



Presented by -
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On April 29, 2022 via Zoom



JSS MAHAVIDYAPEETHA
SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING
JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU
DEPARTMENT OF ENVIRONMENTAL ENGINEERING





Presentation Overview

- ✧ Climate Change Issues and Impacts
- ✧ General Observation
- ✧ Impacts on Rivers and Species due to Global Warming
- ✧ Example Study Steps on a River System and a Himalayan Glacier
- ✧ Building Climate Resilience
- ✧ Complexities and Constraints
- ✧ Working together to face this challenge





Glacier Breaks in Uttarakhand Leads to Deadly Flooding



Climate Resiliency and Reversal Initiative

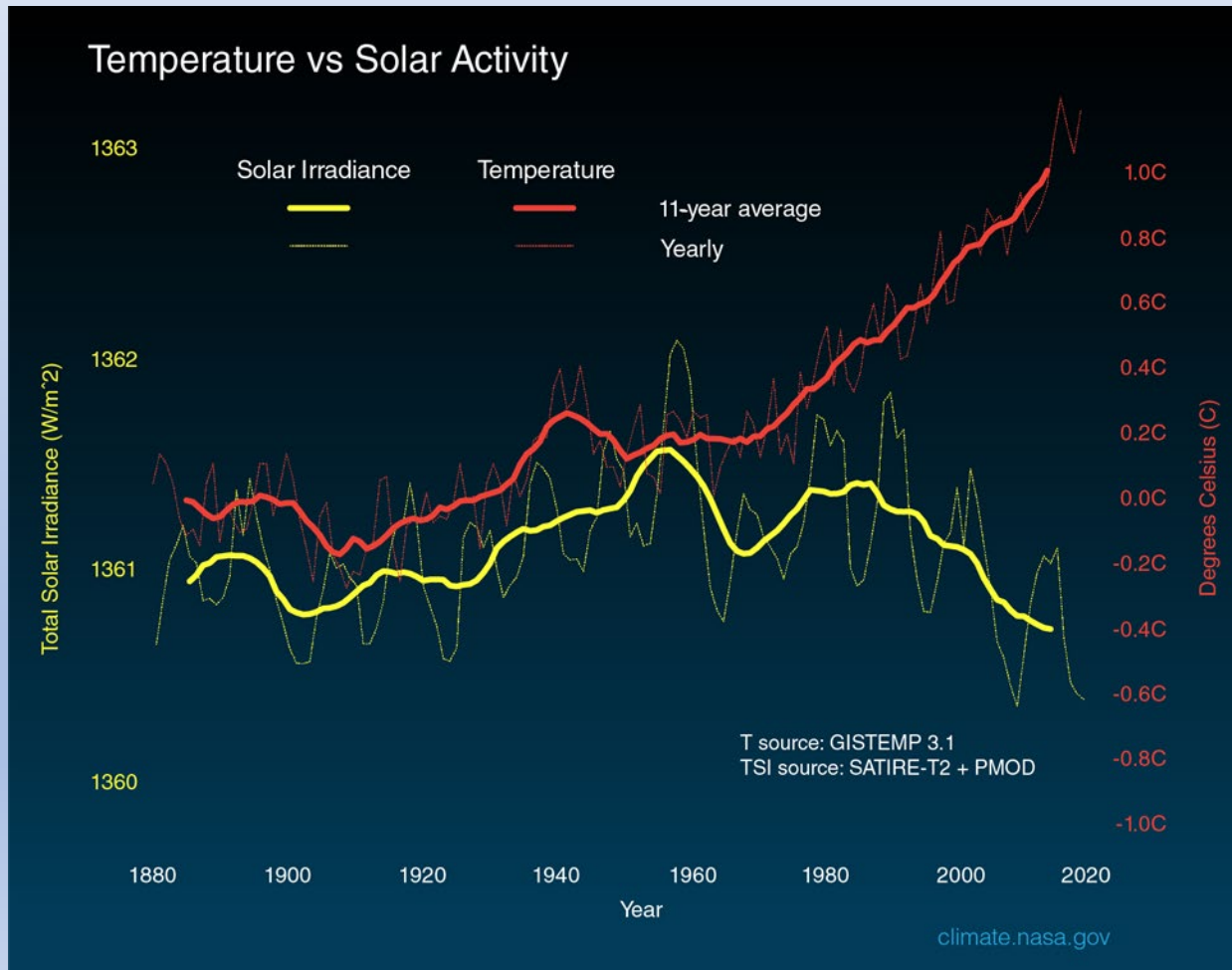
1. Recent disasters due to the weather pattern changes and calamities all across the globe underscores the need to focus on this issue.
2. A few major findings by the EC¹ and the National Aeronautics and Space Administration (NASA²) on tracking greenhouse gas emissions and the lower earth temperature increases are listed below:
 - Human activities are increasingly adding an enormous amount of greenhouse gases to those naturally occurring in the atmosphere, which is causing the greenhouse effect and global warming (EC, 2020).
 - It is evident from the data that greenhouse gases are trapping heat in the lower parts of the atmosphere causing the temperature rise.

