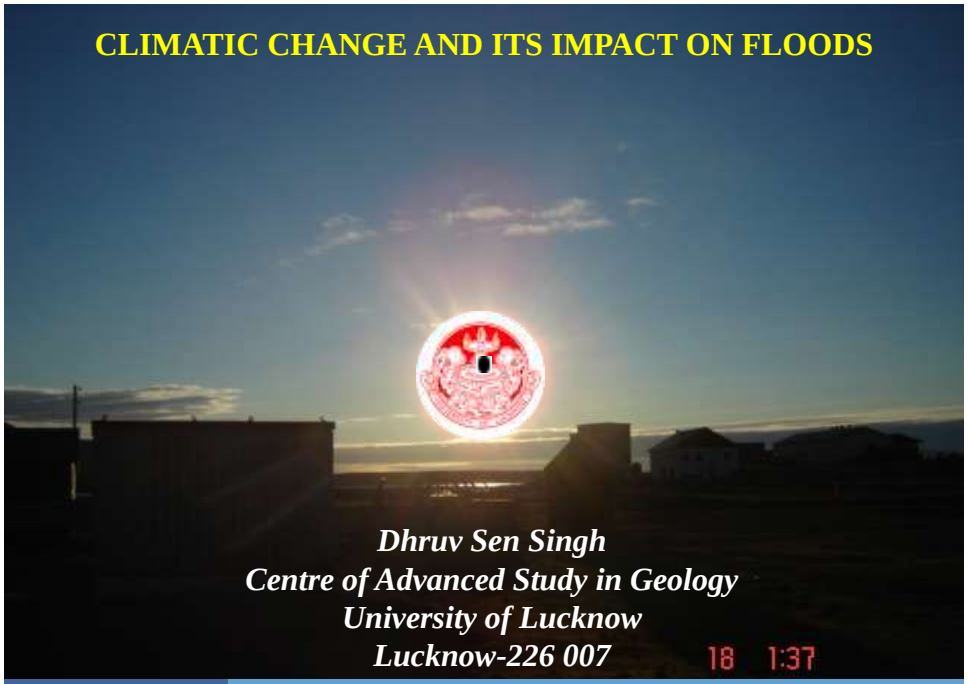
CLIMATIC CHANGE AND ITS IMPACT ON FLOODS



Dhruv Sen Singh
Centre of Advanced Study in Geology
University of Lucknow
Lucknow-226 007

CLIMATE CHANGE

Climate change is one of the major challenges in the 21st century faced by the citizen of planet earth.

It has affected the social, cultural, political and economical aspects of the society.

The climate change has affected the agriculture, environment, and enhanced the natural hazards.

It requires the change in the energy resources from Non-renewable to renewable. The developing countries are not yet ready for this change.

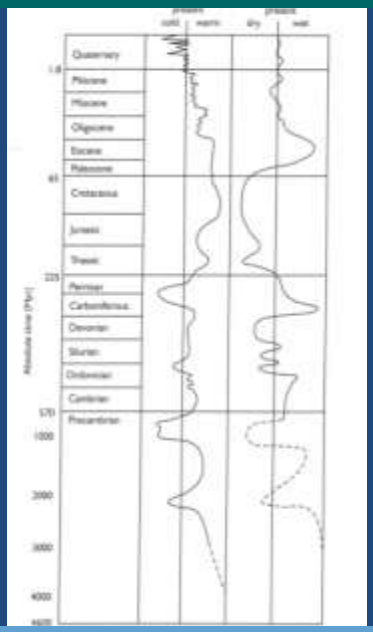
Social awareness and adaptive capacity for climate change needs to be strengthened to solve all the above critical issues.

GLOBE

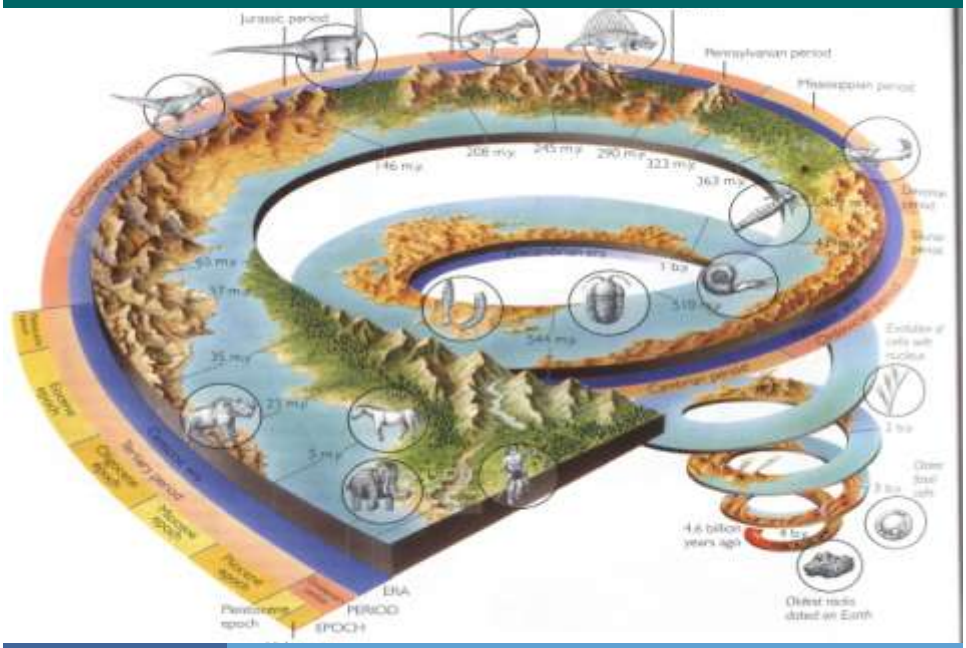
TIME FRAME OF CLIMATE CHANGE ON PLANET EARTH

TIME FRAME

Earth- 4.6 b y
Man- 10 k a
Industry- 300 y



EVOLUTION OF LIFE ON THE EARTH



GANGOTRI GLACIER AND IPCC

GANGOTRI GLACIER AND OUR VIEW

PATTERN OF RETREAT
MORPHOLOGICAL ZONES IN THE GANGOTRI GLACIER

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

Pattern of retreat and related morphological zones of Gangotri Glacier, Garhwal Himalaya, India

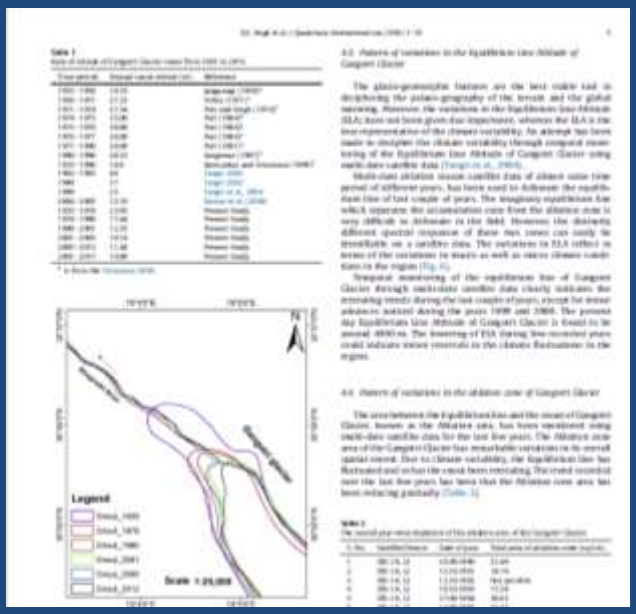
Dhruv Sen Singh [a,*], Anjani Kumar Targni [b], Dhirendra Kumar [a], Chetan Anand Dubey [c], Rameshwar Bali [c]

[a] Centre of Advanced Study in Geology, University of Lucknow, Lucknow 226007, Uttar Pradesh, India
[b] A-63, Sahyadri Nagar, Indra Nagar, Lucknow 226016, Uttar Pradesh, India

ARTICLE INFO

ABSTRACT

PATTERN OF RETREAT



MORAINES OF GANGOTRI GLACIER

GANGOTRI GLACIER REGION

LAUNCHING OF FIRST INDIAN EXPEDITION TO THE ARCTIC

INTERNATIONAL SCIENCE CITY, NY-ALESUND IN ARCTIC

FLAG HOISTING FOR THE FIRST TIME IN THE HISTORY OF INDIAON 15TH AUGUST 2007 IN NORTH POLE REGION

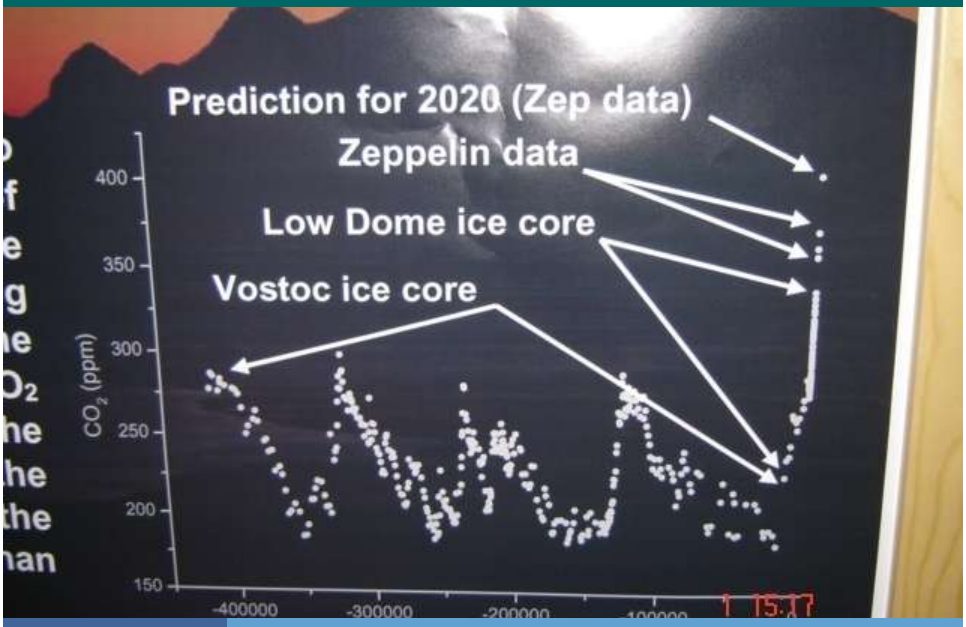
TIRANGA WAS HOISTED FOR THE FIRST TIME IN INDIAN HISTORY IN HIMADRI ARCTIC 15 AUGUST, 2008

