advocate Dehradun (Uttarakhand) Reg.No.19(01)... GOVT. OF UTTARAKHAND

उपरोक्त तालिका "C" में वर्णित नदियों के बाढ़ मैदान परिक्षेत्रण कार्य की अद्यतन स्थिति :–

Hydrological & Hydraulic Modelling का कार्य पूर्ण कर 100 वर्षीय व 25 वर्षीय बाढ़ आवृत्ति की फ्लड लाईन (100 years & 25 years flood frequency line) के सीमांकन कार्य का स्थलीय सत्यापन कर लिया गया है। इसके उपरान्त Initial notification हेतु बाढ़ परिक्षेत्रण प्राधिकारी/जिलाधिकारी के निर्देशन में राजस्व विभाग के अधिकारियो के साथ सजरा मैपिंग का कार्य प्रारम्भ कर फ्लड लाईन के अन्तर्गत आने वाली परिसम्पत्तियो का रजिस्टर (Property register) तैयार कर शासन को प्रेषित किया जायेगा। तदोपरान्त भूमि को प्रतिषिद्ध एवं निर्बन्धित क्षेत्र घोषित करने हेतु सार्वजनिक रूप से सूचित करने की कार्यवाही की जायेगी। सार्वजनिक सूचना के उपरान्त प्राप्त होने वाली आपत्तियों का निराकरण कर सम्बन्धित बाढ़ परिक्षेत्रण प्राधिकारी/जिलाधिकारी द्वारा Final notification हेतु रिपोर्ट शासन को प्रेषित की जायेगी। उक्त कार्यवाही पूर्ण होने के उपरान्त मुख्य सचिव महोदय, उत्तराखण्ड शासन की अध्यक्षता में गठित समिति के समक्ष आख्या प्रेषित की जायेगी। समिति की सहमति के उपरान्त अन्तिम अधिसूचना की कार्यवाही की जायेगी। उक्त सभी कार्यवाही, दिसम्बर, 2025 तक पूर्ण कर ली जायेगी।

8905534940 | Ramesh Upadhyay

(7)

आसन नदी के बाढ़ मैदान परिक्षेत्रण (Flood Plane Zoning) के सम्बन्ध में आख्या :–

जनपद देहरादून के अन्तर्गत आसन एवं उसकी सहायक नदियों (निम्मी, नून, स्वारना एवं शीतलाराव) जिसकी कुल लम्बाई 106 कि0मी0 है। आसन नदी के Flood Plane Zoning कार्य की अद्यतन स्थिति निम्नवत् है :–

i. Data Preparation, Flood Frequency Analysis, Rainfall Analysis & Catchment Delineation का कार्य पूर्ण हो गया है।

ii. Survey & Hydrological Studies and Hydraulic modeling का कार्य पूर्ण हो गया है। जिसके फलस्वरूप flood flows for different return periods i.e. 25 years & 100 years की बाढ़ लाईन (Flood Lines) का कार्य पूर्ण हो गया है।

iii. Report preparation, Ground truth verification का कार्य प्रगति पर है।

आसन नदी के दाँये किनारे पर स्थित **"शीशमबाड़ा कूड़ा निस्तारण प्लान्ट"** के समीप नदी की 100 वर्षीय बाढ़ आवृत्ति (Flood Frequency) की सीमा रेखा को चिन्हित कर सजरा शीट पर रेखांकन कर दिया गया है। **आसन नदी के बाढ़ मैदान परिक्षेत्रण (Flood Plane Zoning)** की अद्यतन स्थिति के आधार पर यह निष्कर्ष प्राप्त हुआ है कि **"आसन नदी के दांये किनारे पर स्थित शीशमबाड़ा कूड़ा निस्तारण प्लान्ट की बाउन्ड्री वॉल, आसन नदी के 100 वर्षीय बाढ़ आवृत्ति की सीमा रेखा से 150 मी0 – 250 मी0 की दूरी पर स्थित है।"**

अधिशासी अभियन्ता
जल विज्ञान खण्ड, बहादराबाद

अधिशासी अभियन्ता
सिंचाई खण्ड, विकास नगर

अधीक्षण अभियन्ता
जल विज्ञान मण्डल, बहादराबाद

अधीक्षण अभियन्ता
सिंचाई कार्य मण्डल, देहरादून

NOTARY Rajender Singh Negi Advocate Dehradun Reg.No.19(01)2002 GOVT. OF UTTARAKHAND (INDIA)

५०३१

कुछ स्पष्ट करना चाहें

15/7/24

प्रमुख अभियन्ता
सिंचाई विभाग, उत्तराखण्ड
देहरादून

(8)

प्रेषक

अधीक्षण अभियन्ता,
सिंचाई कार्य मण्डल, देहरादून।

प्रेषित,

नगर आयुक्त
नगर निगम देहरादून।

पत्रांकः 2684 /सिं0का0म0दे0/एन0जी0टी0 दिनांकः 11/07/2024

विषयः मा0 राष्ट्रीय हरित अधिकरण, नई दिल्ली में योजित वाद संख्या 477/2022 श्री राजेन्द्र गन्सारी बनाम उत्तराखण्ड राज्य में जनपद देहरादून के अन्तर्गत आसन नदी के फ्लड प्लेन जोन के निर्धारण के सम्बन्ध में आख्या।

महोदय,

उपरोक्त विषयक के सन्दर्भ में आपके पत्र सं0–934/एस0टी0/2024, दिनांक 10.07.2024 का सन्दर्भ ग्रहण करने का कष्ट करें, जिसके द्वारा दिनांक 11.07.2024 को अपरान्ह 12:00 बजे आपके कार्यालय कक्ष में आहुत बैठक में मा0 राष्ट्रीय हरित अधिकरण, नई दिल्ली में योजित वाद संख्या 477/2022 श्री राजेन्द्र गन्सारी बनाम उत्तराखण्ड राज्य में जनपद देहरादून के अन्तर्गत आसन नदी के फ्लड प्लेन जोन के निर्धारण के सम्बन्ध में विस्तृत चर्चा हुयी।

बैठक में आपके द्वारा की गयी वांछनानुसार प्रकरण के सम्बन्ध में वांछित आख्या संलग्न कर आपको आवश्यक कार्यवाही हेतु प्रेषित है।

संलग्न–उपरोक्तानुसार।

भवदीय,

11/07/24

(संजय राज)
अधीक्षण अभियन्ता

पत्रांकः /सिं0का0म0दे0/तद्दिनांक

1– प्रतिलिपि प्रमुख अभियन्ता, सिंचाई विभाग उत्तराखण्ड देहरादून को सूचनार्थ प्रेषित।

2– प्रतिलिपि अधिशासी अभियन्ता, सिंचाई खण्ड विकासनगर को सूचनार्थ एवं इस कथन के साथ प्रेषित है कि विषयगत महत्वपूर्ण प्रकरण पर खण्डीय स्तर पर की जाने वाली कार्यवाही समयबद्ध सीमा में पूर्ण करते हुये इस कार्यालय को भी अवगत कराया जाना सुनिश्चित् करें।

NOTARY Rajender Singh Negi Advocate Dehradun District Reg.No.19(01)2002 GOVT. OF UTTARAKHAND (INDIA)

(संजय राज)
अधीक्षण अभियन्ता

(9)

मा0 राष्ट्रीय हरित अधिकरण, नई दिल्ली में योजित वाद संख्या 477/2022 श्री राजेन्द्र गन्सारी बनाम उत्तराखण्ड राज्य में जनपद देहरादून के अन्तर्गत आसन नदी के फ्लड प्लेन जोन के निर्धारण के सम्बन्ध में आख्या।

1— जनपद देहरादून के अन्तर्गत आसन नदी के फ्लड प्लेन जोन के निर्धारण का कार्य जल विज्ञान मण्डल बहादराबाद द्वारा किया जा रहा है। जिसके अन्तर्गत बाढ़ मैदान परिक्षेत्र के अध्ययन का कार्य निम्न चरणों में पूर्ण कर लिया गया है:—

- Data Preparation, Flood Frequency Analysis, Rainfall Analysis & Catchment Delineation.
- Hydrological and Hydraulic flood flows for different return periods using HEC-RAS
- Report preparation, Ground truth verification.

(Annexure-1)

उपरोक्त कार्यवाही के सम्बन्ध में अधिशासी अभियन्ता, जल विज्ञान खण्ड बहादराबाद का पत्र सं0—625/ज0वि0ख0/FPZ दिनांक 10.07.2024 संलग्न है।

(Annexure-2)

अगले चरण में सम्पादित किये जाने वाले कार्यों एवं उन पर लगने वाले अनुमानित समय का विवरण निम्नानुसार है:—

- Preparing flood plain zone maps- (60 days)
- Demarcation of different flood frequency (25 yr and 100 yr) lines and marking on shajra sheets and preparing property register-(120 days)
- Interim notification and asking for objections and disposals-(90 days)
- Final notification and marking of flood lines on shajra sheets-(60 days)
- Installation of pillars at site-(60 days)

2— देहरादून में शीशमबाड़ा स्थित कूड़ा निस्तारण स्थल के सम्बन्ध में अवगत कराना है कि आसन नदी में फ्लड प्लेन जोन के निर्धारण में 100 वर्षीय बाढ़ आवृत्ति (100 yr flood frequency) की रेखा शीशमबाड़ा कूड़ा निस्तारण प्लान्ट की बाउंड्री से न्यूनतम दूरी 152 मी0 है, से सम्बन्धित गूगल मैप संलग्न है।

(Annexure-3)

NOTARY Rajender Singh Negi Advocate Dehradun District Reg.No.19(01)2002 GOVT. OF UTTARAKHAND (IND.)