1 European Commission (EC). (2020) *Causes of climate change* [Online] Available from: https://ec.europa.eu/clima/change/causes_en .

2 NASA. (2020) *Global Climate Change, Vital Signs of the planet*, [Online] Available from: <https://climate.nasa.gov/causes/> .



- This global warming are not caused by a more active Sun, as that would have caused warmer temperatures in all layers of the atmosphere.
- Instead, scientists have observed a cooling in the upper atmosphere, and a warming at the surface and in the lower parts of the atmosphere. (NASA, 2020)





- Many of these gases causing global warming occur naturally, but human activity is increasing the concentrations of some of them in the atmosphere, in particular (EC, 2020):
 - ◆ carbon dioxide (CO₂),
 - ◆ methane,
 - ◆ nitrous oxide, and
 - ◆ fluorinated gases.

The resulting climatic disasters during the past few years causing unprecedented –

- ▶ floods, ▶ landslides, ▶ mudslides, ▶ tornadoes, ▶ hurricanes, ▶ forest fires, ▶ drought, and ▶ evolving viral outbreaks.

These intense climatic events are causing huge loss of lives, damages to properties, and businesses supporting current agricultural, and industrial infrastructure.

This effort is looking into two specific outcomes –

1. develop steps to prevent the loss/damage of lives and properties due to unprecedented weather events (**Climate Resiliency**) and
2. remedial steps involving **Climate Reversal** -

The remedial step involving climate reversal is a long-term effort to begin the reversal of the increasing trend of global temperature rise for [the past six decades](#) (NASA, 2020).



