Celebrating 10 years of…

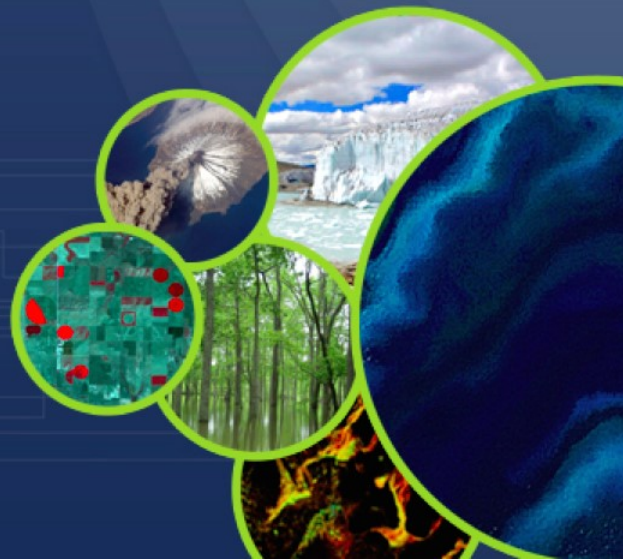
WGCapD

Capacity Building Towards Space Based Flood Disaster Risk Reduction : Indian Experiences from South Asia

Session 3

Addressing global challenges: opportunities to build flood resilience capacity

Prakash Chauhan
Indian Institute of Remote Sensing, ISRO, India



CEOS WGCapD-10 Annual Meeting
Building a Vision for the Next Decade
1-4 March 2021 (virtual)

Capacity Building :Flood-related focus areas

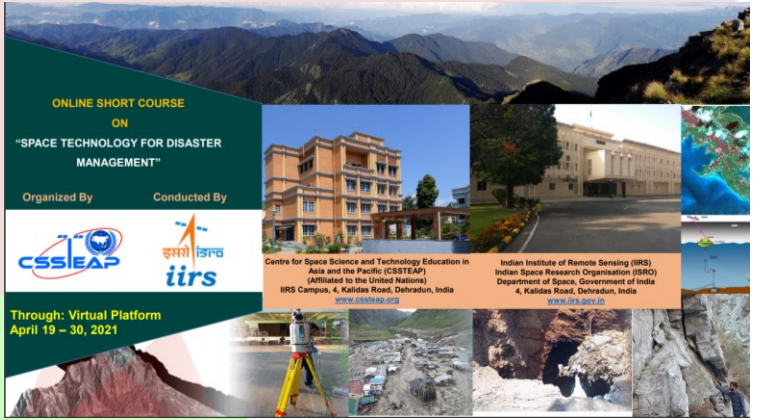
Indian Institute of Remote Sensing, ISRO, Dehradun

- Natural Hazard and Disaster Risk Management (NHDRM): M. Tech & PG Diploma
- Customized courses for Indian Ministries

Centre of Space Science & Technology Education in Asia & Pacific (UN affiliated) Programme:

- RS & GIS courses (Every Year)
- Satellite Meteorology & Global Climate (SATMET) (Alternate Even Year)
- Short courses for SAARC countries : India, Nepal, Bangladesh, Bhutan, Pakistan, Sri Lanka, Afghanistan, Maldives
- Global MOOC on Disaster Risk Management with UNOOSA

  Flood focus talks
- Short courses on "SPACE TECHNOLOGY FOR DISASTER MANAGEMENT"