LAND OF MID NIGHT SUN SIX MONTHS DAY IN POLAR REGIONS

TIDAL GLACIERS WITH CREVASSES

TIDAL GLACIERS

CO2 CURVE IN PPM IN ATMOSHPERE

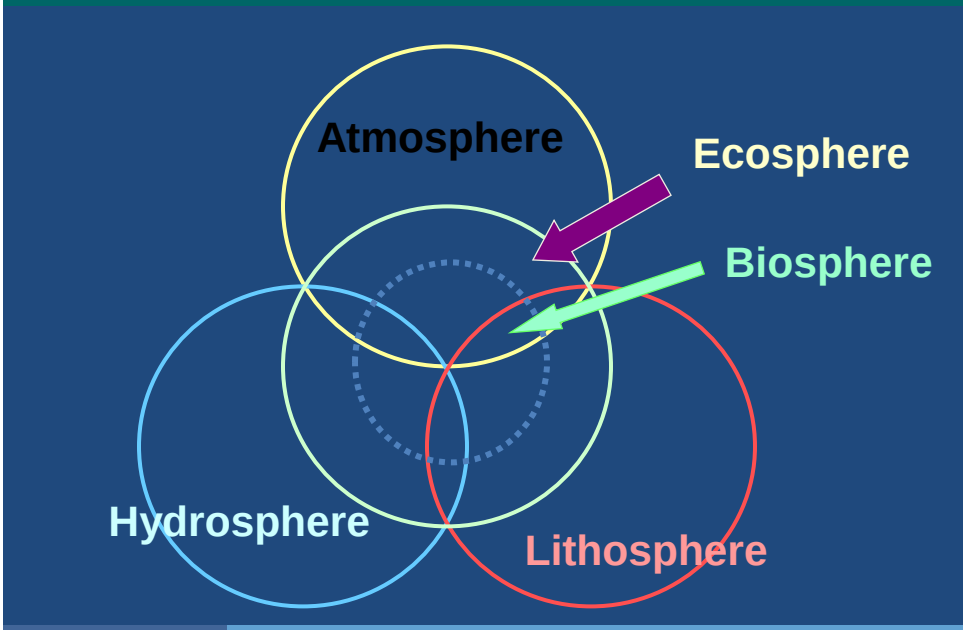


ENVIRONMENT

Environment provides the Life Support System, Air, Water and Food.

every drop counts *Dhruv Sen Singh, Centre of Advanced study in Geology, University of Lucknow*

COMPONENTS OF ENVIRONMENT



DIFFERENT COMPONENTS OF ENVIRONMENT

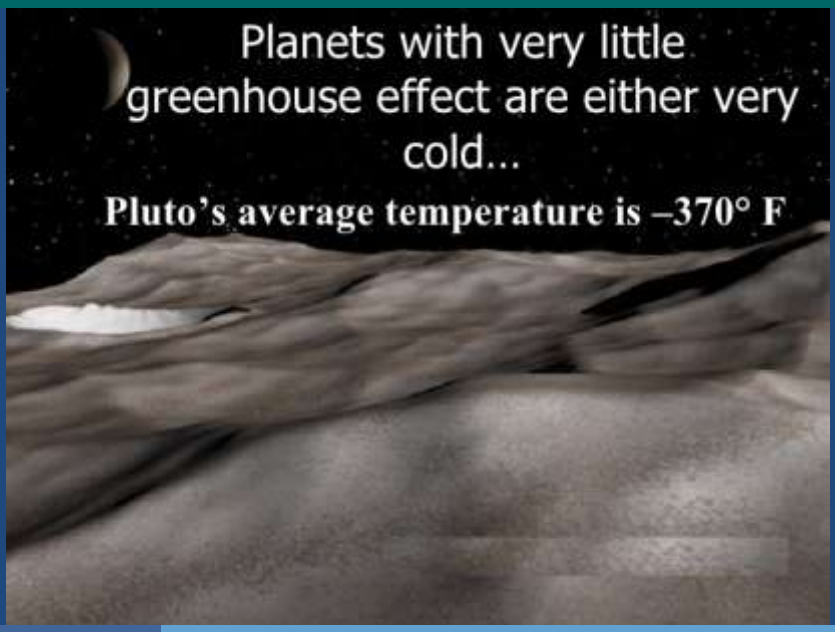

Gangotri Glacier


Ganga River


Sambhar Lake


Vivekanand Rock, Indian Ocean

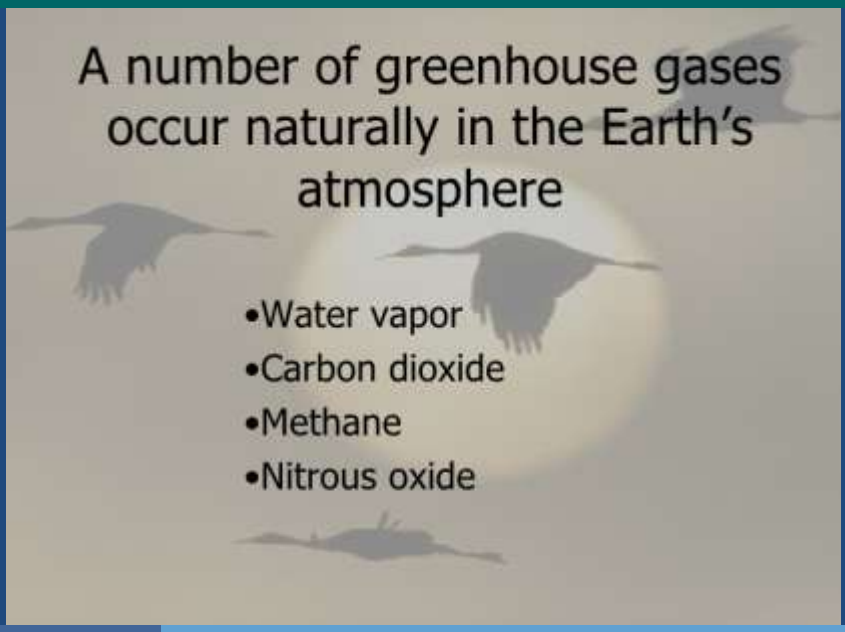
PLANETS



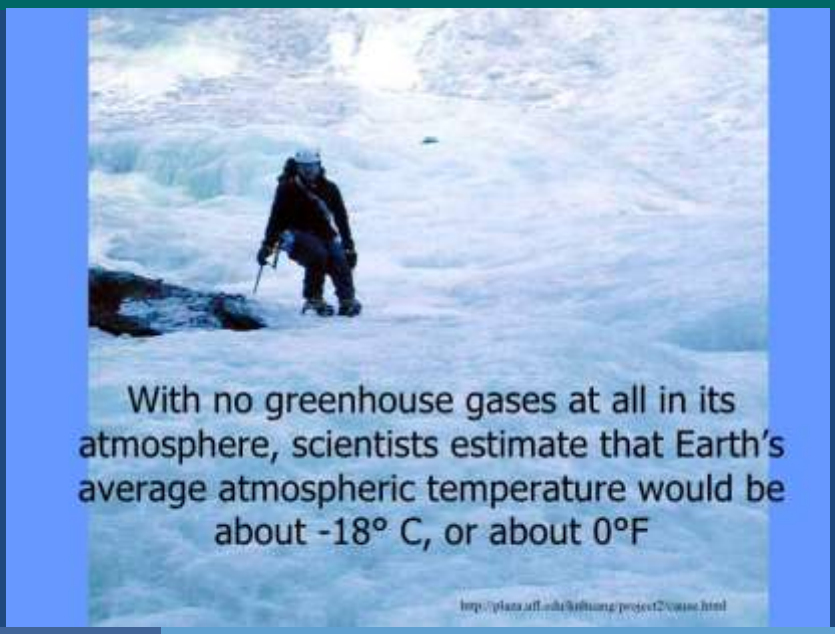
PLANETS

PLANETS AND GREEN HOUSE GASES

GREEN HOUSE GASES



GREEN HOUSE GASES



EARTH AND CLIMATE CHANGE

CONFLUENCE OF YAMUNA AND GANGA AT ALLAHABAD

PATH CHANGE OF RAPTI NEAR GORAKHPUR

CONFLUENCE OF RAPTI AND GHAGHARA

every drop counts Dhruv Sen Singh, Centre of Advanced study in Geology, University of Lucknow