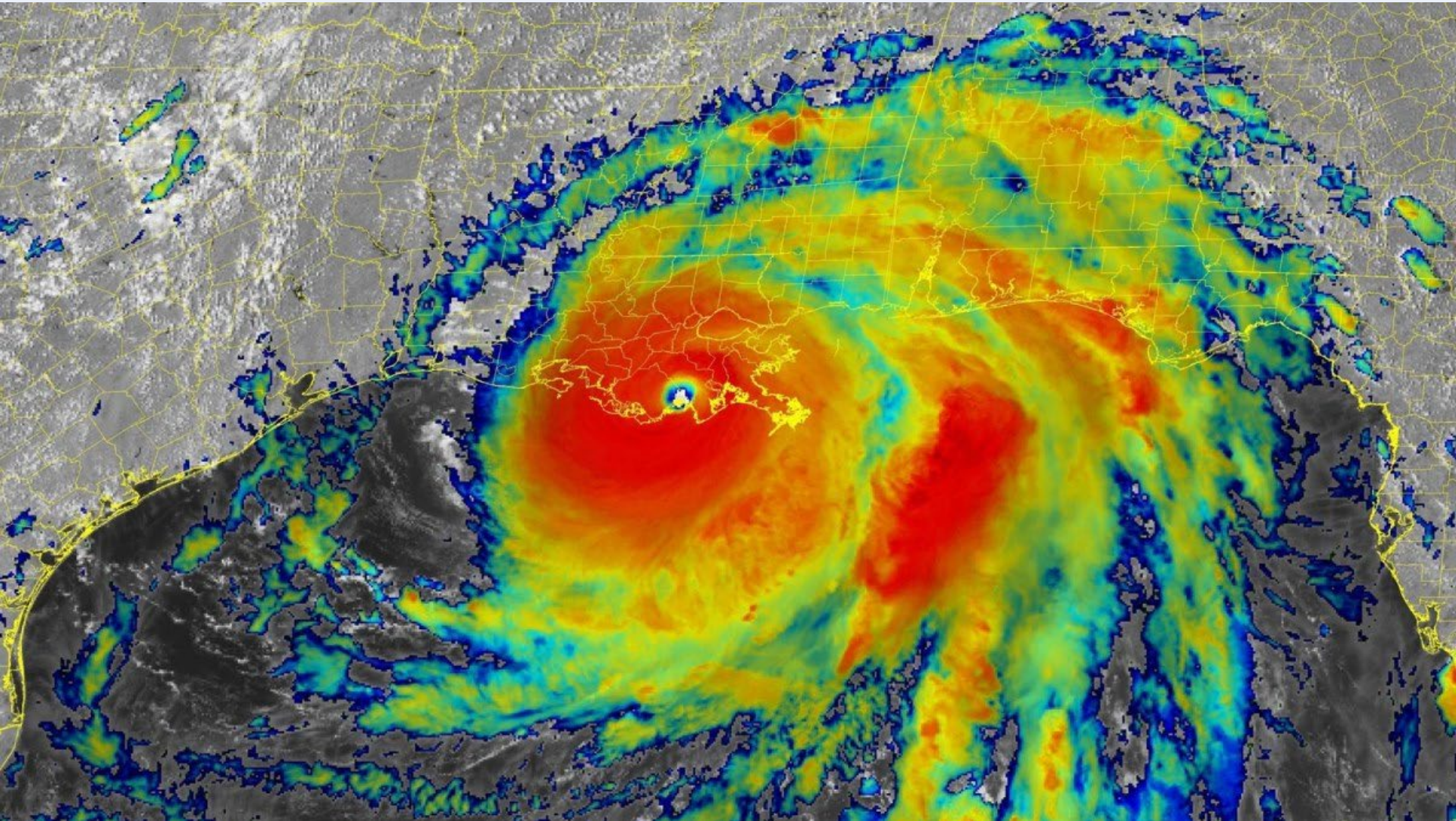
To build the *Climate Resiliency* among various global communities, it is prudent to begin with a few model areas where local facilities, supporting community contacts, and hydrological information on related waterbodies (streams/ivers) are available.

The Summary Approach:

- ◆ Developing a short background on
 - ✦ river basins and watersheds, ✦ their interdependency and
 - ✦ other watershed parameters that impact the quantity and quality
- ◆ Develop emergency drinking water purification systems for the climatic disasters.
- ◆ Develop a precise predictive model for a specific town/city/area of interest where we are hoping to predict the climate intensity and timing within a high level of accuracy.
- ◆ This effort includes ground sensors [data gathering and satellite based live weather extremes in partnership with NASA/NOAA- and combining the two.](#)
- ◆ Some of our team member already have partnership arrangements with NASA -



Climate Change Issues – Building Resilience & Reversal of Global Warming



Infrared satellite image of Hurricane Ida at 3:21 p.m. EDT August 29, 2021, after making landfall near Port Fourchon, Louisiana. Ida was the most expensive weather disaster of 2021, with \$75 billion in damages. (Image credit: [NOAA](#))



Local Ground-level Monitoring :

River Monitoring

The river basin monitoring primarily consists of -

- ◆ measuring hydrological fluxes, storages and quality changes. This includes :
 - ✦ *tracking* of essential hydro-geo-meteorological parameters such as –
 - ✦ water level, water quality, topography, and weather.