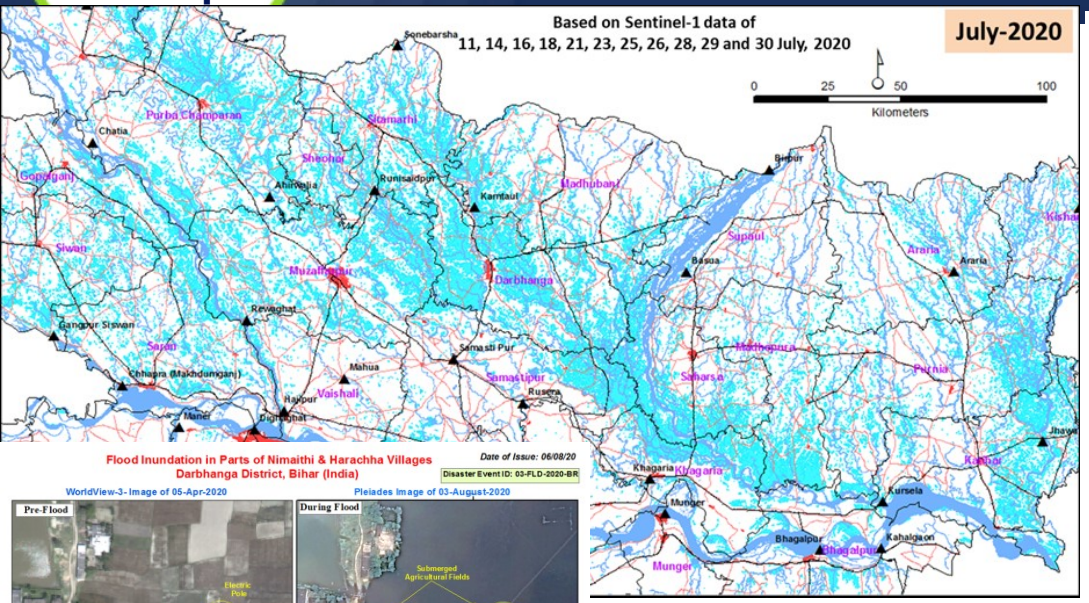
ASEAN-India Space Cooperation Programme:

- PG Diploma & Short courses

Special Capacity Building Programs Focused at Enhancing Flood Disaster Risk Management

Date	Course Name	Organizer	Participants	Mode
May28-June22, 2018,	Disaster risk reduction (DRR) with special emphasis on Floods & Earthquakes	CSSTEAP/ISRO	18 (8 countries)	On Campus
May 20-31, 2019	Disaster Risk Reduction (DRR) with Special Emphasis on Floods and Forest Fires	CSSTEAP/ISRO	23 (5 Countries)	On Campus
July 01 to 12, 2019	Short course on weather Forecasting using Weather Prediction Models	CSSTEAP/ISRO	26 (9 countries)	On Campus
Sept. 17-20, 2019	Application of Remote Sensing in Hydro-meteorological and Geological disasters	CSSTEAP/ISRO	148 (12 Countries)	Webinar/Online
Oct. 13, 2020-Dec 31, 2021	'Geospatial Applications for disaster Risk Management'	UNOOSA & CSSTEAP/ISRO	11892 (148 Countries)	Massive Open Online Course (MOOC) /Online
Feb. 17, 2021	Enhancing Preparedness for Climate Related Disasters Using Space-Based Technologies	SAARC DMC (IU), UN-SPIDER, IWMI and CSSTEAP	63 (8 Countries)	Webinar
Nov. 18-19, 2018	Satellite Remote Sensing of Flood Monitoring and Management	NASA ARSET and IIRS/ISRO		On Campus
July 8-12, 2019	Advances in Remote Sensing and geospatial technologies for Disaster early warning, monitoring and mitigation	IIRS/ISRO Dehradun	958	Distance Learning Program/Online
10-14 February, 2020	Application of UAV/Drone Technology in Disaster Management	IIRS/ISRO	15	On Campus (for NDMA Officials)
Feb. 24- March 13, 2020	Space Based Application of Geospatial Technologies for Disaster Risk Reduction	IIRS/ISRO	1011	Distance Learning Program/Online
Aug. 31-Sept. 04, 2020	Advanced Techniques in Remote Sensing, GIS and Process based modelling for Brahmaputra River Monitoring	IIRS/ISRO	31	On Campus (for CWC Officials)