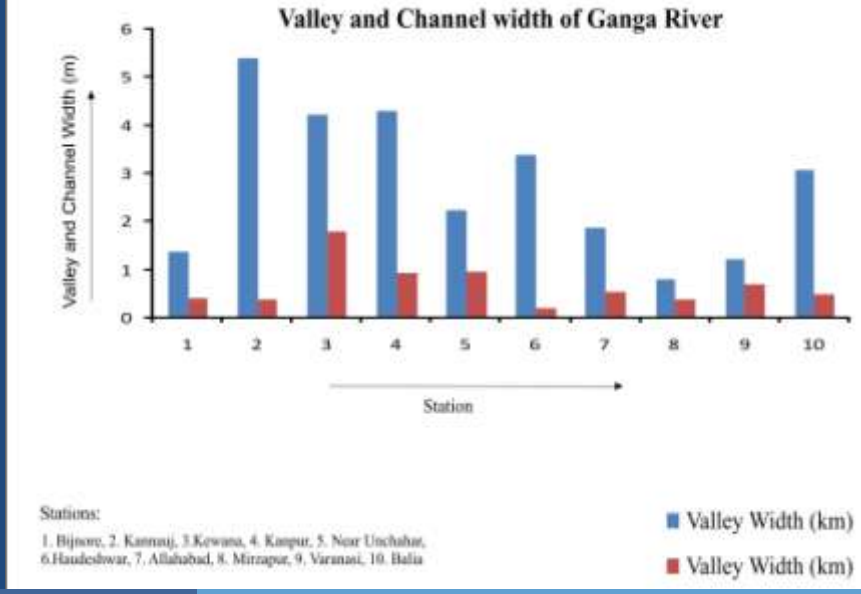
CONFLUENCE OF CHHOTI GANDAK AND GHAGHARA

every drop counts Dhruv Sen Singh, Centre of Advanced study in Geology, University of Lucknow

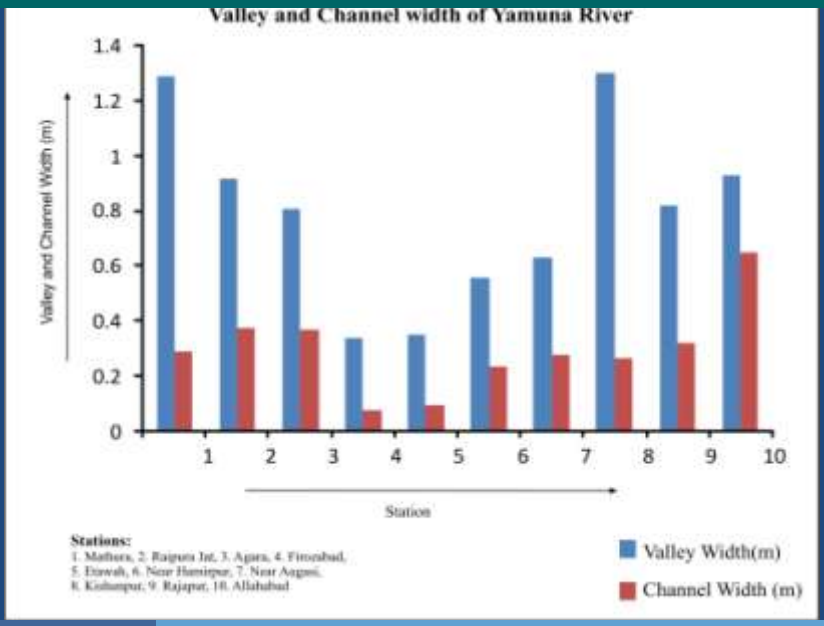
CONFLUENCE OF GANGA AND GHAGHARA AT CHHAPRA