Example: Yamuna River Monitoring by ROW from Delhi till -Chambal Confluence
Coverage – 402.1 Km One-way



Watershed Monitoring

- ◆ Monitor the watershed under study by using data from NOAA, NASA and other resources to track and monitor storm systems
- ◆ Undertaking a few such studies currently
- ◆ One such studies - [Yamuna River Bank Towns – STP Survey and Water Quality Testing](#)
- ◆ Conducted January 10 – 16, 2022

Weather Monitoring

Use of data from NOAA, NASA and other resources to track and monitor storm systems (Ex: Storms Today) Storms

FAMILIAR PATTERN
FRIDAY

CHILLY FLOW CONTINUES

MILDER

Rain, snow, and freezing temperatures heading to Northeast

A dip in the jet stream will deliver chilly air to the Northeast that could allow for some light snowfall across part of the region's interior

Accuweather Accuweather, Accuweather
Published 12:04 p.m. ET April 27, 2022 | Updated 12:08 p.m. ET April 27, 2022

Today	Tomorrow	10 days
Today Rain	90%	49° 41°
Saturday, 30 Apr Partly cloudy		49° 42°
Sunday, 1 May Cloudy		46° 33°
Monday, 2 May Showers	50%	44° 38°
Tuesday, 3 May Showers	50%	44° 40°
Wednesday, 4 May Showers	50%	46° 41°
Thursday, 5 May Showers	40%	45° 39°
Friday, 6 May Showers	40%	47° 41°
Saturday, 7 May Scattered showers	30%	49° 42°
Sunday, 8 May Scattered showers	30%	49° 42°



Social Networking:

- ❖ This is an era of social networking, which has transformed the way people connect and share information with each other.
- ❖ People are creating their digital identities and transcending the geo-political boundaries to freely interact, share information and develop relationships between organizations to work on common issues.
- ❖ We are working towards adopting a digital presence, democratize the data and gather public support.
- ❖ We are working on compiling information generated through IoT and satellite systems , further curated with hydrological models that can help the digital river information.
- ❖ We have already begun educating and disseminating information among people with priority placed on most vulnerable populations (Ex: Gangi, Guttu, Kopardhar, and Bhilangana area, Uttarakhand).



Climate Change Issues – Building Resilience & Reversal of Global Warming



Khatling Glacier Study



Khatling Glacier Study
April 6-8, 2022

Satellite Imagery: courtesy Google Earth, NOAA
River delineation: Rivers of the world
Foundation
<https://rowfoundation.org>