अधिशासी अभियन्ता
सिंचाई खण्ड विकासनगर

11/07/24
अधीक्षण अभियन्ता
सिंचाई कार्य मण्डल, देहरादून

(10)

Anx.—1

cloudbursts-signalled by something that sounded like a sudden explosion that shook most of the houses--at Kedarnath took place around 7.30 pm on June 16. The check dam behind the temple crumbled and water gushed towards the temple. A second cloudburst on the morning of June 17 made the Chorabari Tal breaches its walls. The massive amount of water released from the lake, combined with that of the incessant rain, flowed down and brought with it a massive mudslide that dislodged boulders and brought them down. All those structures that had withstood the previous night's onslaught perished under the sheer speed and weight of the water.

The floodwaters weren't content with ravaging the town of Kedarnath. As it flowed downhill towards flat land, it went through nearly 200 villages with such terrifying speed that the

villagers had little or no time to escape. The result: houses, two-three storey buildings came crashing down as the floodwaters washed away the earth they were standing on, people and livestock were no exceptions. Roads and bridges soon became part of the debris the water was carrying with it.

1.2 Flood of Year 2021

On Sunday morning of 7th February 2021 at 10:08 Hrs, a massive flash flood took place along Rishi Ganga River valley of Chamoli district. As per the official records, among 204 died people only 80 dead bodies retrieved and 124 people's bodies still missing which were later declared dead after long search operation. In this flood, Rishiganga Hydropower project and under construction Tapovan Vishnugad Hydropower project were also extremely damaged. In addition, flood also dismantled a bridge near the confluence of Dhauliganga and the Rishiganga (1985m.a.s.l.). Several disturbing live footages recorded by eyewitness were surfaced online through news channels and social media platforms. In the immediate aftermath of the event, based on the recorded videos, it was speculated that the flood was most probably triggered by

Glacial Lake Outburst Flood (GLOF) event. However, early aerial surveys and available satellite imagery data confirmed that the flash flood was triggered by failure of a massive rockslide just below Ronti peak in the Nanda Devi massif (Source: Singh et.al.2022).

Among the places most severely hit by the floods are Joshimath, Rini, Nanda Devi National Park, Tapovan Vishnugad Hydropower Plant and Sridhar.

NOTARY Rajender Singh Negi Advocate Dehradun District Reg. No. 19(01)2002 GOVT. OF UTTARAKHAND

The disaster left over 200 killed or missing. As of May 2021, "83 bodies and 36 human body parts out of a total of 204 people missing have been recovered so far. Of the missing and dead, 140 were workers at the Tapovan Hydropower Plant site.

Measures to Control Flood Disasters: The flood related disasters are generally controlled through structural and non-structural measures. The non-structural measures like flood forecasting, flood, flood risk mapping, flood plain zoning are mostly preferred over the structural measures due to its cost and time-consuming effects. Out of all the non-structural measures the flood plain zoning is a well-accepted due its simplicity in application and long-term planning for reduction of disaster related losses.

1.3 Flood Plain Zoning

The basic concept of flood plain management is to regulate the land use in the flood plains in order to restrict the damage due to floods, while deriving maximum benefits from the same. This is done by determining the locations and the extent of areas likely to be affected by floods of different magnitudes/ frequencies and to develop those areas in such a fashion that the resulting damage is minimum in case the floods do occur. Flood Plain Zoning, therefore aims at disseminating, such 'potential loss' information on a wider basis so as to regulate indiscriminate and unplanned development in flood plains and is relevant both for unprotected as well as protected areas.

Flood Plain Zoning recognizes the basic fact that the flood plains are essentially the domain of the river, and as such all developmental activities in flood plains must be compatible with the flood risk involved. Heavy encroachment of flood plains has been responsible for increasing trend of damage over the years. The need for Flood Plain Zoning has received recognition at various fora in the past also.

As far back as 1973-74, the Central Water Commission (CWC) had prepared guidelines 18 for Flood Plain Zoning which were approved by the Central Flood Control Board. Since the implementation of these guidelines needed statutory backing, CWC also prepared a model draft bill which was circulated in 1975 by the then Ministry of Irrigation, Government of India, to all the States advising them for enactment of a suitable legislation. In pursuance of the provisions of clause (3) of Article 348 of the constitution of India, the Uttarakhand Government passed the Uttarakhand Flood Plain Zoning Act 2012. The aftermath of 2013 Kedarnath flood, the Honorable Supreme Court and the Honorable National Green Tribunal (N.G.T.) has taken a serious note of that and in the lights of the directions passed by Honorable Supreme Court and subsequently by the Honorable N.G.T., it becomes imperative

(12)

to decide the limiting boundary for rivers/streams in Uttarakhand. For regulating land use in different flood zones, the National Disaster Management Authority (N.D.M.A.) has classified following priorities in respect of construction of buildings and other utility services (Table 1).

1.4 Objective of Study

Flood-plain zoning is a concept for flood plain management. It 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 measures aim at demarcating zones or areas likely to be affected by floods of different magnitudes or frequencies and probability levels, and specify the types of permissible developments in these zones. The objective is to document flood plain boundaries based on channel configuration, geometry, bed form and profile characteristics of the identified major rivers of Uttarakhand together with their hydraulic characteristics and to identify areas/stretches where the stream flow is likely to have adverse impact on human interests during spells of high discharge caused by flood or flash flood. It will include flood plain Zoning based on the modelling results for the characteristic discharges calculated for the said streams (flood frequencies of say 5 years, 25 years, 50 years, and 100 years return period). The study is also intended to provide detailed account/database for engineering design and others, of the various flood control/mitigation measures and channel improvement measures near habitations along the river course so as to reduce the impact of the flood disaster on human life, property and adjoining habitation.

1.5 Scope of Works

The scope of work in the light of objectives discussed above shall include stipulated tasks under following heads which shall be completed as per NDMA guidelines.

1. Preparation of Digital /Survey maps of the streams as mentioned above, showing all the major cities, towns, semi urban development using satellite imageries or suitable latest techniques.

2. Preparation of Detailed Maps showing habitation around the rivers.

3. Calculation of Characteristic flood discharges of all the major streams based on flood frequency analysis.

4. Defining the streams in the sensitive reaches based on the results found as per para 4 above.

NOTARY Rajender Singh Negi Dehradun District Reg.No. 12/[illegible]2002 GOVT. OF UTTARAKHAND

(13)

5. The prime objective of this assignment is to restrict/prohibit the human activities in the river flood plains. Since the reserve forests/national parks are already protected by law hence the river reaches falling in these areas will be excluded from the study. However civil lands having forest cover will be included.

6. Tabulation of flood plain boundary limit in various cities /towns villages, in general depending on desired waterway to pass the characteristic discharge.

7. Preparation of digital /GIS map showing the defined prohibitive, regulating, and warning zone as per NDMA flood plain zoning guidelines.

8. Preparation of digital GIS maps showing flood plain boundaries for floods of return periods and the map will be prepared showing the defined zone boundary.

9. To estimate water surface profiles employing hydro-dynamic river flow model.

10. All survey work & data acquisition from different agencies will be done by the consultant.

11. Consultant shall assist the department to clarify the methodology and other technical issues related to the task, before the Govt., Honorable N.G.T. or any other court if required.

12. River Cross-section Interval in habitations the cross-section interval should not be more than 50 m c/c. In other habitable reaches this interval should not be more than 500m. In hilly/forest areas the cross-section interval may be chosen suitably for the required level of accuracy.

1.6 NDMA Guidelines

The scope of work provided above and the expected deliverables are inline to meet the guidelines provided by national Disaster Management Act Jan 2008. Below are the guidelines from the NDMA document: In the regulation of land use in flood plains, different types of buildings and utility services can be grouped under three priorities from the point of view of the damage likely to occur and the flood plain zone in which they are to be located:

NOTARY Rajender Singh Negi Advocate Dehradun District Reg.No.19(01)2002 GOVT. OF UTTARAKHAND (INDIA)

Table 1: NDMA guidelines for Flood Plain & Land Utilization

Priority	Reach
Priority 1	• Defence 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-year frequency or the maximum observed flood levels. Similarly, they should also be above the levels corresponding to a 50-year rainfall and the likely submersion due to drainage congestion.
Priority 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 stilts as indicated above.
Priority 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 a vulnerable area, it will be possible to develop parks and play grounds, which would provide a proper environment for the growth of the city.

1.7 Methodology: -

Whenever we are going for the flood Plain zoning works so in that case, we have two types of catchments first one is gauged catchment and the other one is ungauged catchment so the discharge calculation will depend on the type of catchment weather it is gauged or ungauged. Here we will mention the discharge preparation steps for different return period and modeling steps for gage catchment and engagement catchment separately.