BROAD VALLEY OF GANGA NEAR KANPUR

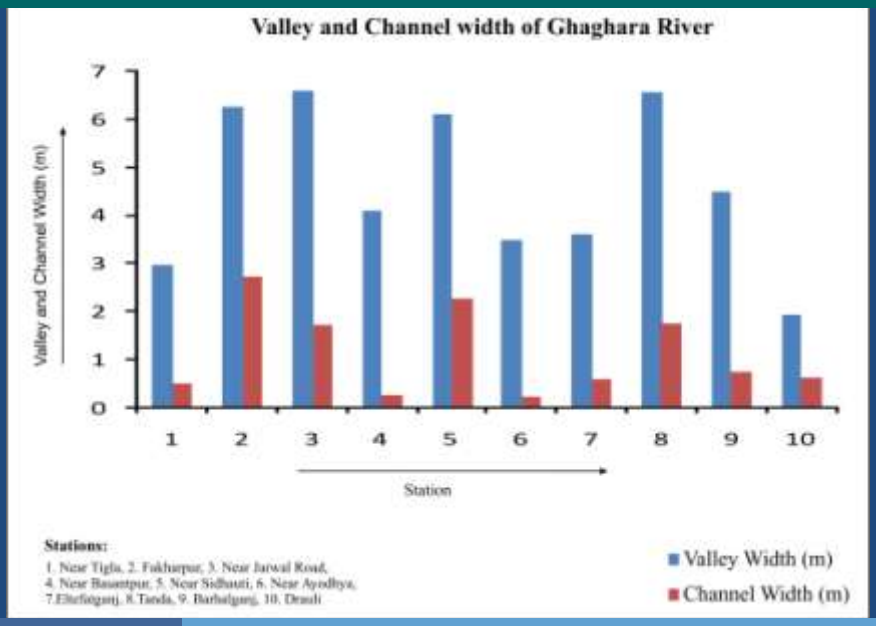
GANGA RIVER



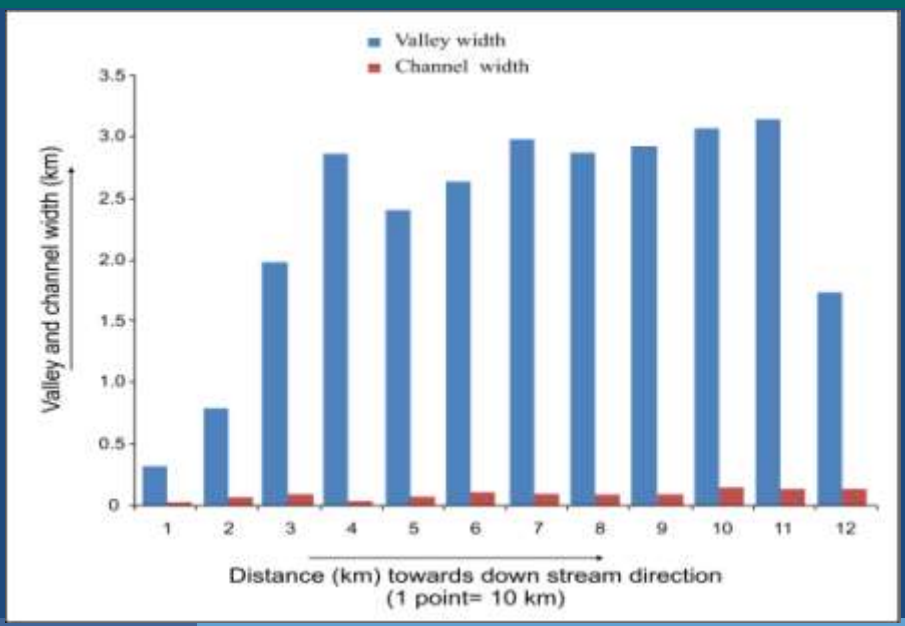
YAMUNA RIVER



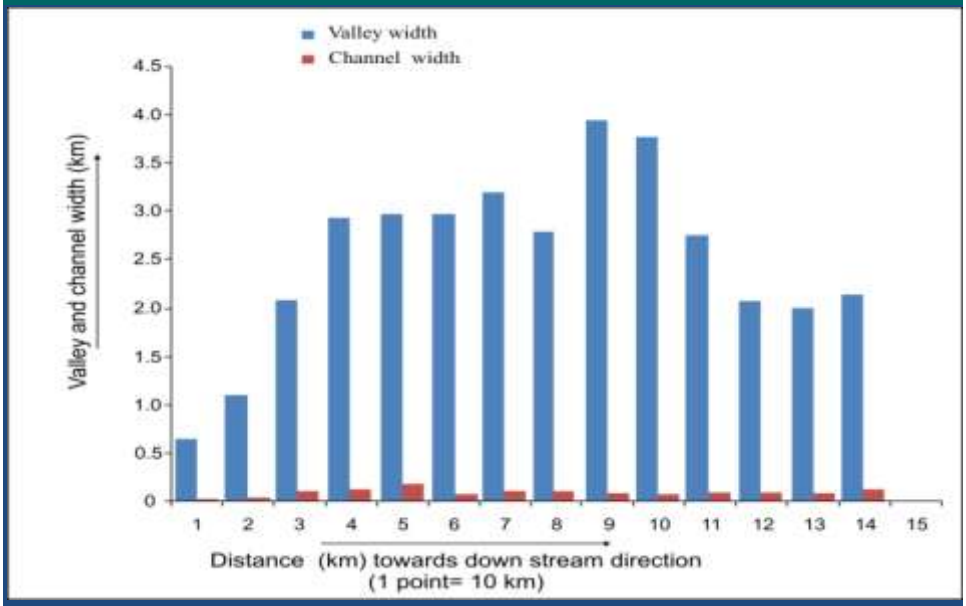
GHAGHARA RIVER



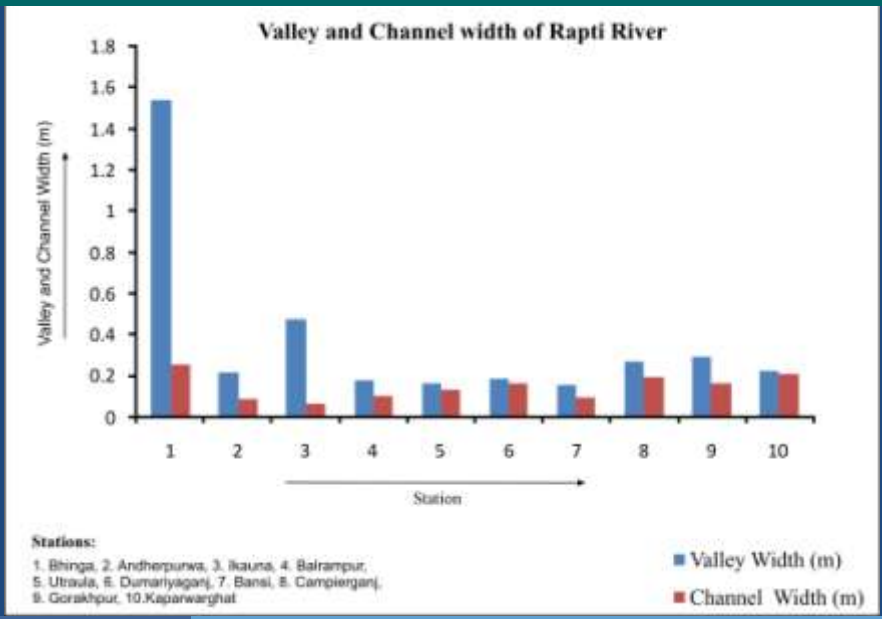
GREAT GANDAK RIVER



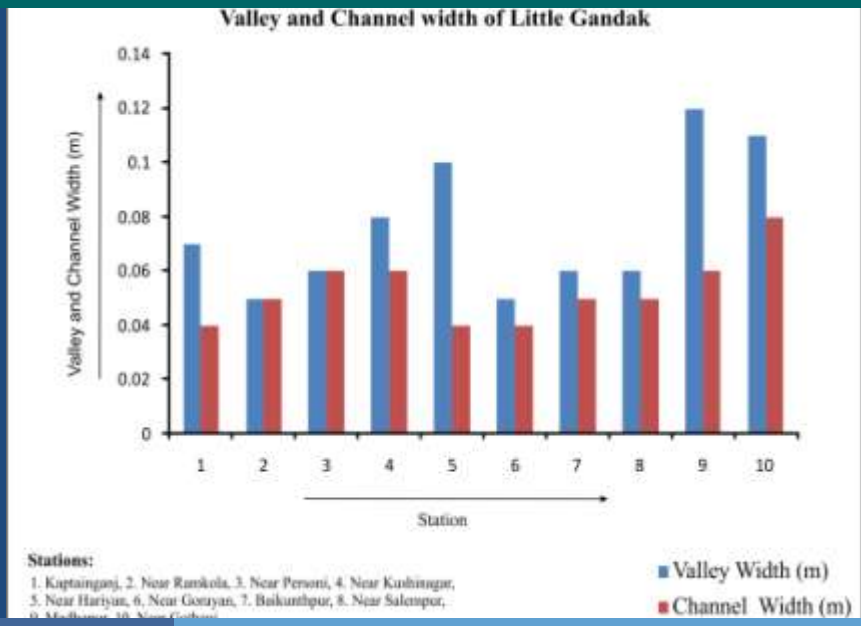
KOSI RIVER



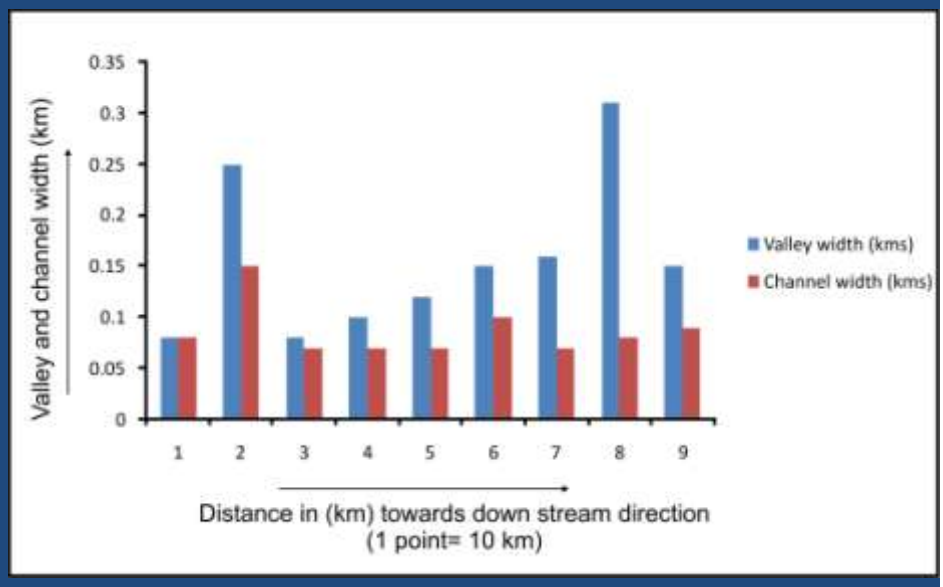
RAPTI RIVER



CHHOTI GANDAK RIVER



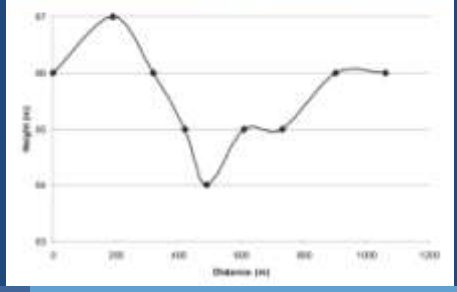
GOMATI RIVER

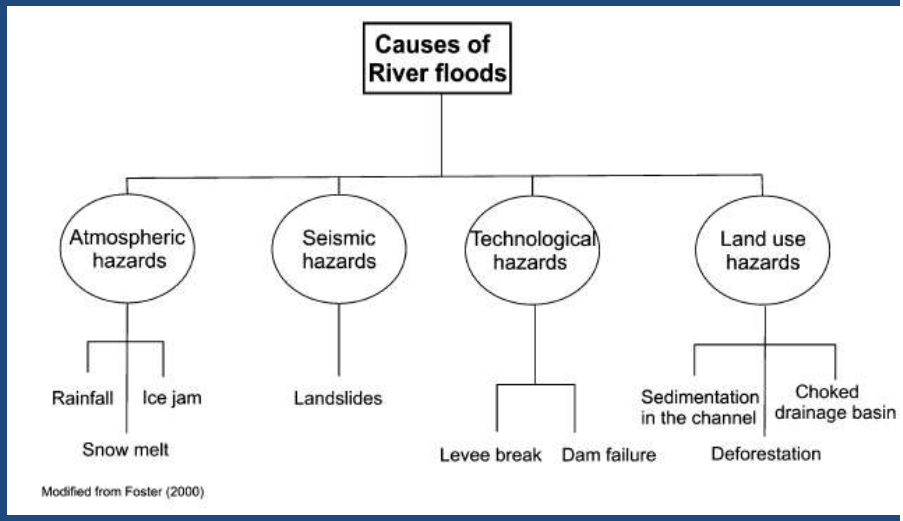