© 2022 Google
Image Landsat / Copernicus

30°43'14.31" N 78°32'22.59" E elev. 6222 ft eye alt. 70.89 mi

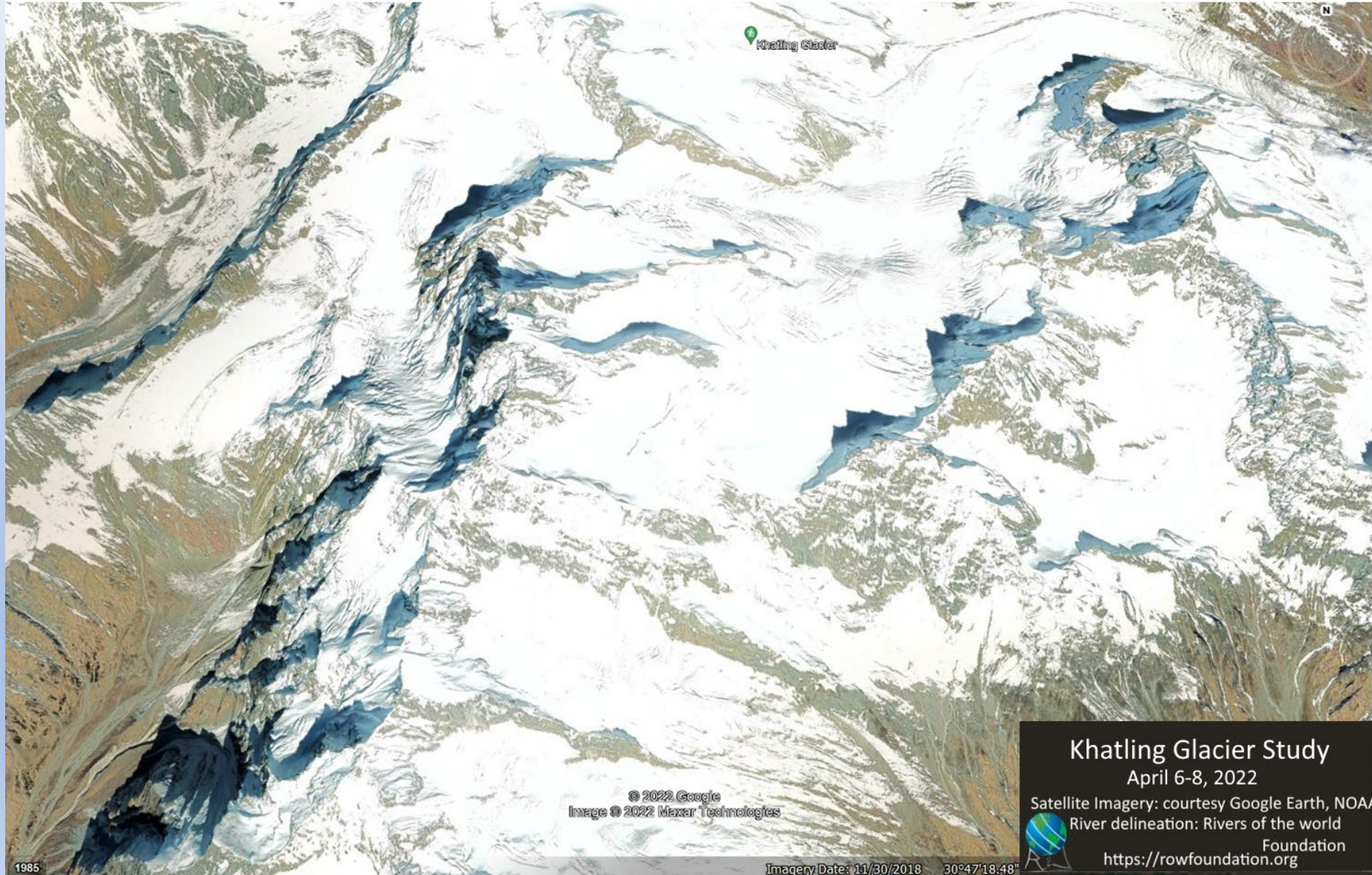


Climate Change Issues – Building Resilience & Reversal of Global Warming





Climate Change Issues – Building Resilience & Reversal of Global Warming



Khatling Glacier

© 2022 Google
Image © 2022 Maxar Technologies

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Climate Change Issues – Building Resilience & Reversal of Global Warming