For Gauged Catchment:

To estimate the design flood using flood frequency approach, the following procedures shall be adopted:

(a) The flood peak series shall be checked for randomness, homogeneity, trend, jump, outliers etc using appropriate statistical methods.

(b) Flood frequency analysis shall be carried out using time series of instantaneous annual flood peak. Based on the hourly gauge data the observed annual flood peak shall be converted into instantaneous flood peak.

(c) Using the instantaneous annual flood peak time series, the flood frequency analysis shall be carried out using standard frequency distributions such as Gumbel, log Pearson type-III and Log Normal distributions etc. to estimate the desired return period flood.

(d) Goodness of fit test for the frequency distribution shall be carried out using standard statistical tests such as Chi Square, D-Index etc. to assess the appropriate frequency distribution for the data set and decide the appropriate design flood.

a) Normal Distribution

Analysis by using the Normal distribution uses the formula as below:

$Q_T = \bar{Q} + K_T\sigma$

Where:

Q_T = the probable discharge with a return period of T years

$\bar{Q}$ =mean flood (for n years)

K_T= frequency factor

σ = Standard deviation of data

The tables presented below summarize calculated discharges for different return period based on the Normal distribution.

b) Log-Normal Distribution

The formula used for estimation of discharges for any return period in the method is written as:

$$\log Q_T = \log(Q)_{avg} + K_T\sigma$$

(16)

Where:

Q_T = the probable discharge with a return period of T years

log(Q)avg. = average of the log Q discharge values

K_T= frequency factor (referred from for return period)

σ = the standard deviation of the log Q values

c) Log Pearson Type III Distribution

The formula used for estimation of discharges for any return period in the method is written as:

$$logQ_T = \log(\overline{Q}) + K_T\sigma$$

Where:

Q_T = the probable discharge with a return period of T years

$\log(\overline{Q})$ = average of the log Q discharge values

K_T= frequency factor (referred from standard table based on skewness coefficient Cs and return period)

σ = the standard deviation of the log Q values

d) Gumbel Extreme Value Type 1 Distribution (GEVT – 1)

The formula used for estimation of discharges for any return period in the method is written as:

$$Q_T = \bar{Q} + K_T\sigma$$

Where:

Q_T= the probable discharge with a return period of T years

$\bar{Q}$ = mean flood (for n years)

K_T= frequency factor = $(Y_T - Y_n)/\sigma_n$

σ_n = Standard deviation of data

Y_T = - Ln (Ln (T/T- 1))

Y_n, σ_n = expected mean and standard deviations of reduced extremes to be found from Gumbel's table based on number of year of data available.

Here also mentioning below the flow chart which explains the holistic approach for flood plain zoning works for Gauged catchments

NOTARY Rajender Singh Advocate Dehradun District GOVT. OF UTTARAKHAND

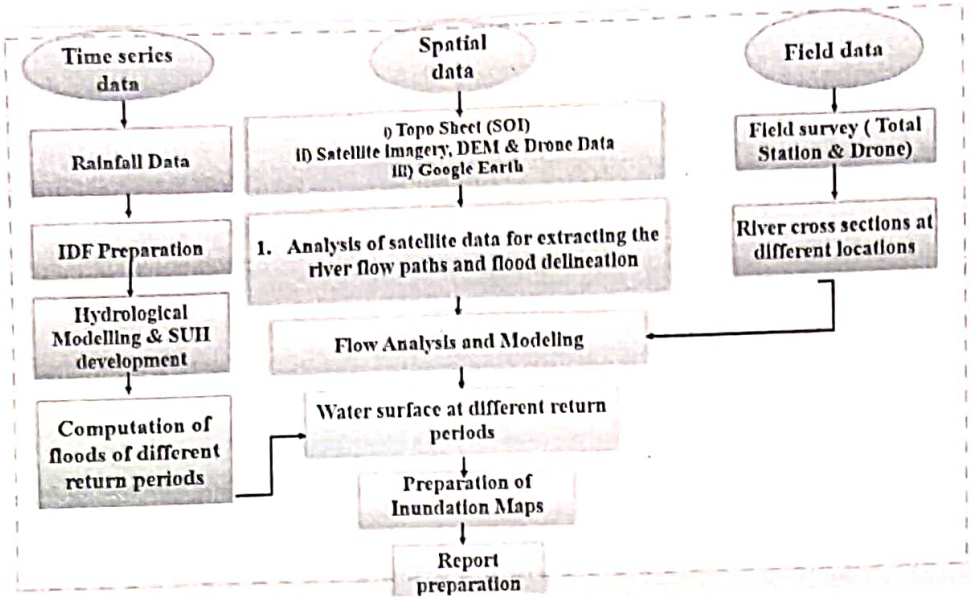

Fig.2 Flowchart of methodology of Flood Plain Zoning

For Ungauged Catchment

The availability of historical discharge data is the prime information required to proceed for Flood Plain Zoning (FPZ) analysis. The major sites sensitive to FPZ are not within the vicinity of the gauged site. So, the analysis for ungauged analysis is to be taken care of. Besides the gauged locations the other locations where scanty or intermittent flow data are available does not give a clear scenario of the flow pattern. At ungauged locations, determining the discharge is always a challenge for doing subsequent hydrological analyses. Simultaneously it is also difficult to put the gauges at all salient locations. Numbers of techniques are used in resolving the problems of data availability at ungauged locations such as:

One of the most frequently used events in hydrology is the relation between rainfall and runoff. It determines the runoff which leaves the watershed from the rainfall received by the basin. In it, a part of the hydrological cycle has been studied to express the process of runoff from the catchment as a function of the rainfall and other catchment characteristics. It helps to extend stream flow time series both spatially and temporally to estimate management strategies and catchment response to climate. There are various popular flood hydrograph modelling techniques for ungauged basins, like the synthetic unit hydrograph (SUH). The SUH models are grouped into four main classes, as follows:

(a) Conceptual models

(b) Traditional or empirical models

(c) Probabilistic models

(d) Geomorphologic models.

The unit hydrograph (UH) theory is a potentially (geomorphological model used) powerful tool in watershed hydrology similar to the unit-impulse response function in fields such as electrical, electronics and telecommunication or and structural engineering (Gavahne and Londhe, 2021).

The Synthetic Unit Hydrograph approach is used in many studies in order to find the design floods of different ungauged catchments. The parameters related to physiographic as well as hydrometeorology based on the regionalization property has been well defined by CWC. Accordingly, CWC divided entire India in to 7 hydro-meteorological zones and 26 sub zones as mentioned in the Figure-3 below:

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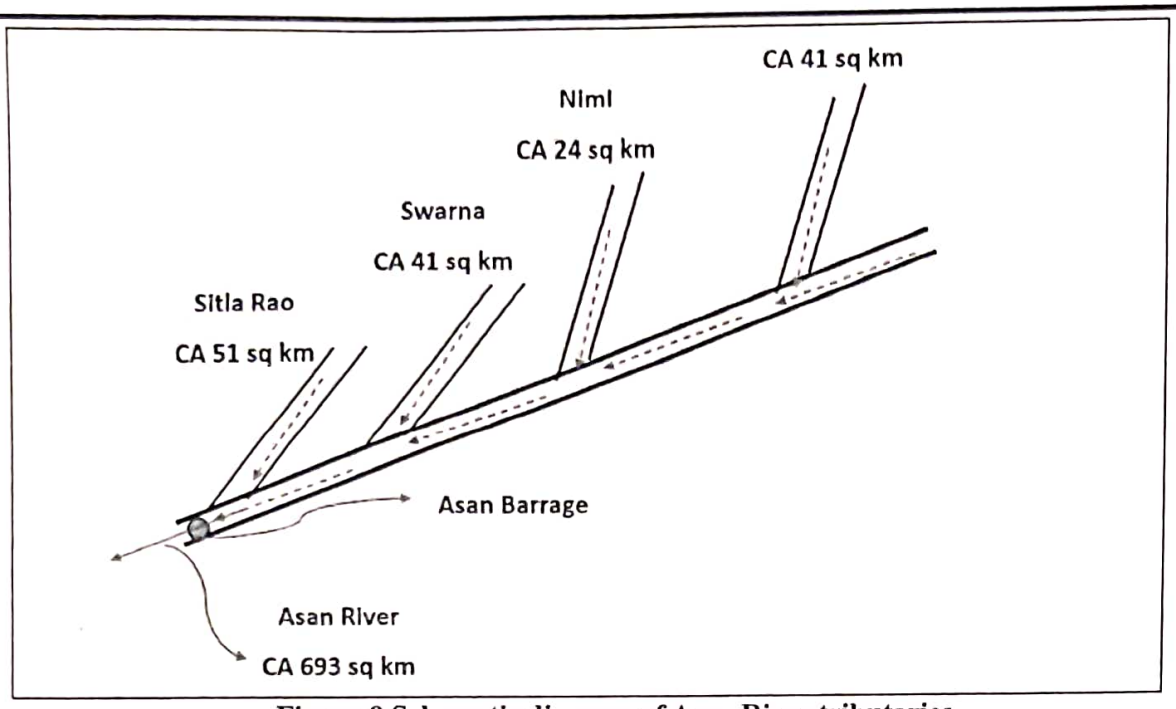