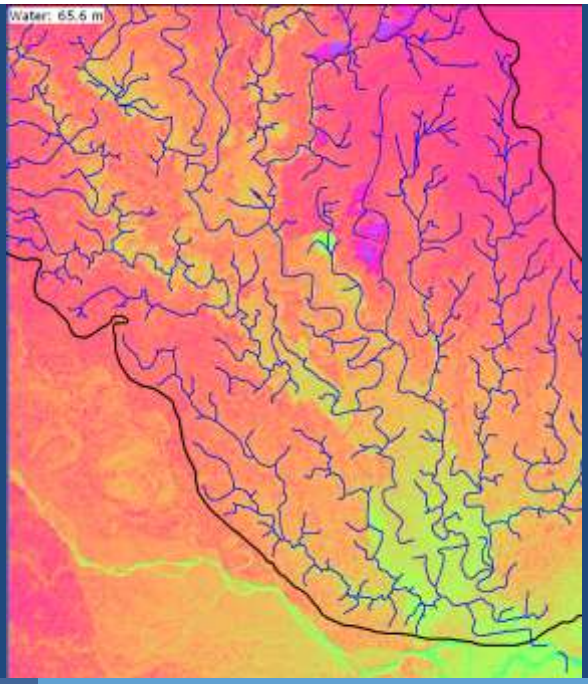
GHAGHARA RIVER

GHAGHARA RIVER

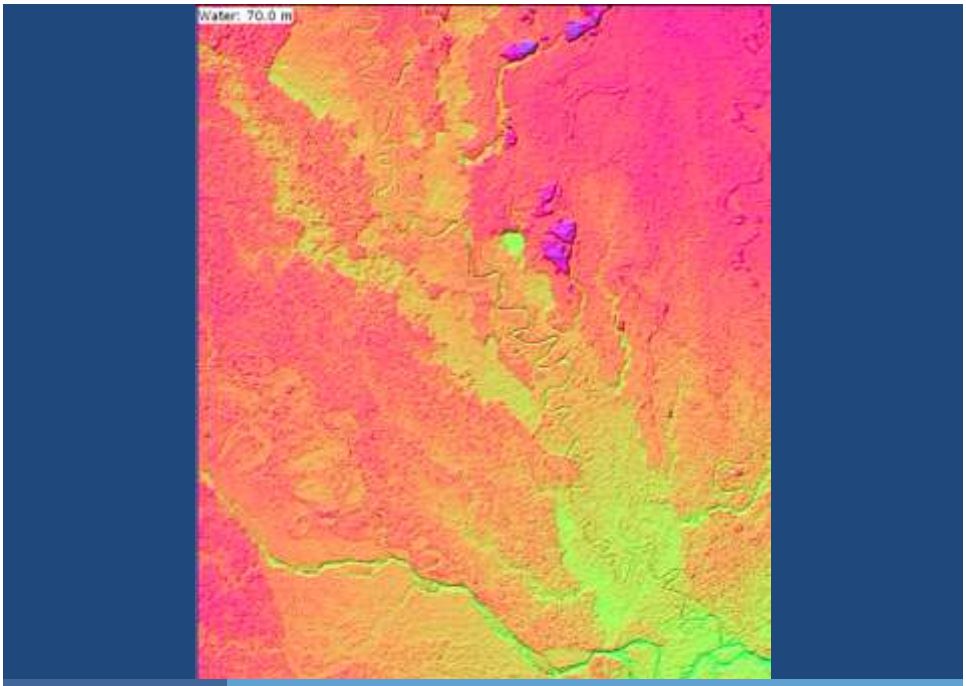

Active flood plain
T3
T2
T1
T1



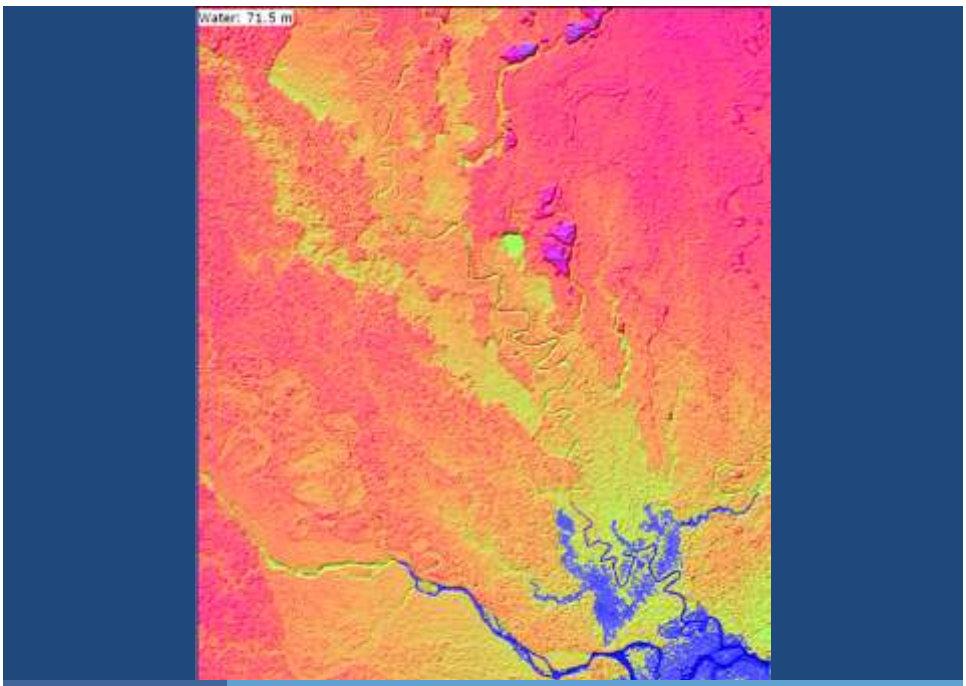




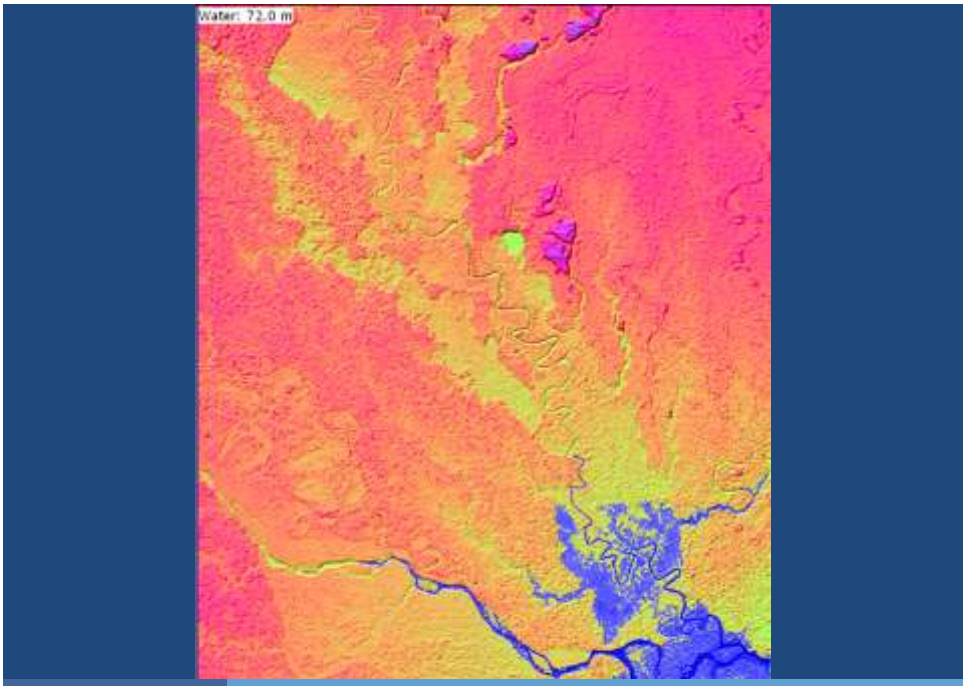
every drop counts Dhruv Sen Singh, Centre of Advanced study in Geology, University of Lucknow

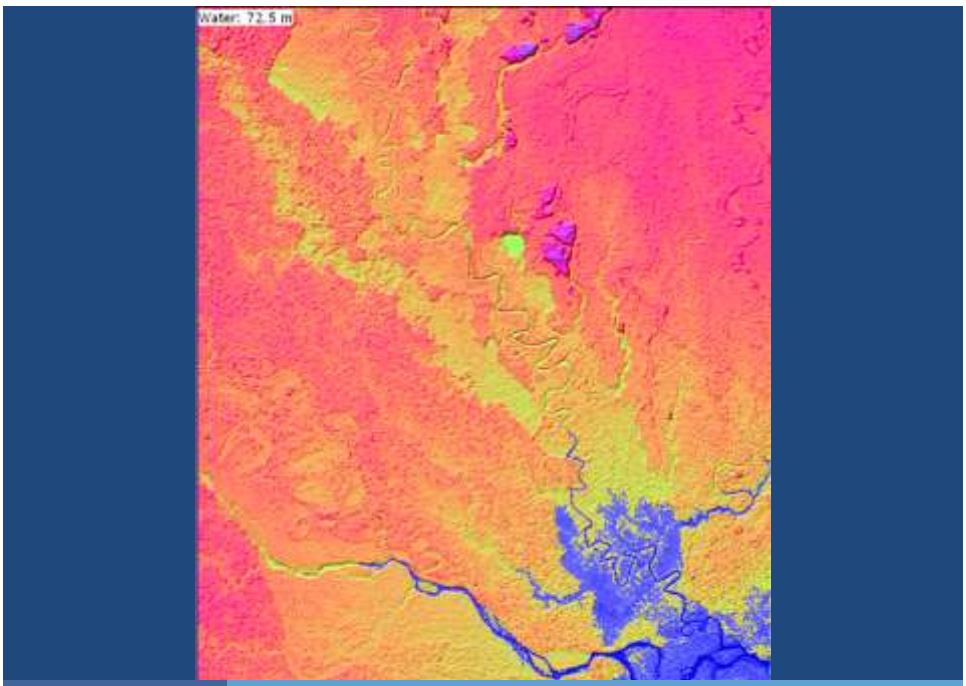


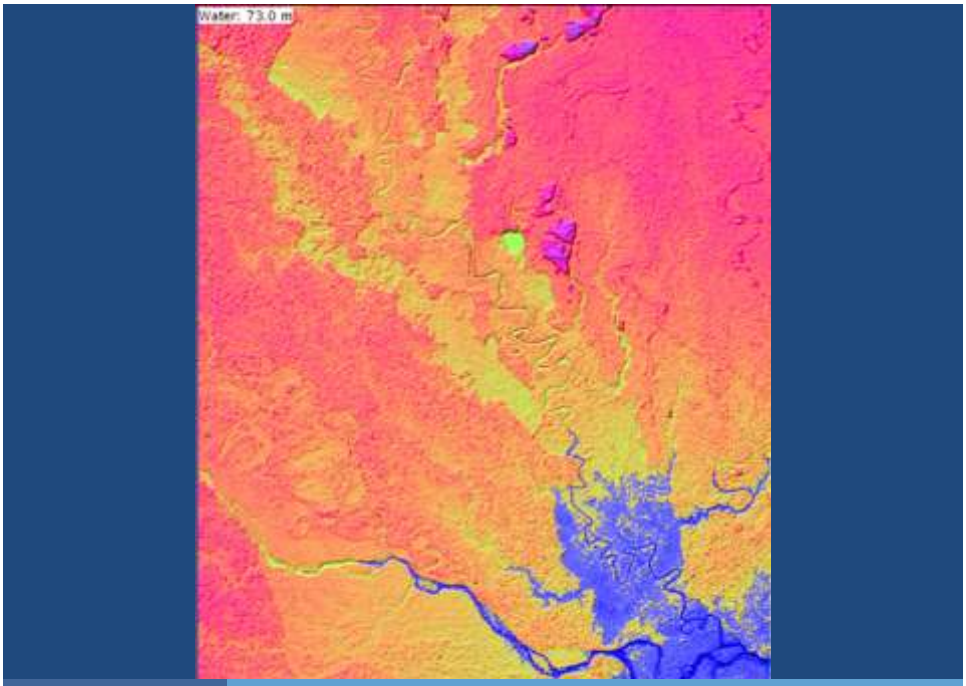
every drop counts Dhruv Sen Singh, Centre of Advanced study in Geology, University of Lucknow