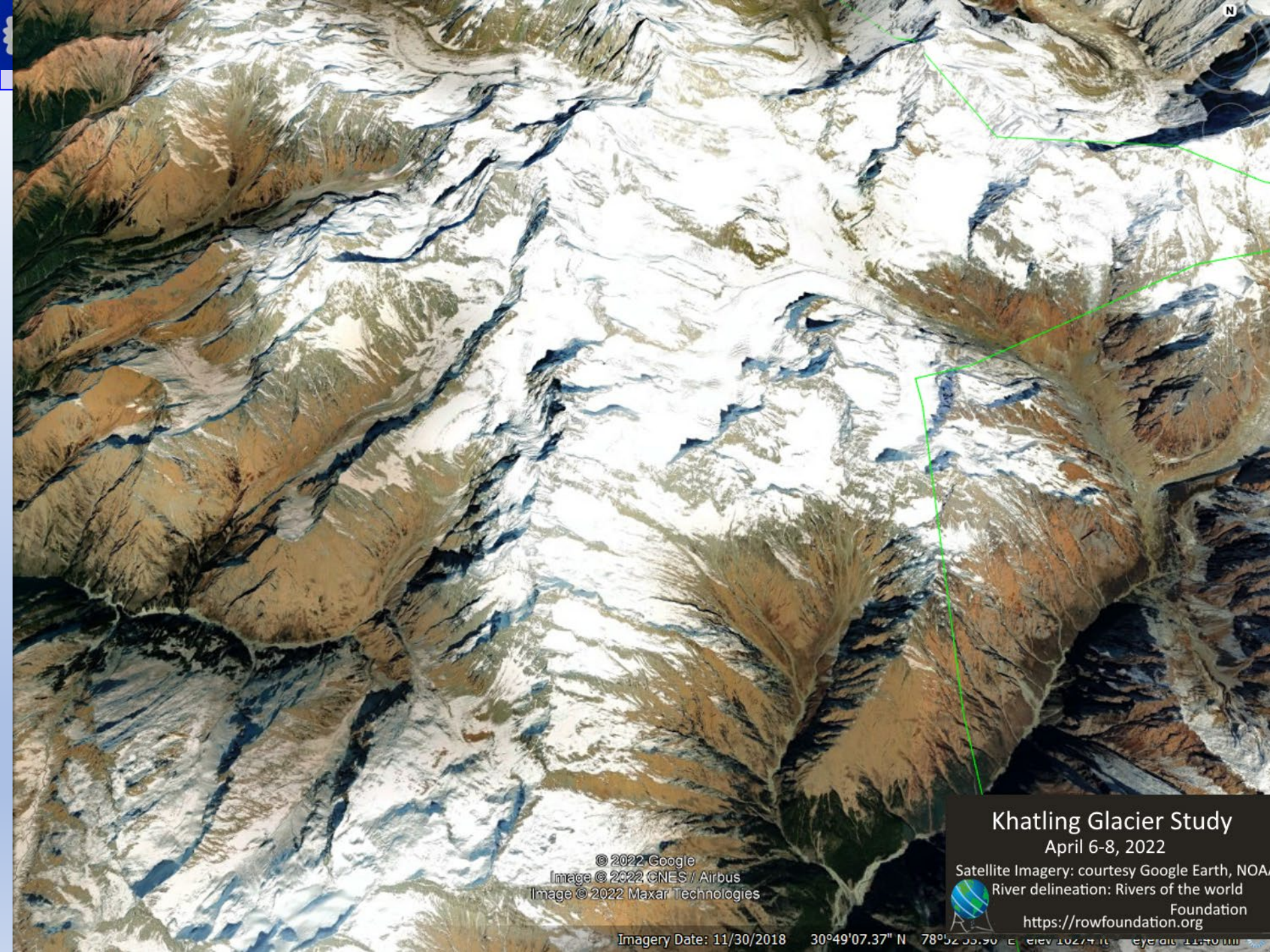
Khatling Glacier

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Image © 2022 Maxar Technologies

Imagery Date: 11/30/2018 30°49'07.37" N 78°52'55.50" E elev 10274 ft Elevation 11780 ft



© 2022 Google
Image © 2022 CNES / Airbus
Image © 2022 Maxar Technologies

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Imagery Date: 11/30/2018

30°49'07.37" N

78°52'33.90" E

elev 10274 ft

eye alt 11300 ft



Bhilangana-River-below-Khatling-Glacirer -WSP#4B ❄️
WSP#4a-Trib-Good-WQ 📍

Image © 2022 Maxar Technologies

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Satellite Imagery: courtesy Google Earth, NOAA

River delineation: Rivers of the world



Foundation

<https://rowfoundation.org>

1985

Imagery Date: 11/30/2018 30°39'41.61" N 78°50'52.01" E elev 8643 ft eye alt 11152 ft