Figure-9 Schematic diagram of Asan River tributaries

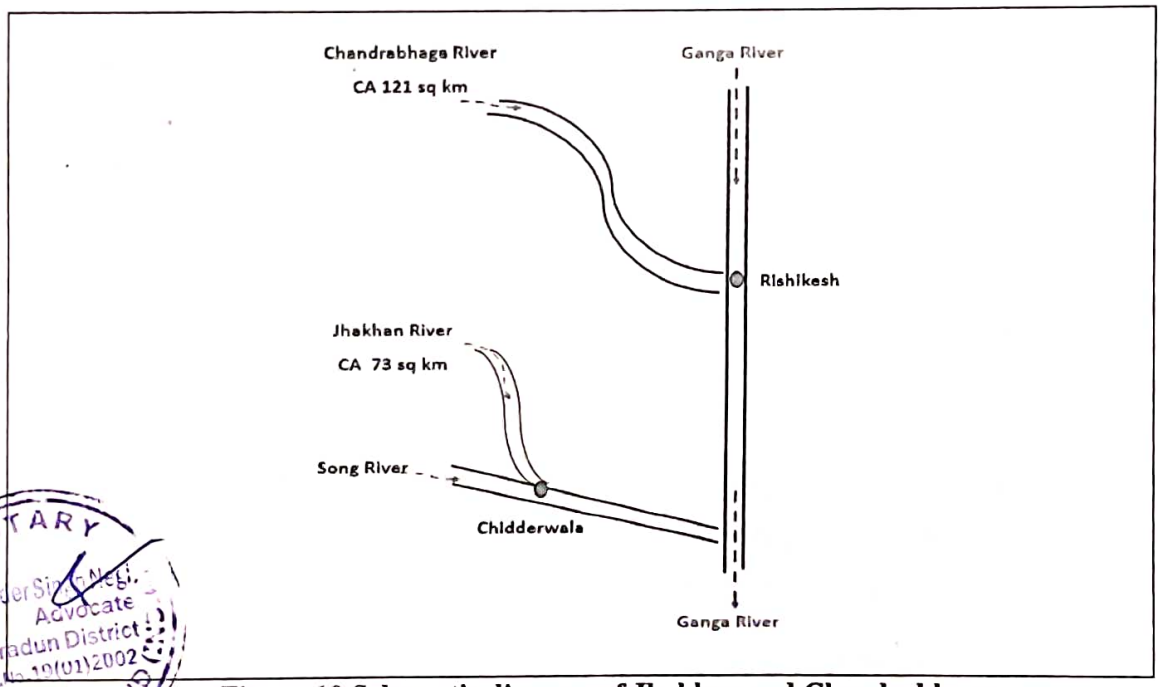


Figure-10 Schematic diagram of Jhakhan and Chandrabhaga

20

The longitudinal sections of rivers. Asan, Swarna, Sitla Rao, Nimi & Nun are shown in Fig.12-16 respectively.