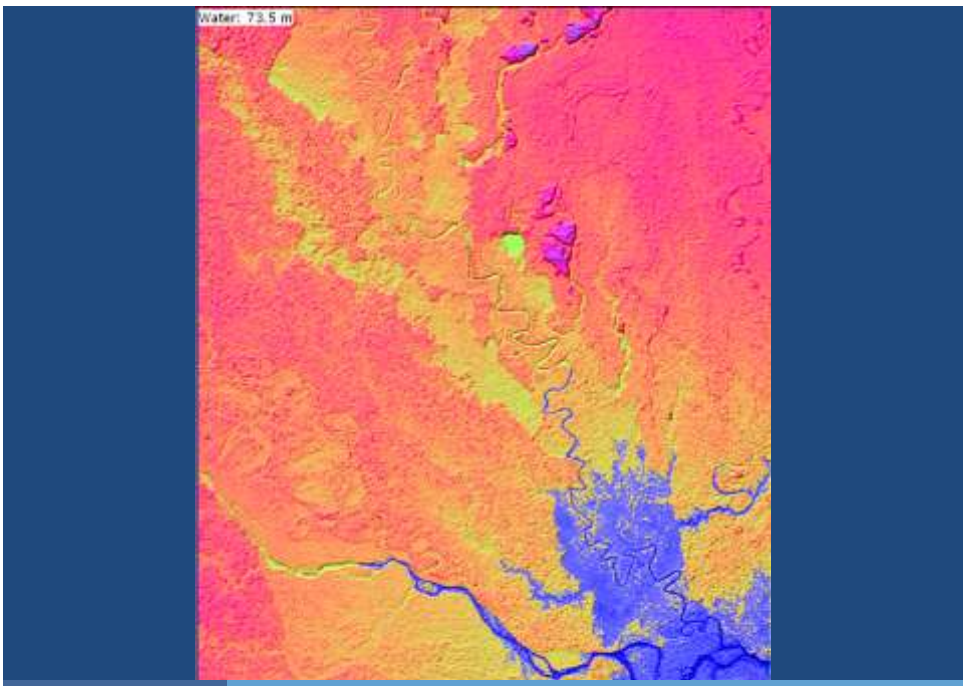
every drop counts Dhruv Sen Singh, Centre of Advanced study in Geology, University of Lucknow


Water: 72.0 m

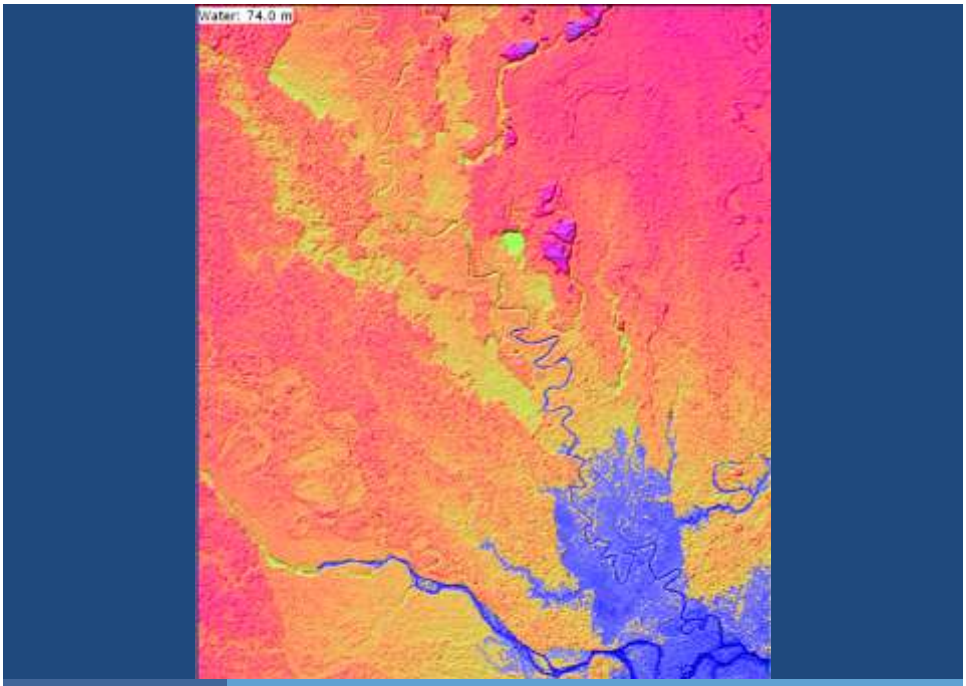

Water: 72.5 m

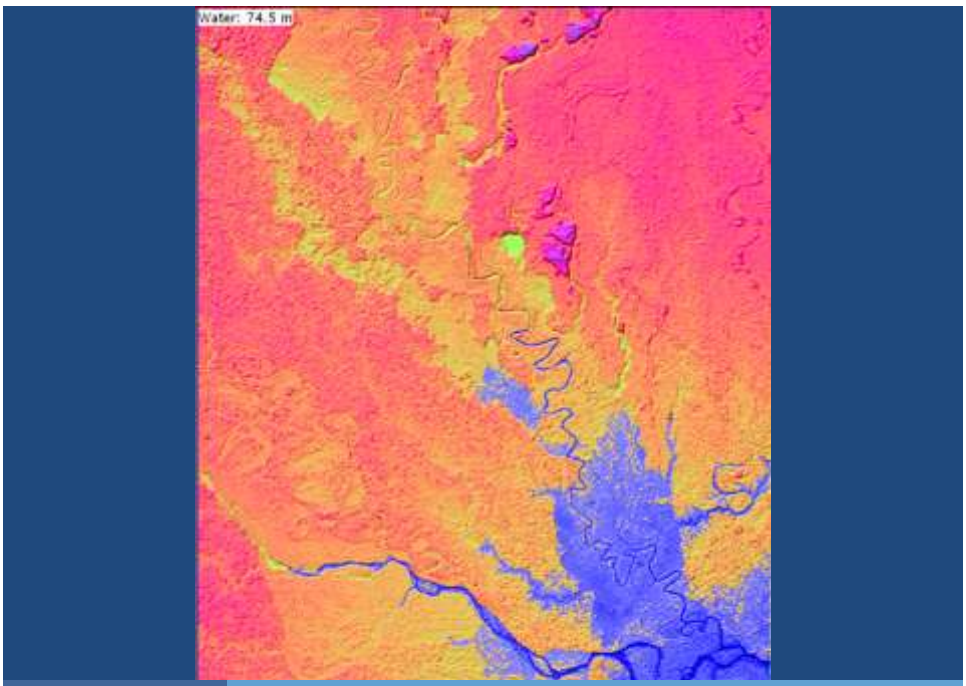


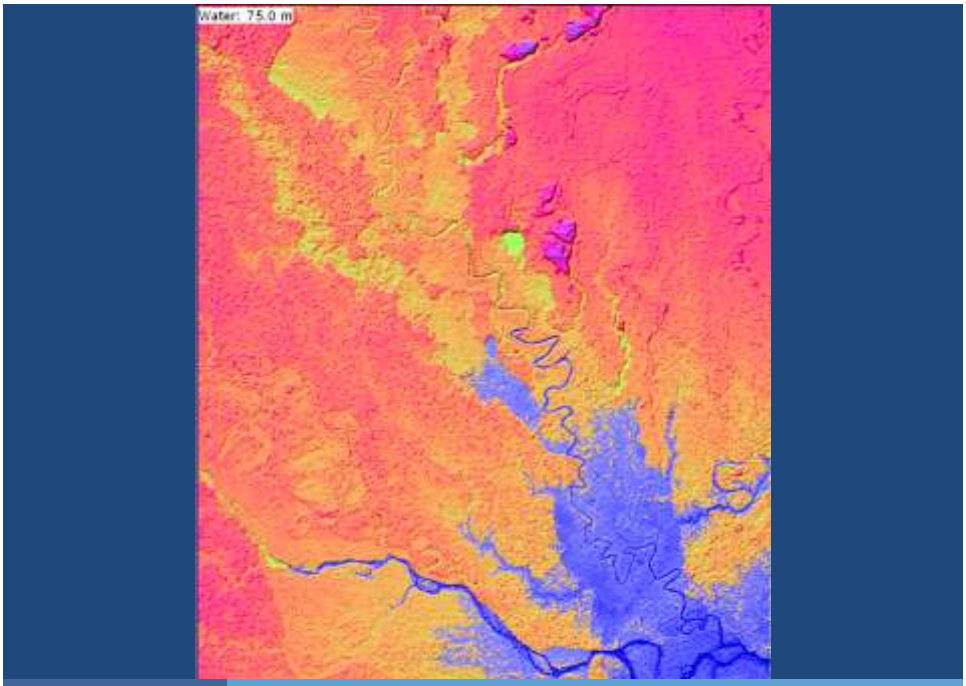
every drop counts Dhruv Sen Singh, Centre of Advanced study in Geology, University of Lucknow