Recent Space Based Floods Mapping & Monitoring Examples



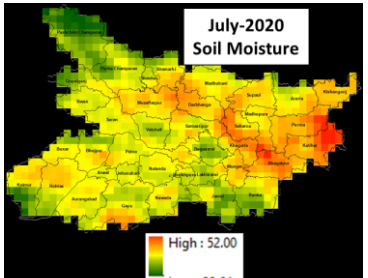
Space Technology Inputs for Flood Early Warning

Data Type/ Category	Satellite Data derived Parameter	Inputs for Flood Early Warning
Soil Conditions	• Surface Soil Moisture	• Antecedent soil moisture conditions • Varying catchment rainfall-runoff response • Soil moisture accounting models
River/Reservoir Water Level	• Altimeter Observations	• River water level • River discharge • Reservoir water level & Storage
Catchment/ Flood Plain Conditions	• Inundated area	• Flood inundation maps • Flood frequency/hazard
	• Surface water	• Surface water spread • Surface water storage
	• Glacial Lakes/Water bodies	• Formation of new lakes/water bodies • Expansion of lakes/water bodies • GLOF risk
	• Flood plain Structures (Embankments, Dykes, Bridges, Culverts, Weirs, …)	• Flood wave propagation • Inundation Simulation • Flood control

Bihar Floods: 2020

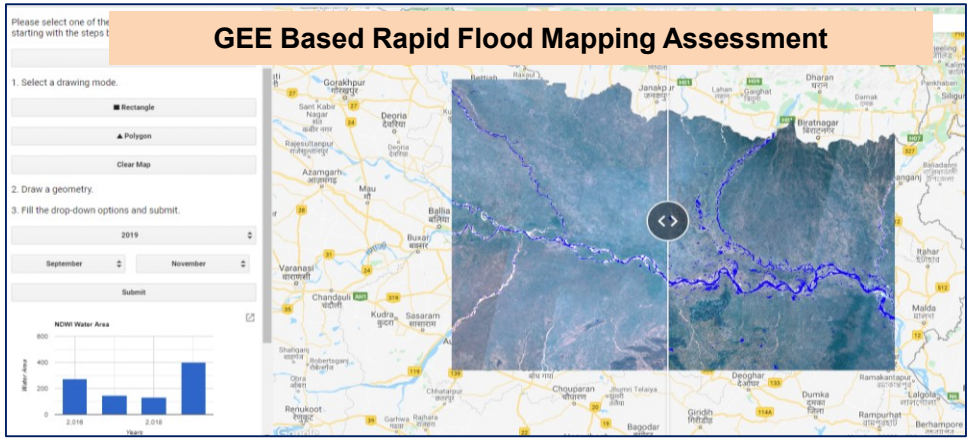
Rapid Satellite Based Assessment of the Event

Bihar State of India were impacted by severe flooding due to extreme precipitation during July, 2020 inundating vast stretches.



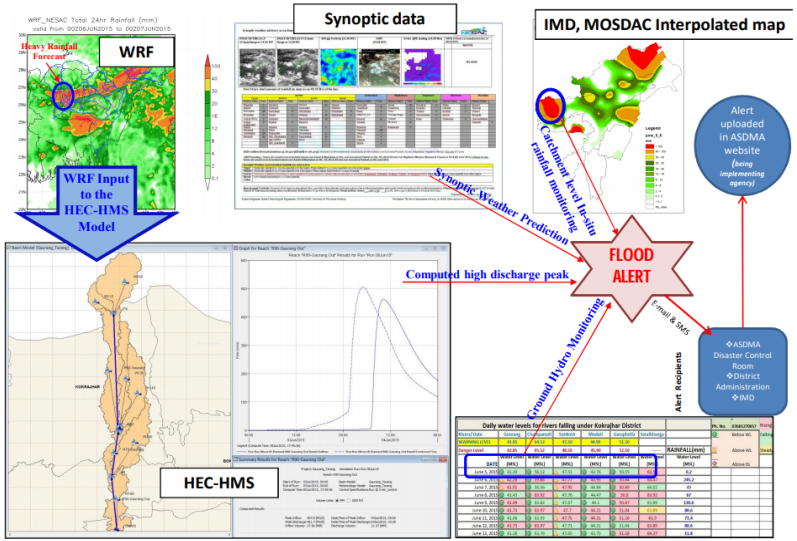
Models, Tools Development for Enhancing Flood Resilience