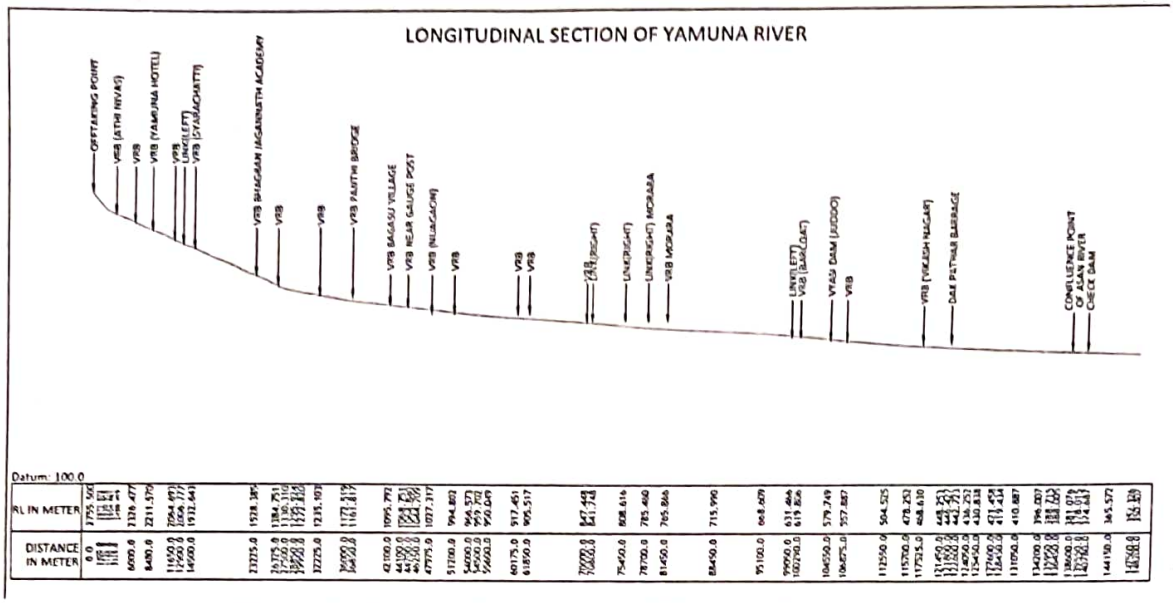


Figure 11: Longitudinal section of Yamuna River

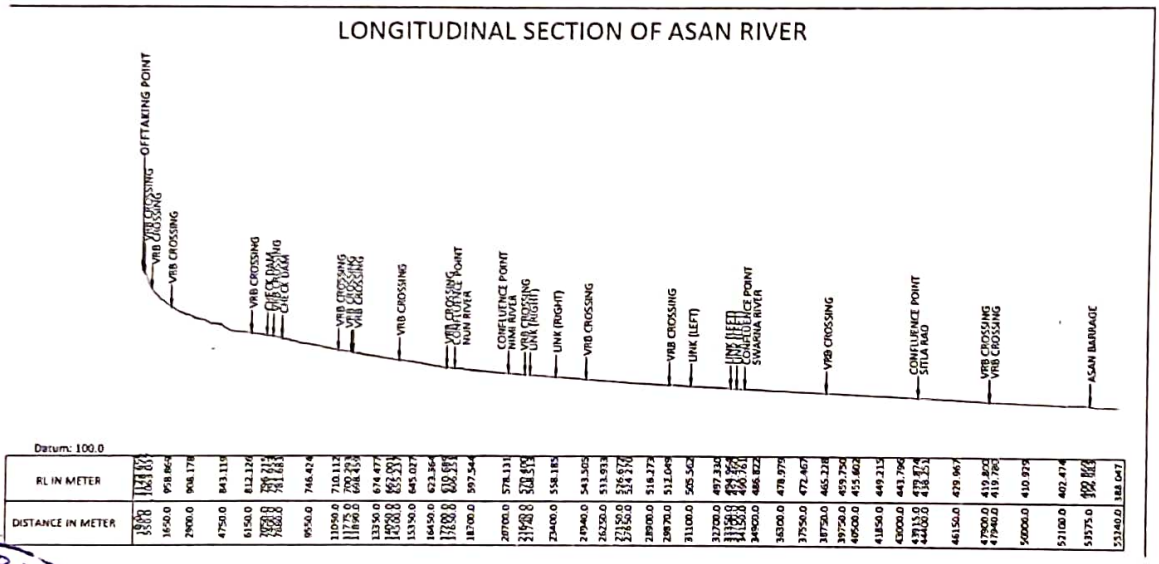


Figure 12: Longitudinal section of Asan River

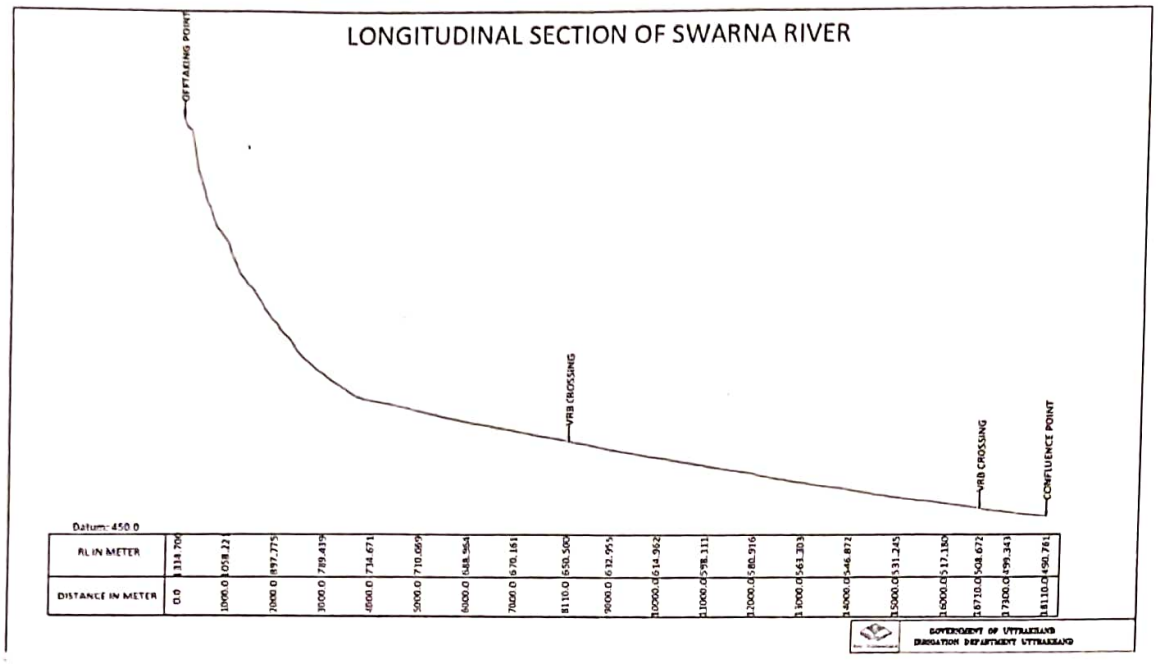


Figure 13: Longitudinal section of Swarna river

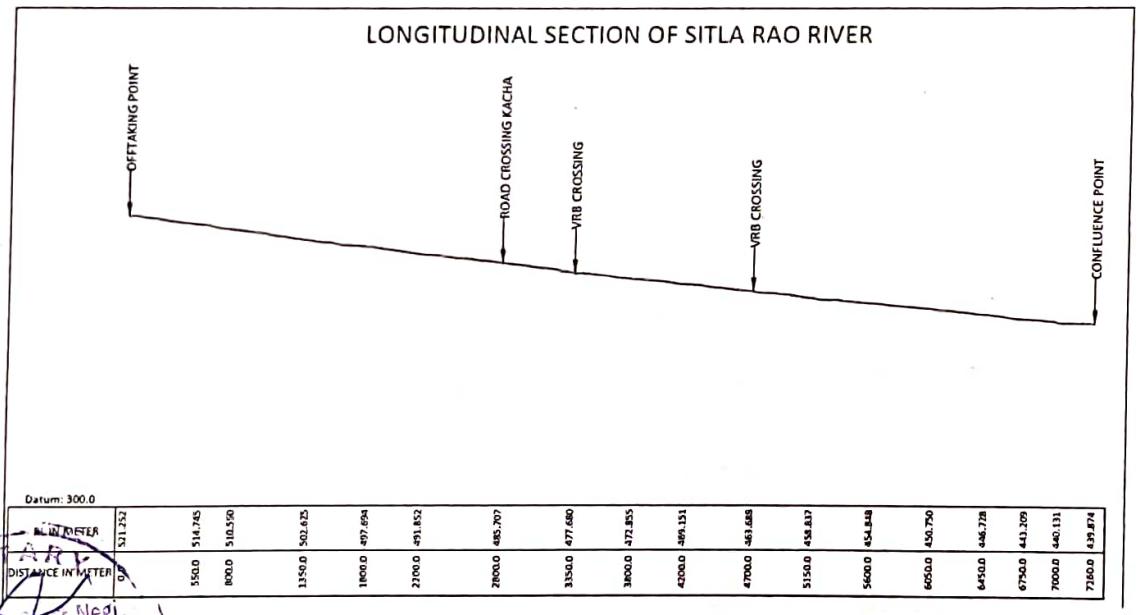


Figure 14: Longitudinal section of Sitala Rao River

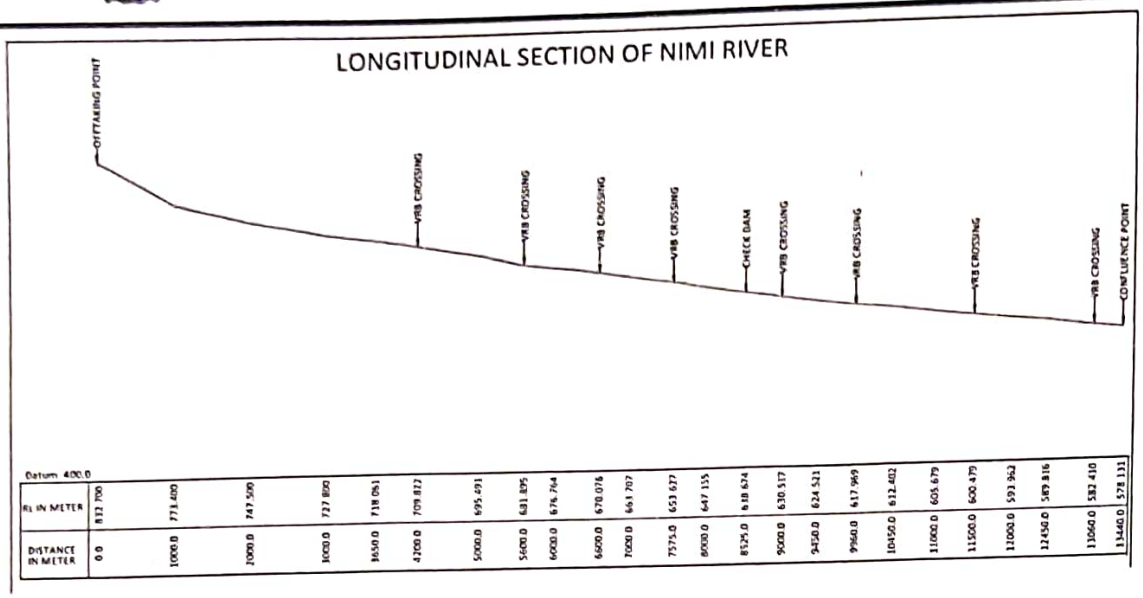


Figure 15: Longitudinal section of Nimi river

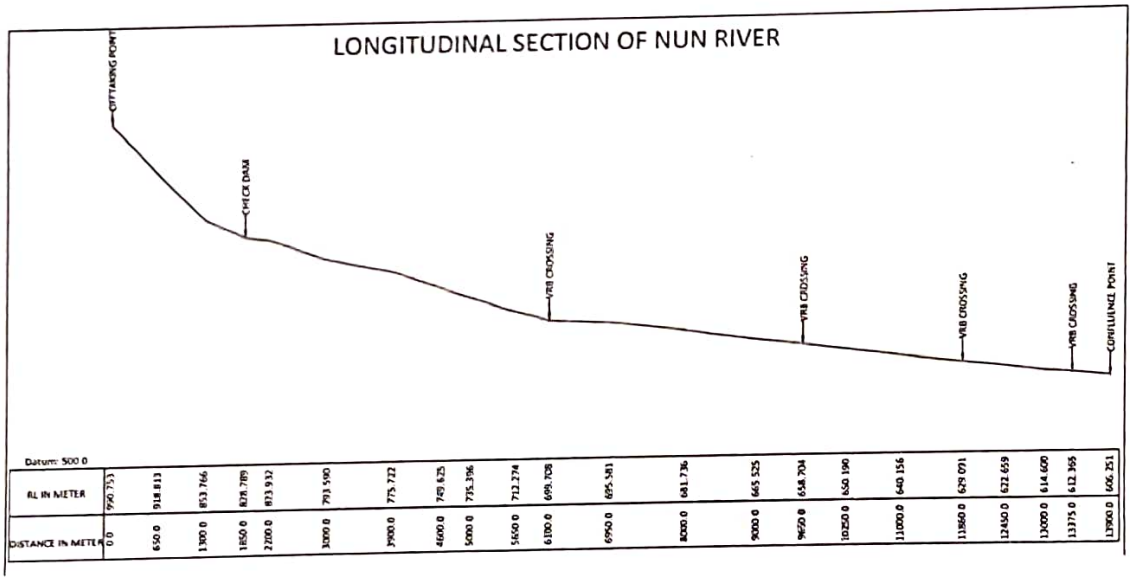


Figure 16: Longitudinal section of Nun River

5.2 Flood Frequency Analysis for Asan Barrage

A. Gumbel Extreme Value Type 1 Distribution (GEVT – 1)

The formula used for estimation of discharges for any return period in the method is written as:

$$Q_T = \bar{Q} + K_T\sigma$$

Where:

Q_T = the probable discharge with a return period of T years

$\bar{Q}$ = mean flood (i.e., of 13 years in this project, n=13)

K_T= frequency factor = $(Y_T - Y_n)/ \sigma_n$

σ_n = Standard deviation of data

Y_T= - Ln (Ln (T/T- 1))

Yn, σ_n = expected mean and standard deviations of reduced extremes to be found from Gumbel's table based on number of year of data available.

The tables presented below summarize the maximum discharge observed for 13 years from 2010 – 2022 and calculated discharges for different return period based on the GEVT – 1 distribution.