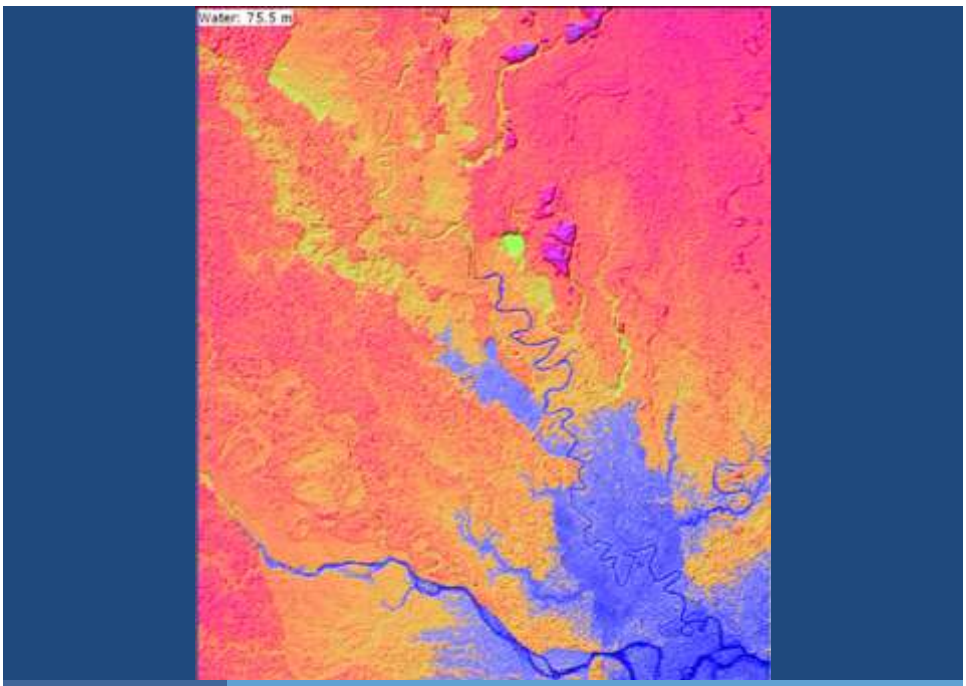


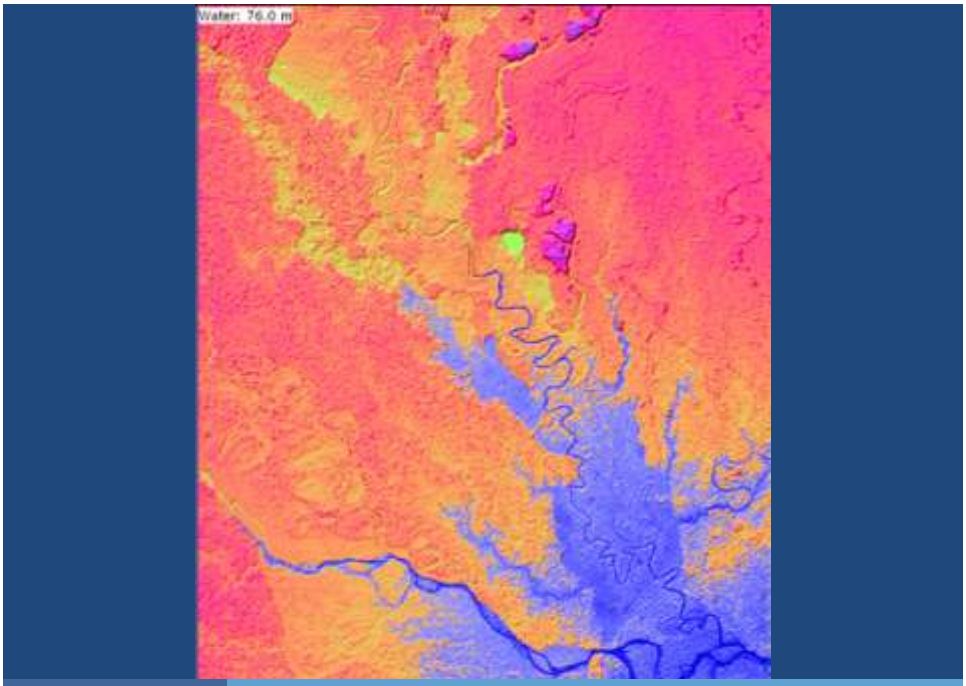
every drop counts Dhruv Sen Singh, Centre of Advanced study in Geology, University of Lucknow