GEE Based Rapid Flood Mapping Assessment



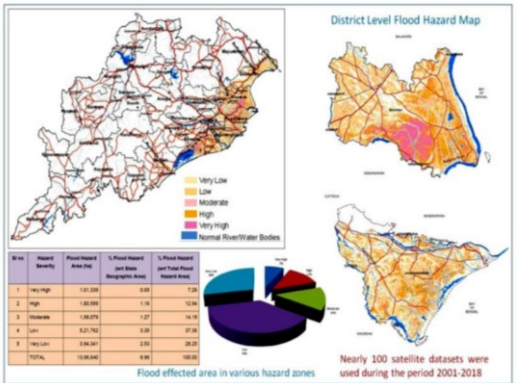
- Flood mapping tool built using GEE which uses Sentinel-1 and Sentinel-2 data for mapping flooded area spatial extent.
- Output is generated in the form of charts as well as satellite images overlaid with a layer of extracted water, which can be swiped.

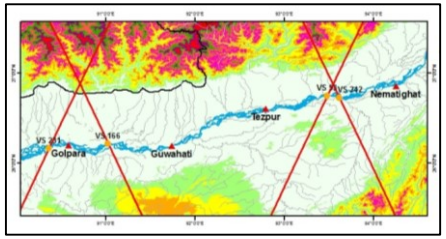
Flood Early Warning System (FLEWS): North East India