Table 45: Annual Maximum observed daily and instantaneous discharges at Asan Barrage

Year	Qmax (Cumec)	Instantaneous Max. Q (Cumec)	Rank(m)	PROBABILITY (P)	Tp(Years)
2010	2028	2433	1	0.071	14.000
2014	1877	2253	2	0.143	7.000
2015	1832	2199	3	0.214	4.667
2012	1794	2153	4	0.286	3.500
2018	1657	1988	5	0.357	2.800
2021	1656	1987	6	0.429	2.333
2016	1656	1987	7	0.500	2.000
2013	1570	1884	8	0.571	1.750
2017	1570	1884	9	0.643	1.556

24

2022	1427	1713	10	0.714	1.400
2020	1333	1600	11	0.786	1.273
2019	1271	1525	12	0.857	1.167
2011	898	1078	13	0.929	1.077
Avg		**1898.62**			
S. D		**356.72**			

Table 46: Discharges at for different return period from GEVT-1

T years	Xavg	KT	S.D.	XT=Xavg+KT*S.D.
2.33	1898.62	0.07	356.73	1924
5	1898.62	1.00	356.73	2254
10	1898.62	1.75	356.73	2522
25	1898.62	2.70	356.73	2862
50	1898.62	3.40	356.73	3113
100	1898.62	4.11	356.73	3363
200	1898.62	4.80	356.73	3612

Note: Value of σ & $\bar{Q}$ will remain same for normal distribution and GEVT-I which is calculated by below mentioned formula.

$$\sigma = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n}}$$

NOTARY Rajender Singh Negi Advocate Dehradun District Reg.No. [illegible]/2002 GOVT. OF UTTARAKHAND

25

B. Log Pearson Type III Distribution

The formula used for estimation of discharges for any return period in the method is written as:

$\log X_T = \log(x)_{avg} + K_T \sigma$

Where:

Q_T or X_T = the probable discharge with a return period of T years

log(x)avg. = average of the log X discharge values

K_T= frequency factor (referred from standard table based on skewness coefficient Cs and return period)

σ = the standard deviation of the log X values

The tables presented below summarize the maximum discharge observed for 13 years from 2010-2022 and calculated discharges for different return period based on the LPT-III distribution.

Table 47: Logarithmic average and skewness calculations for LPT-III discharge distribution.

Year	Qmax (Cumec)(X)	Instantaneous max Q(Multiplied by 1.2)	Z= Log(X)	A=Sum of (Z-Zavg)^3	Cs-Coefficient of Skewness(n*A/(n-1)*(n-2)*s.d.^3
2010	2028	2433	3.386147	0.00	-1.469700575
2014	1877	2253	3.352748	0.00	-1.469700575
2015	1832	2199	3.342139	0.00	-1.469700575
2012	1794	2153	3.33305	0.00	-1.469700575
2018	1657	1988	3.29839	0.00	-1.469700575
2021	1656	1987	3.29813	0.00	-1.469700575
2016	1656	1987	3.298123	0.00	-1.469700575
2013	1570	1884	3.275081	0.00	-1.469700575
2017	1570	1884	3.275058	0.00	-1.469700575
2022	1427	1713	3.233665	0.00	-1.469700575

NOTARY Advocate Dehradun. District Regd.No.10(01)2022 GOVT. OF UTTARAKHAND

26

2020	1333	1600	3.204145	0.00	-1.469700575
2019	1271	1525	3.183287	0.00	-1.469700575
2011	898	1078	3.032458	-0.01	-1.469700575
Log(X)avg	**3.270**				
S.D.	**0.091**				
N	**13**				

Table 48 Discharges at Tons Site at Asan River Barrage

T (years)	KT	б	KTб	logX avg	log(x)avg+KTб	LPTQT= XT(Cumec)
2.33	0.235	0.091996	0.02161	3.270	3.291798865	1958
5	0.826	0.091996	0.0760	3.270	3.346197515	2219
10	1.024	0.091996	0.0942	3.270	3.3644147	2314
25	1.170	0.091996	0.1076	3.270	3.377783988	2387
50	1.235	0.091996	0.1136	3.270	3.383798523	2420
100	1.278	0.091996	0.1175	3.270	3.387733404	2442
200	1.307	0.091996	0.1202	3.270	3.390400563	2457

C. Normal Distribution

Analysis by using the Normal distribution uses the formula as below:

$$QT = \bar{Q} + K_T Sn$$

Where:

Q_T = the probable discharge with a return period of T years

$\bar{Q}$ =mean flood (i.e. of 13 years in this project, n=13) K_T= frequency factor

S n = Standard deviation of data

The tables presented below summarize calculated discharges for different return period based on the Normal distribution.

Table 49: Discharges at Asan River Barrage for different return period from Normal distribution.

T	K_T	Qmean	S.D.	K_T*SD	$QT=Q_{mean}+KT*SD$
2.33	0	1898.62	356.73	0	1899
5	0.824	1898.62	356.73	293.94	2193
10	1.282	1898.62	356.73	457.32	2356
25	1.751	1898.62	356.73	624.63	2523
50	2.054	1898.62	356.73	732.72	2631
100	2.326	1898.62	356.73	829.75	2728
200	2.576	1898.62	356.73	918.93	2818

D. Log-Normal Distribution

The formula used for estimation of discharges for any return period in the method is written as:

$$\log X_T = \log(x)_{avg} + K_T \sigma$$

Where:

Q_T or X_T = Probable discharge with a return period of T years

log(x)avg. = Average of the log X discharge values

K_T= Frequency factor (referred from for return period)

σ = Standard deviation of the log X values

Table 50: Discharges at just for different return period from Log - Normal distribution

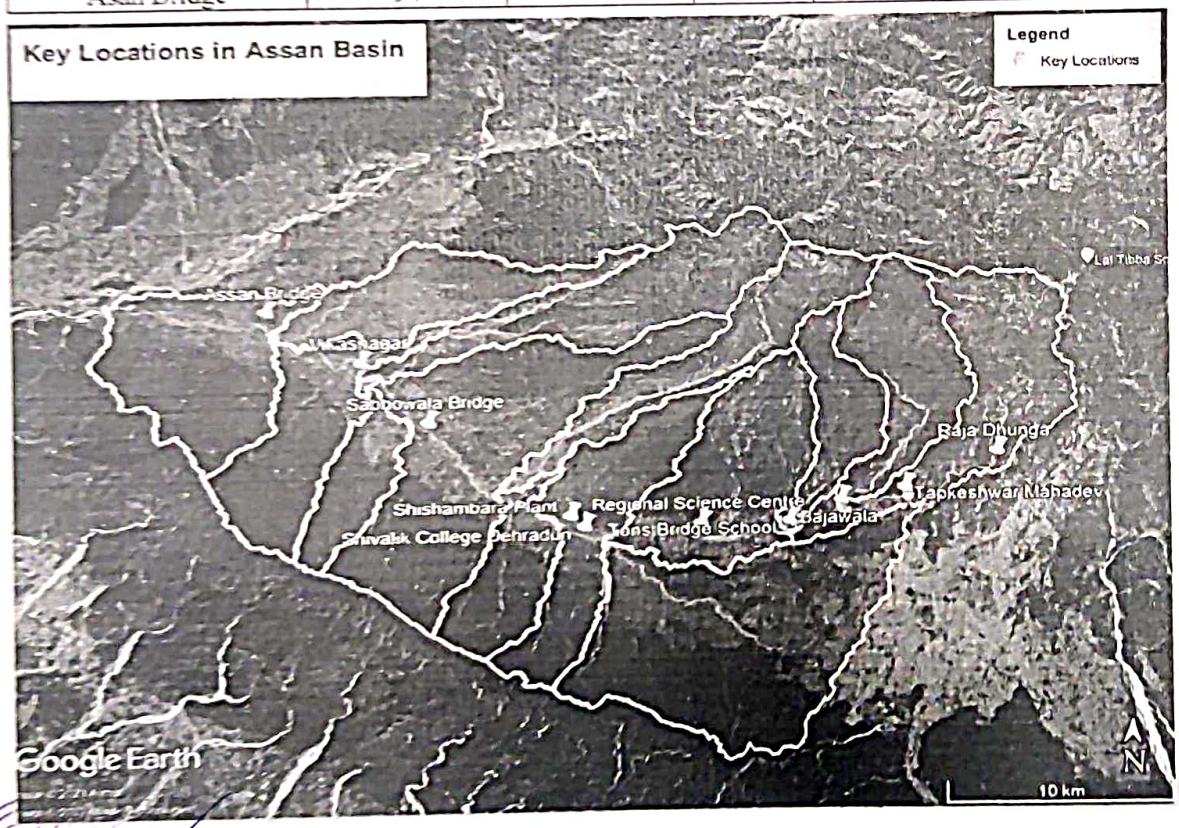
T	K_T	σ	$K_T\sigma$	Log(X)avg	log(x)avg+$K_T\sigma$	X_T(Cumec)
2.33	0	0.092	0	3.270	3.270	1863
5	0.824	0.092	0.076	3.270	3.346	2218
10	1.282	0.092	0.118	3.270	3.388	2444
25	1.751	0.092	0.161	3.270	3.431	2699
50	2.054	0.092	0.189	3.270	3.459	2878
100	2.326	0.092	0.214	3.270	3.484	3049
200	2.576	0.092	0.237	3.270	3.507	3215

By using A-Q power function equation (section 5.1.6) developed for Yamuna River basin discharge at different key location can be calculated (table mentioned below showing the discharge values)

28

Table 51 Discharge at salient locations of Asan barrage

Identification Name	Catchment Area of Drain(km²)	Catchment Area (km²)	Return Period (Year) Flow (cumec)			
			5	25	50	100
Raja Dhunga	41.1	41.1	134	170	185	199
Birpur Barrage	2.6	43.7	142	180	196	212
Tapkeshwar Mahadev	6.3	50	163	206	225	243
Bajawala	43	93	302	384	418	451
Tons Bridge School	68.06	161.06	524	665	723	782
Regional Science Centre	44.94	206	670	851	925	1000
Shishambara Plant	51.09	257.09	836	1062	1155	1248
Sabharwal Bridge	84.21	341.3	1110	1410	1533	1656
Vikas Nagar	50.7	392	1275	1619	1761	1902
Asan Bridge	94	486	1581	2007	2183	2358