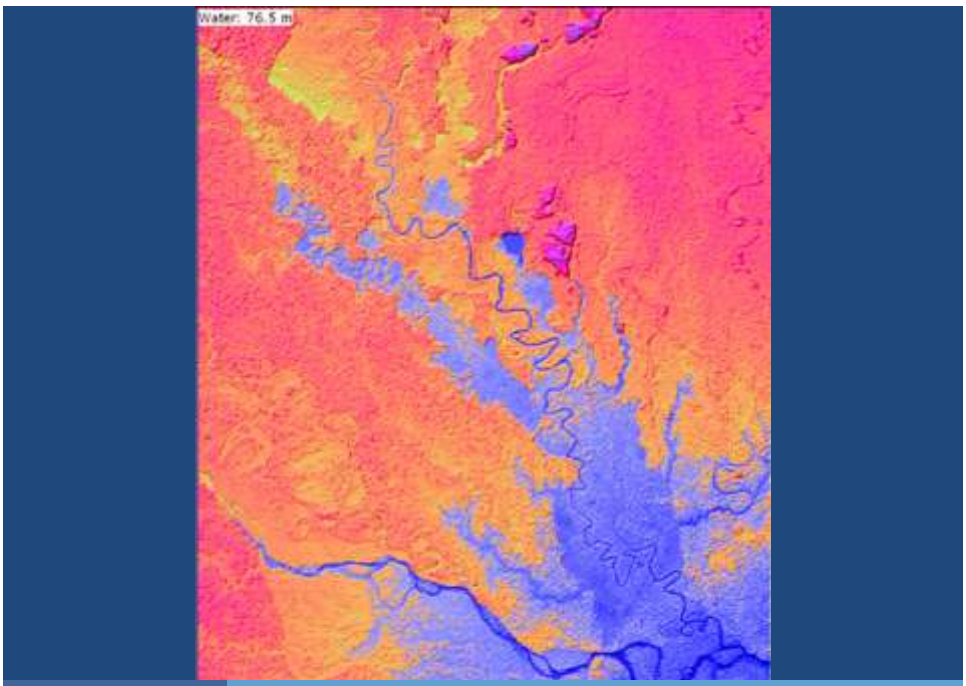

Water: 74.0 m

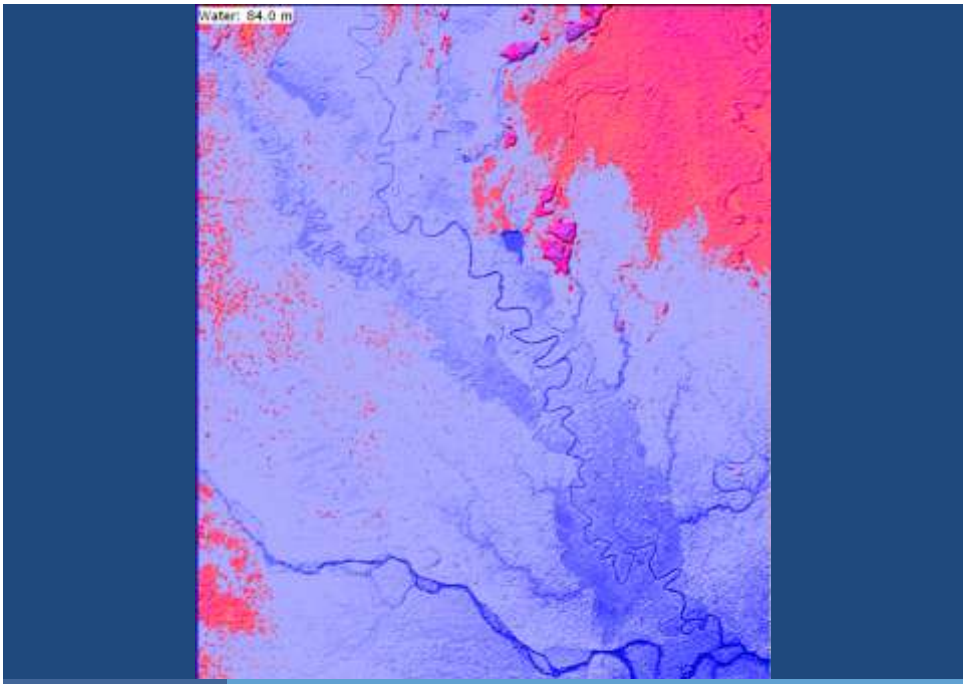

Water: 74.5 m


Water: 75.0 m

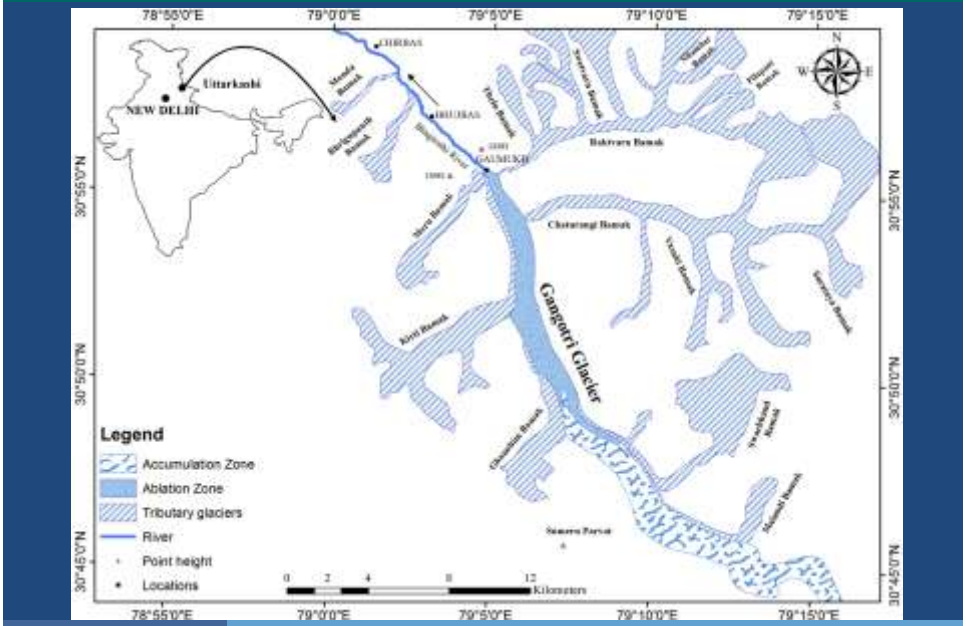

Water: 75.5 m


Water: 76.0 m


Water: 76.5 m

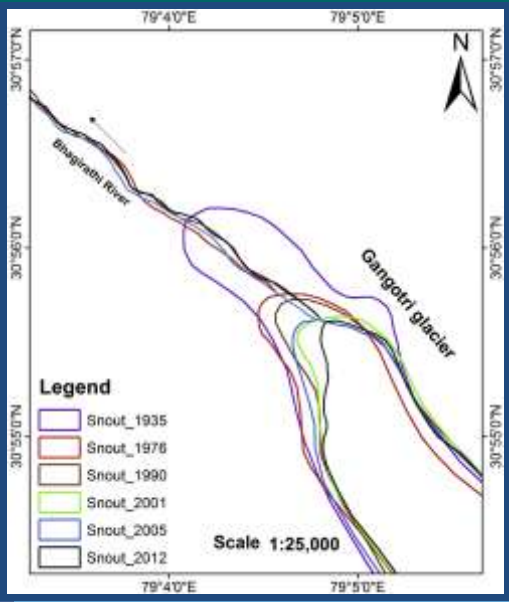


LOCATION MAP OF GANGOTRI GLACIER



POSITION OF THE GANGOTRI GLACIER SNOUT IN 2001 (a) AND 2015 (b)

POSITION OF THE SNOUT OF THE GANGOTRI GLACIER



YEAR WISE DEPLETION RATE OF THE ABLATION AREA

The overall year-wise depletion of the ablation area of the Gangotri Glacier.

S. No.	Satellite/Sensor	Date of pass	Total area of ablation zone (sq km)
1	IRS-1A, L2	25.09.1990	21.49
2	IRS-1A, L2	15.10.1991	19.19
3	IRS-1A, L2	12.10.1992	Not possible
4	IRS-1A, L2	10.10.1993	17.34
5	IRS-1A, L2	27.09.1994	20.62
6	IRS-1A, L2	14.09.1995	22.77
7	IRS-1C-L3	19.10.1996	18.03
8	IRS-1C-L3	14.10.1997	Not possible
9	IRS-1C-L3	09.10.1998	21.07
10	IRS-1D-L3	16.10.1999	21.25
11	IRS-1C-L3	15.11.2000	19.97
12	IRS-1D-L3	23.09.2001	19.89
13	IRS-1D-L3	2012	17.04

CHARACTERSTIC OF GEOMORPHIC ZONES

Characteristics of morphological zones

S. No.	Morphological zones	Sediments	Percentage of sediment (size in cm)					Roundness and sorting
			Boulders				Matrix	
			>150 LSB	60-150 LMSB	30-60 SMSB	2.5-30 SSB		
1	Glacial	Primary	2-5	5-10	5-10	40-60	20-40	Angular, poorly sorted
2	Glacio-Fluvial	Secondary	2-5	5-10	10-20	20-40	50-60	Sub rounded, poorly sorted

LSB = Large Size Boulders, LMSB = Large Medium Size Boulders, SMSB = Small Medium Sized Boulders, SSB = Small Size Boulders, Matrix - Sand, Silt, Clay.

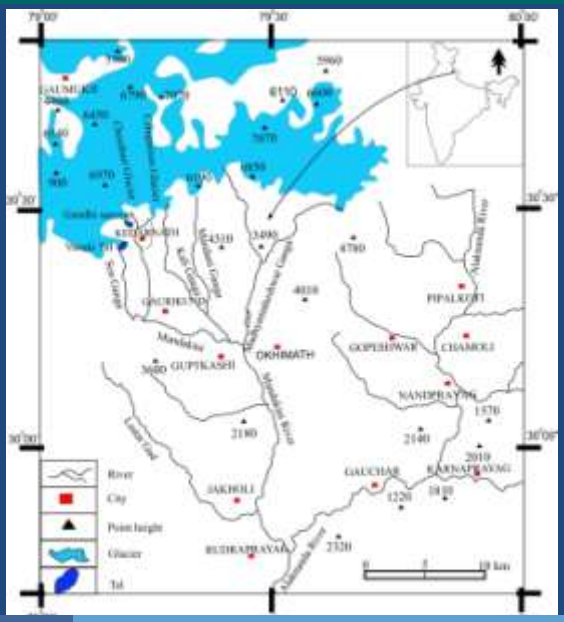
every drop counts — Dhruv Sen Singh, Centre of Advanced study in Geology, University of Lucknow

CLOUD BURSTS IN GANGOTRI GLACIER ON 6 JUNE, 2000

every drop counts — *Dhruv Sen Singh, Department of Geology, University of Lucknow*

CLOUD BURSTS IN GANGOTRI GLACIER ON 6 JUNE, 2000

LOCATION OF KEDARNATH AREA AND MANDAKINI RIVER

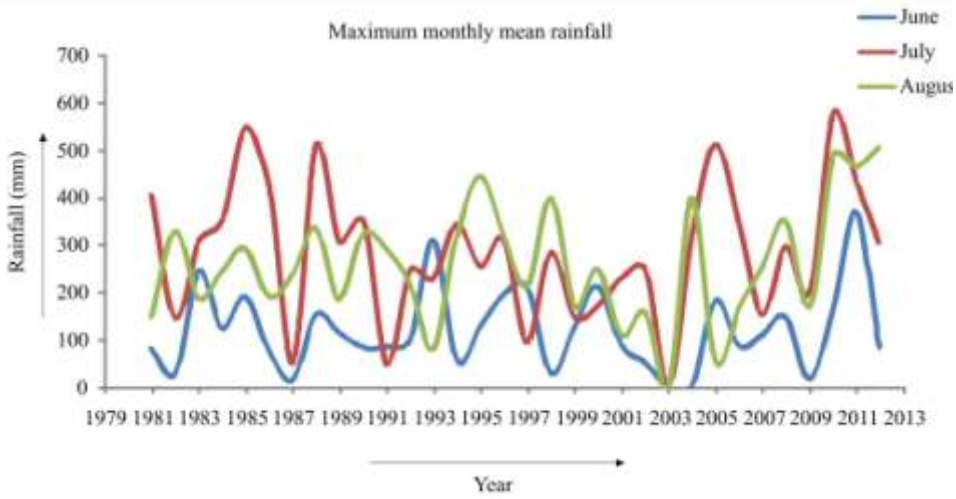


CHORABARI GLACIER AND MANDAKINI RIVER

SUSTAINABLE SOLUTIONS ABOUND

KEDARNATH DEVASTATION, 16, 17—June, 2013

PRECIPITATION VARIATIONS FROM 1980-2013

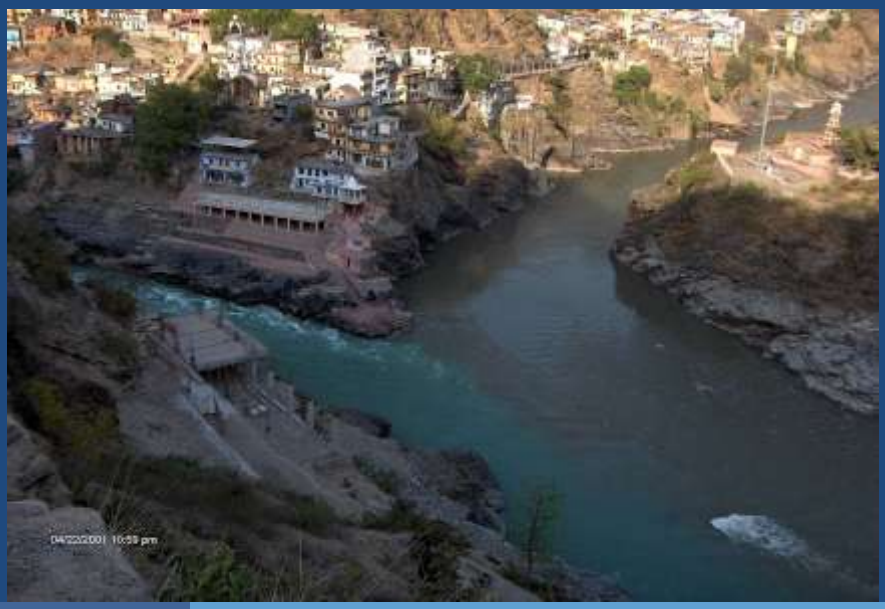


IMD and India Water Portal

CAUSES OF KEDARNATH TRAGEDY

DISTRUBUTION OF DEBRIS AFTER DISASTER

BHAGIRATHI AND ALAKNANDA AT DEVPRAYAG



BHAGIRATHI AND ALAKNANDA AT DEVPRAYAG

every drop counts *Dhruv Sen Singh, Department of Geology, University of Lucknow*

Keadranath

every drop counts — *Dhruv Sen Singh, Department of Geology, University of Lucknow*

Kedarnath

every drop counts — *Dhruv Sen Singh, Department of Geology, University of Lucknow*

February, 2021

Climate change has led to rise in natural disasters...

...Encroachment Of Rivers Adds To Havoc

BY INVITATION

EARTH

There's no place like home...

...and there may never be again. Do your part.

THANKS