Flood Hazard Zonation Map of Odisha

nrsc





Satellite Altimetry for Flood Alerts: Brahmaputra River

Chamoli, Uttarakhand Flash Floods: 7 Feb, 2021

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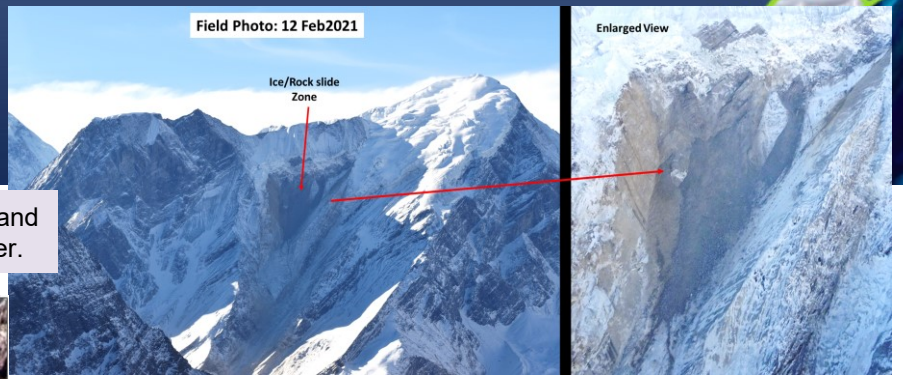
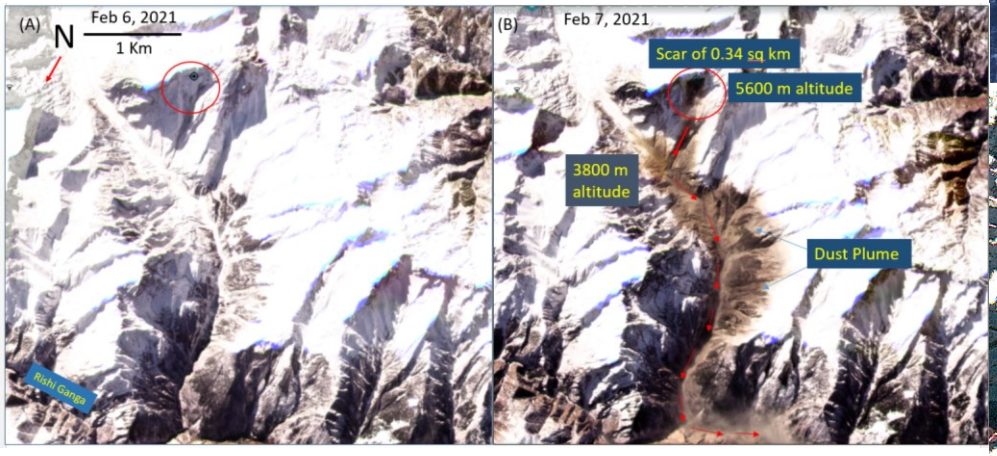
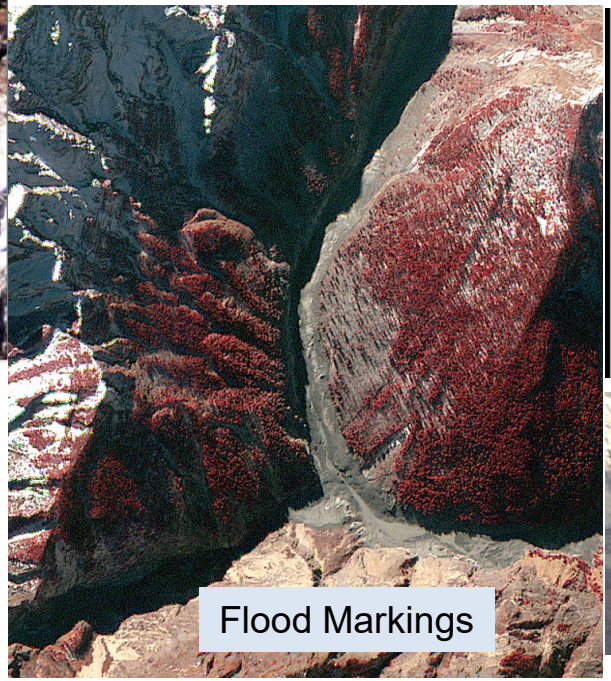
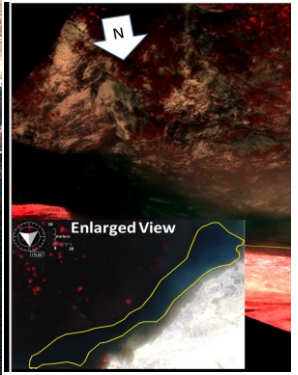
Ice/rock slide flash floods in Rishi Ganga River upper catchment on 07 Feb.2021 and resulted in severe damage in the downstream region of Rishi Ganga/Alaknanda River.

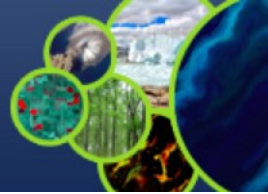






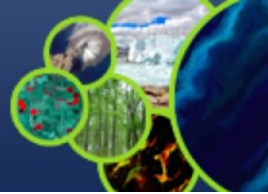


Identifying gaps & synergies



- **Simpler tools** like hydrological and hydraulic models and potential damage evaluation tools are needed for flood risk assessment.
- **Skilled personnel** for running models and interpreting hydrological modelled output demands more capacity building.
- **Analysis Ready & Actionable Products** easily understood and implementable on ground by stakeholders.
- **Addressing Urban Flood Modelling** to be considered in priority.
- **Early Warning** to be strengthened especially for flash flood hazards.
- **Flood Risk Insurance** by transferring risk through space based inputs for the flood hazard affected regions.
- **Impact of climate change** on flooding needs further investigation as highlighted by recent Uttarakhand Flash Floods of 2021.

Practical Next steps for Capacity Building



- Hybrid Mode (Online & In Person) training is to be encouraged for knowledge to be disseminated from experienced resource person globally and to have deeper penetration of the best knowledge and technology among the stake holders.

- Lessons Learnt from each flood event and best practices to be shared among working professionals for improvising upon earlier approaches.

- One single platform “Flood Disaster Dashboard” bringing all information from all agencies at one place (alerts, processing and value added products) for better accessibility and results is needed at regional level.

- WGCapD can play a very effective role in bringing together domain experts and CB tools and best practices to educate younger people for flood resilient society development.

Thank You