29

Fig. 27 Key Location for Asan Basin

Table 52: Discharge for Ungauged tributaries of Asan Rivers

Tributataries	Area (Sq km)	LPT-III				GEVT-I			
		Q5	Q25	Q50	Q100	Q5	Q25	Q50	Q 100
Nun	41	45	47	48	48	42	57	64	70
Nimi	24	30	29	29	29	27	36	40	44
Swarna	41	45	47	48	48	42	57	64	70
Sitla Rao	56	54	57	58	59	50	68	77	85

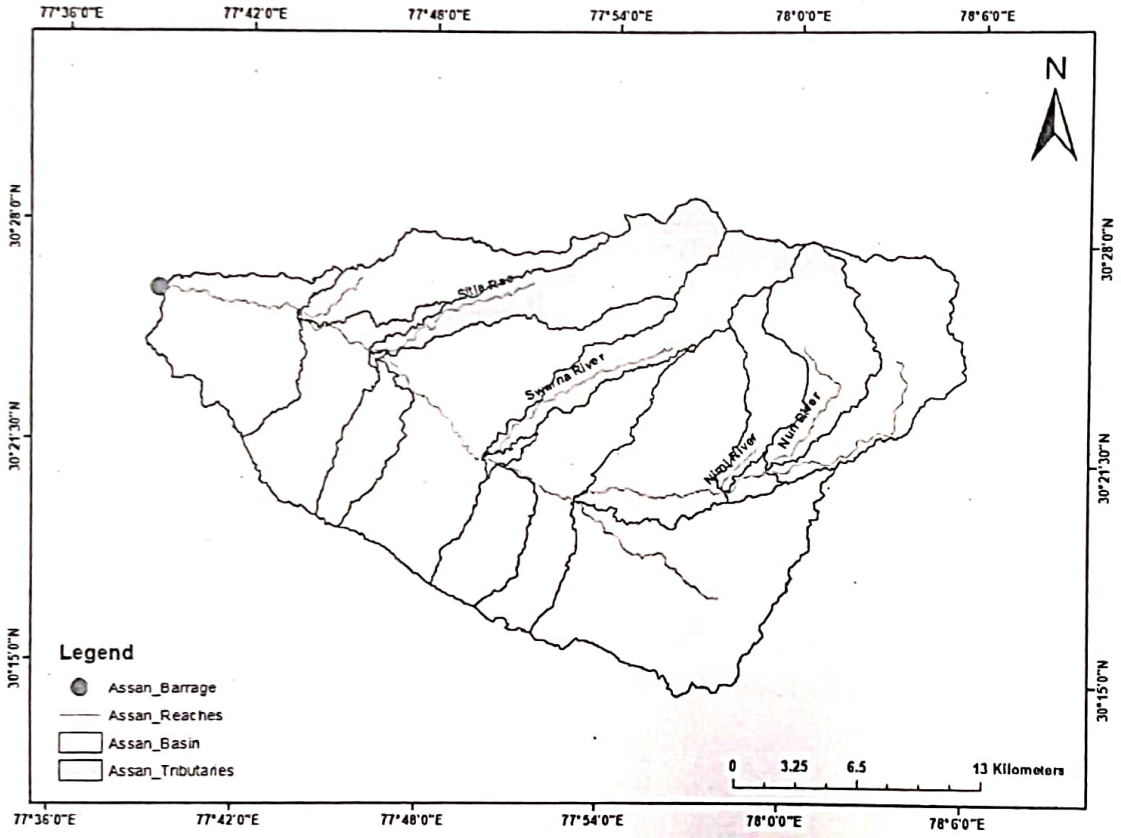


Fig. 28 Ungauged tributaries of Asan River

30

Table 53: Discharge at Asan barrage corresponding to different return periods is shown in table.

Discharge in cumecs at Asan barrage				
Return period (Yr.)	**Log Normal**	**Normal**	**LPT-III**	**GEVT-I**
2.33	1863	1899	1958	1924
5	2218	2193	2219	2254
10	2444	2356	2314	2522
25	2699	2523	2387	2862
50	2878	2631	2420	3113
100	3049	2728	2442	3363
200	3215	2818	2457	3612

The Jhakhan and Chandrabhaga rivers are not covered by GD sites hence treated as per the methodology followed for ungauged catchments. Hence Synthetic Unit Hydrograph (SUH) approach has been applied for both the sites and discharges have been calculated the design storm kept for different return periods. The same has also been compared with L-Moment chart.

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(31)

1.0 INTRODUCTION:

The whole of Uttarakhand State is extremely vulnerable to severe natural hazards. Located on the southern slope of the Himalayan range, Uttarakhand is one of the most disaster-prone states in India. Due to its topography and geology, the state faces the risk of calamitous events like flash floods/ floods, cloudbursts, avalanches, landslides, mudflows, and earthquakes, among others. Furthermore, it must be noted that the frequency and intensity of these hazards have increased in the fragile state over the last few decades. This has happened due to anthropological factors, scientists have documented. The floods are usual phenomena at Uttarakhand state. The network of rivers coming from hills, passing through a tough terrain and finally reaching at plains and the high slope encountered during their travel makes the scenario difficult when a high intense rainfall continues for a significant duration. Many damages and loss of lives and properties are recorded during past and few of them of recent times are presented.

1.1 Kedarnath Flood (June 16-17, 2013)

Over Sunday and Monday, June 16-17, 2013, when a series of cloudbursts wreaked havoc in 5 districts of Rudraprayag, Uttarkashi, Chamoli, Pithoragarh and Tehri, there were nearly 12,000 people at Kedarnath and Gaurikund the stretch that bore the brunt of the deluge. Ten days later, about 6,000 had been rescued from Kedarnath. More than 800 bodies were recovered in and around Kedarnath. Hundreds were reported missing.

Fig. 1 Flood at Rishikesh

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The cloudbursts led to flash floods that swept away mountainsides, villages, people, animals, houses, trucks, cars, roads, nothing escaped. Nothing survived, it had no hope of surviving. The first of the

There are number of measures to mitigate the effect of flood like Structural and Non-structural measures. Due to the involvement higher cost, time and land requirements the structural measures are scarcely used whereas due to easy implementation processes the non-structural measures like flood plain zoning, flood risk mapping, flood warning/forecasting are largely implemented. While flood plain zoning is a proven technique for reducing the flood damages, the state of Uttarakhand has adopted this in principle to delineate the flood plain zoning lines in order to demarcate the areas along the flood plains according to the effect of flood damages as per NDMA guidelines. The entire rivers selected for flood plain zoning are divided in three lots. Rivers like Yamuna, Asan and its Tributaries, Jhakhan, Chandrabhaga falls under Lot-1. The assigned reaches for the corresponding rivers are mentioned in the Table below and a total of 287 km is processed for Flood Plain Zoning.

Sl. No.	Reach/River	Length Covered (Km.)	Name of Lot
1	Yamuna	145	Lot-I
2	Asan and its Tributaries	106	Lot-I
3	Jhakhan	28	Lot-I
4	Chandrabhaga	8	Lot-I
	Total	287 KM	

Initially the survey work of the flood plain is done by using DGPS, Total Station as well as Drone Survey. The appropriate Digital Elevation Model is also procured for use in Hydraulic model. The rainfall and discharge data is collected from respective sources. Due to non-availability of sufficient discharge data, the two rivers (Jhakhan & Chandrabhaga) are treated as ungauged and the discharge calculation is done on the concept of Synthetic Unit Hydrograph. The maximum rainfalls have been obtained from PMP ATLAS and disaggregation of the data is done as per the defined process. The design discharge is obtained after performing critical sequencing of the rainfall. The discharge values are obtained for the 5-, 25-, 50- and 100-year return periods.

The hydrodynamic modelling is applied to the obtained design discharge. The HEC-RAS software is used to make the analysis. Both 1-D and 2-D modelling analysis is done to the given data. The cross-sections obtained at 50 m interval, the DEM data, DGPS survey & Drone data are combined together for a hybrid DEM which remain the input for our model. The design discharge data remain the

NOTARY Rajender Singh Advocate Dehradun GOVT. OF UTTARAKHAND IND.

(33)

hydrologic input for the model. The local Manning's Constant (n) values are taken as per the river stretch configuration. The outputs in the form of flood lines corresponding to 5, 25, 50 and 100-year flood lines are obtained which are communicated to field staff for putting the marks at field at 50 m intervals. The same has been done in presence of field staff as well as the Survey team.

The task of placing the flood lines in the Shajra map is essential for finalising the flood inundation lines as well as fixing the flood zones i.e the restrictive, prohibitive and warning zones. The same has also been done and submitted to appropriate authority. Mean time two workshops were held at Irrigation Dept. Seminar Hall, one on 7th Oct. 2023 where the discussion on study area and approach & methodologies were discussed and in the second workshop on 12th March, 2024, the outcomes of the analysis basically the flood lines and implementations are discussed. The remarks and suggestions for improvements/corrections were gladly accepted and rectified in the present report. The flood plain zoning work is highly essential for the rivers as the utility of flood plain is important due to the land constraints. Further the frequency of flood and climate change driven floods are more frequent now. So, in one hand the safety of life and property and in other the increasing the utility of land have to be balanced. In that context, making flood plain zoning for sensitive rivers is the foremost step.