Khatling Glacier Study - Location and WQ Data +		
Study Points	Location Lat/Lon	Remarks/WQ Trest data
Spring-Flow-Water Sampling Point WSP #1	30° 35' 15.18025" N 78° 49' 30.50058" E	Check Dam area TDS: 37 ppm Conductivity: 78 umho/cm Temp.: 22.2 C pH - 6.0
Gangi Village WSP #2	30° 38' 6.7902" N 78° 51' 5.55142" E	Gangi Village - North ~200 ft. aove the end of Vehicular Traffic Elev. 8608 TDS: 28 ppm Cond.: 59 umho/cm Temp.: 20 C pH - 6.0
Gangi-Khatling- bridge- const. WSP #3	30° 38' 32.62074" N 78° 51' 3.69295" E	Elev. 8543 Gangi to base of Khatling midway. Pul (Bridge u/ construction) TDS: 16ppm Conductivity: 34 umho/cm Temp.: 15.4C pH - 6.0
Trib-Good-WQ -WSP#4a	30° 39' 33.94595" N 78° 51' 2.83691" E	WSP #4A 1.0 Tributary of Bhilangana River from West side TDS: 13 ppm Conductivity: 27 umho/cm Temp.: 12.3C pH - 6.5
Bhilangana-below-Khatling - WSP#4B	30° 39' 34.34429" N 78° 51' 4.42919" E	WSP #4B 2.0 Bhilangana from the source Khatling Glacier Elev. 7798 ft. TDS: 27 ppm Conductivity: 58umho/cm Temp.: 14.4 C pH - 6.0.

Impacts on Rivers and Species due to Global Warming

“This comprehensive work will serve working engineers, government regulators, and environmental stewards. The reader will be solidly grounded in a wide range of solutions for environmental remediation. And such solutions will surely continue to be needed for a long time to come.”

John H. Lienhard V, PhD, PE, Massachusetts Institute of Technology, Cambridge, MA, USA

“This book is an excellent practitioner’s guide to a wide range of issues that professionals may encounter with hazardous waste in a variety of environmental situations. [...] The book will also be a very useful resource for students preparing for a career in environmental protection and hazardous waste management.”

William E. Roper, PhD, P.E. Visiting Professor, Johns Hopkins University, Baltimore, Maryland, USA

“In this latest book by Subijoy Dutta, P.E. on municipal, industrial and medical waste management, he has exhaustively dealt with all pertinent issues. Of particular interest to me as a medical practitioner is chapter 14, where special emphasis is placed on COVID-related wastes and their management.”

Dr. Kumar Kanti Das, F.A.C.S, F.R.C.S, Kalyani Hospital, Silchar, India

Environmental Treatment Technologies for Municipal, Industrial and Medical Wastes will provide the reader with a simple and clear path to analyzing the full range of options to manage/treat any solid, hazardous, or medical waste problems/issues at hand.

This book aims to disseminate information on available remediation treatment technologies to developing and developed countries. It will also include adequate information on all available treatment technologies for waste treatment technologies (hazardous, non-hazardous municipal solid waste, and medical waste). The technologies will be grouped into the following categories: Containment Technology; Soil Washing; Thermal Treatment; Vapor Extraction; Bioremediation including Phytoremediation; Plasma/ Incineration; Other Physical/Chemical Treatments.

It enlightens the effect of emissions during remediation activities on climate change and suggests measures to identify and control such emissions. It also covers the application of remote sensing technologies with examples and the impending issue of proper disinfection and disposal of COVID-19-related waste.

Environmental Treatment Technologies for Municipal, Industrial and Medical Wastes
Second Edition

Dutta

Second Edition

Environmental Treatment Technologies for Municipal, Industrial and Medical Wastes

Remedial Scope and Efficacy



Subijoy Dutta

“This comprehensive work will serve working engineers, government regulators, and environmental stewards. The reader will be solidly grounded in a wide range of solutions for environmental remediation. And such solutions will surely continue to be needed for a long time to come.”

John H. Lienhard V, PhD, PE; Massachusetts Institute of Technology, Cambridge, MA, USA

<https://www.snmengineering.com/docs/Environmental-Treatment-Flyer-w-review.pdf>



Effort towards Reversal of Global Warming

An open learning center for Schools and Communities – Can be arranged with a local School or Organization jointly to engage groups of students and communities by arranging day trips to learn about the water and the Impacts of Climate Change. Recent Disasters can be highlighted such as -

- ✚ Global Warming
- ✚ Flood
- ✚ Fire
- ✚ Drought
- ✚ Retreating glaciers
- ✚ Rise in sea level

Demonstrate to students and communities about the importance of protecting water and environment and show what they can do to reverse the trend of global warming to avoid disasters due to climate change.



QUESTIONS?

Please send comments or questions to Subijoy Dutta
snmengineering1@gmail.com