This study regarding flood plain zoning completes all the scopes assigned to the specific problem.

Expecting a healthy co-operation from all

Warm Regards

VISIONTEK CONSULTANCY SERVICES PVT LTD
BHUBANESWAR

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(34)

CONSULTANCY WORK FOR FLOOD PLAIN ZONING IN ACCORDANCE WITH UTTARAKHAND FLOOD PLAIN ZONING ACT-2012 FOR YAMUNA, JHAKHAN, CHANDRABHAGA, ASAN AND ITS TRIBUTARIES (NIMI, NUN, SWARNA & SITLA RAO) RIVERS

CLIENT

Superintending Engineer, Hydraulic Circle, Bahadarabad

(IRI Roorkee), Haridwar Uttarakhand

Submitted by

NOTARY Rajender Singh Negi Advocate Dehradun District Reg.No.19(01)2002 GOVT. OF UTTARAKHAND

VISIONTEK CONSULTANCY SERVICES

(Committed for Better Environment)

Plot No-M22 and 23 Chandaka, Industrial Estate Patia, Bhubaneswar, Distt- Khurda

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35

EXECUTIVE SUMMARY: -

India as a country has much of its concern towards natural calamities due to its location, topography, hydro-meteorological conditions. Out of many numbers of natural calamities flood constitutes one of the major national calamities faced 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 realized that absolute and permanent protection to all flood prone areas and for all magnitudes of floods by structural measures alone is impossible due to constraints of time, money and land. So, the emphasis will be on non-structural measures like Flood Plain Zoning and regulation, flood risk mapping, flood forecasting etc. to effectively supplement the structural measures for providing sustainable protection to flood affected areas.

Uttarakhand is an Indian Himalayan State known for its rich spiritual and religious tourism, ecological richness & diversity, and cultural ethos rooted in traditions, but it is also known for growing frequency and intensity of natural disasters and for its fragility of ecological and geological systems. Consisting mostly of uplifted sedimentary & metamorphic rocks and tectonically very active, the region is vulnerable to natural disasters. Due to its geo-climatic, ecological and socio-economic settings, Uttarakhand is one of the most disaster-prone States of the country.

Floods of varying magnitude, affect low lying areas and river valleys in Uttarakhand, due to variability in the monsoonal rainfall. However, the rapid increase of population and developmental activities in this hilly state aggravated the situation.

Cloudburst and related floods during August 1998 at Ukhimath (Rudraprayag) and Malpa (Pithoragarh), August 2001 at Phata (Rudraprayag), August 2002 at Burakedar (Tehri), August, 2012 in Asi Ganga (Uttarkashi), September, 2012 at Ukhimath (Rudraprayag) and June 2013 at Kedarnath (Rudraprayag), Feb 2021 in Rishi ganga and Dhauliganga and the flood over most part of Uttarakhand during 2023 are some of the examples of recent flood. Out of all the disasters the Kedarnath flood remain the worst.

NOTARY Rajender Singh Advocate District Dehradun GOVT. OF UTTARAKHAND

672

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कार्यालय
अधिशासी अभियन्ता
जल विज्ञान खण्ड, बहादराबाद

पत्रांकः 625 / ज0वि0ख0 / FPZ

दिनांकः 10.07.2024

विषयः मा0 राष्ट्रीय हरित अधिकरण, नई दिल्ली में योजित वाद संख्या 477 / 2022 श्री राजेन्द्र गन्सारी बनाम उत्तराखण्ड राज्य में जनपद देहरादून के अन्तर्गत आसन नदी के फ्लड प्लेन जोन के निर्धारण के सम्बन्ध में।

अधिशासी अभियन्ता, सिंचाई खण्ड विकासनगर।

उपरोक्त विषयक के सम्बन्ध में सूचनीय है-कि मा0 राष्ट्रीय हरित अधिकरण, नई दिल्ली में योजित वाद संख्या 477 / 2022 श्री राजेन्द्र गन्सारी बनाम उत्तराखण्ड राज्य में जनपद देहरादून के अन्तर्गत आसन नदी के फ्लड प्लेन जोन के निर्धारण के सम्बन्ध में निम्न कार्यवाही पूर्ण कर ली गयी है।

- Data Preparation, Flood Frequency Analysis, Rainfall Analysis & Catchment Delineation.
- Hydrological and Hydraulic flood flows for different return periods using HEC-RAS
- Report preparation, Ground truth verification.

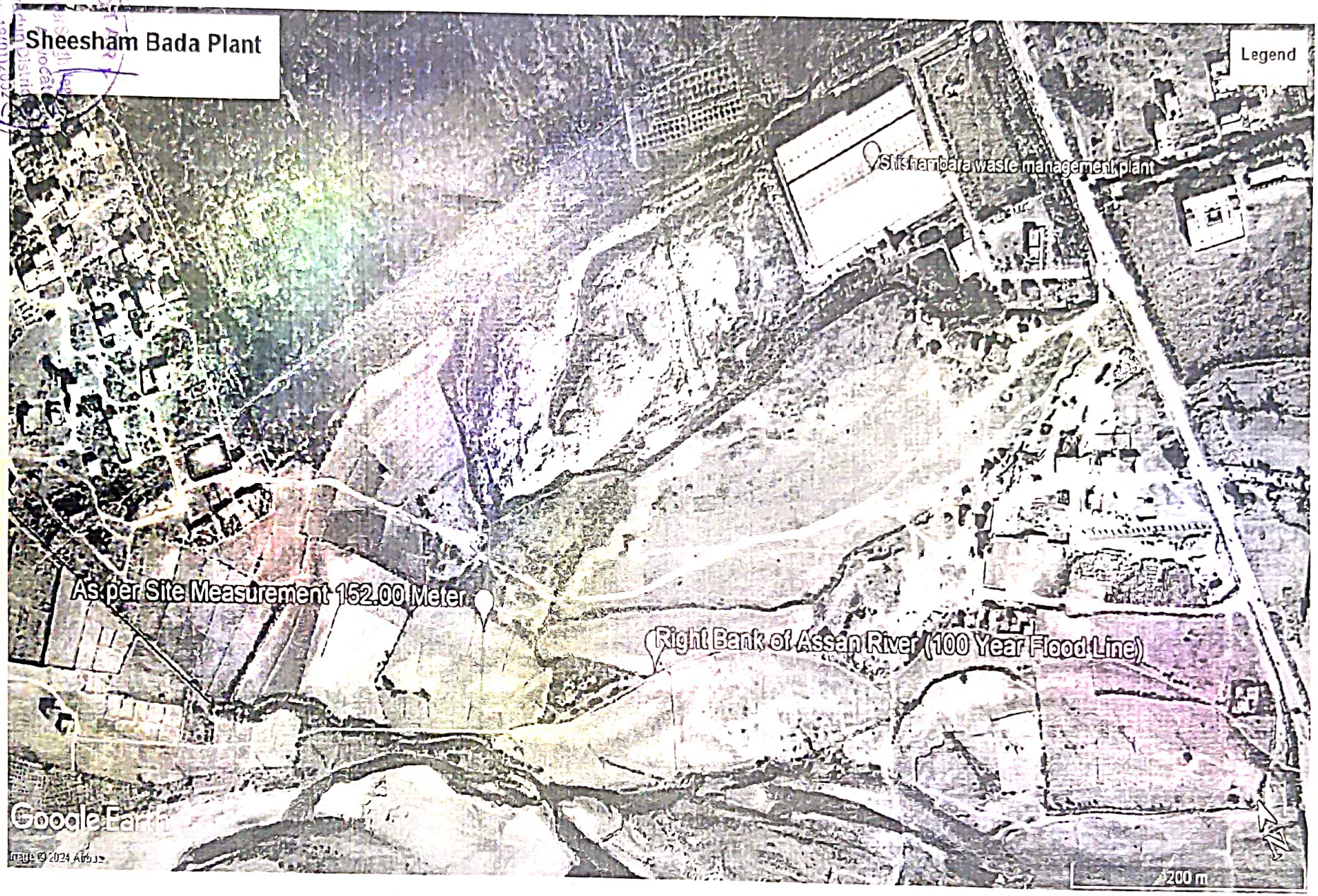
अधिशासी अभियन्ता
जल विज्ञान खण्ड, बहादराबाद

पत्रांकः ____ / ज0वि0ख0 / तद्दिनांक

प्रतिलिपि अधीक्षण अभियन्ता, जल विज्ञान मण्डल, बहादराबाद को सूचनार्थ प्रेषित।

अधिशासी अभियन्ता
जल विज्ञान खण्ड, बहादराबाद

Rajender Singh
Advocate
Dehradun District
Reg.No.19[illegible]/2002
GOVT. OF UTTARAKHAND (INDIA)


Sheesham Bada Plant
Legend
Shishambara waste management plant
As per Site Measurement 152.00 Meter
Right Bank of Assan River (100 Year Flood Line)
Google Earth
200 m

673

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37