



ICIMOD



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November 2022



Earth observation  
for DRR applications  
at ICIMOD

# EO applications in the HKH

ICIMOD established Mountain Environment Regional Information System (MENRIS) in 1990 to promote the use of GIS and RS applications focusing on mountain environments

1990–2000

Introduction to  
Geospatial  
Technology

2000–2010

Transition to Internet-  
based Applications  
and Decision-  
Support Systems

2010–2020

Transformation from  
Applications to  
Services

2020–2030

Converging digital  
innovations and  
institutionalization

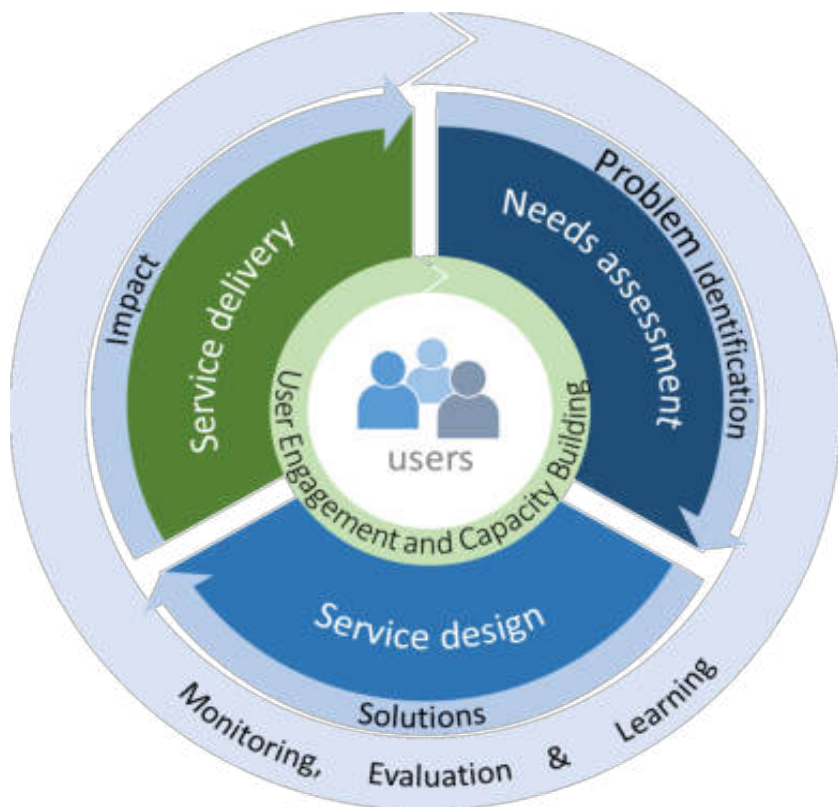
- Capacity building
- Customized solutions
- Regional collaboration

# ICIMOD as a regional hub of SERVIR

**Connecting space to village** through innovative solutions using **Earth observation and Geospatial technologies** to address critical challenges, improve livelihoods and foster self-reliance in Asia, Africa, and the Americas.



# Service planning approach



## Thematic Priorities



Agriculture and food security



LULC and Ecosystems



Water resources and hydro-climatic disasters



Weather and climate

## Major focus

- Build capacity of people and institutions to integrate EO science and technology
- Science and technology innovations/advances to solve development challenges
- Foster strategic collaborations across scales and sectors to achieve sustainable solutions



### LEVERAGING PARTNERSHIPS

SERVIR-HKH engages with its partners in the design, development, and implementation of its solutions. Partnerships increase buy-in related to data sharing and management, and development and adoption standards of practices, while enhancing solution uptake and sustained scaling up of services.



### ENHANCING INSTITUTIONAL CAPACITIES

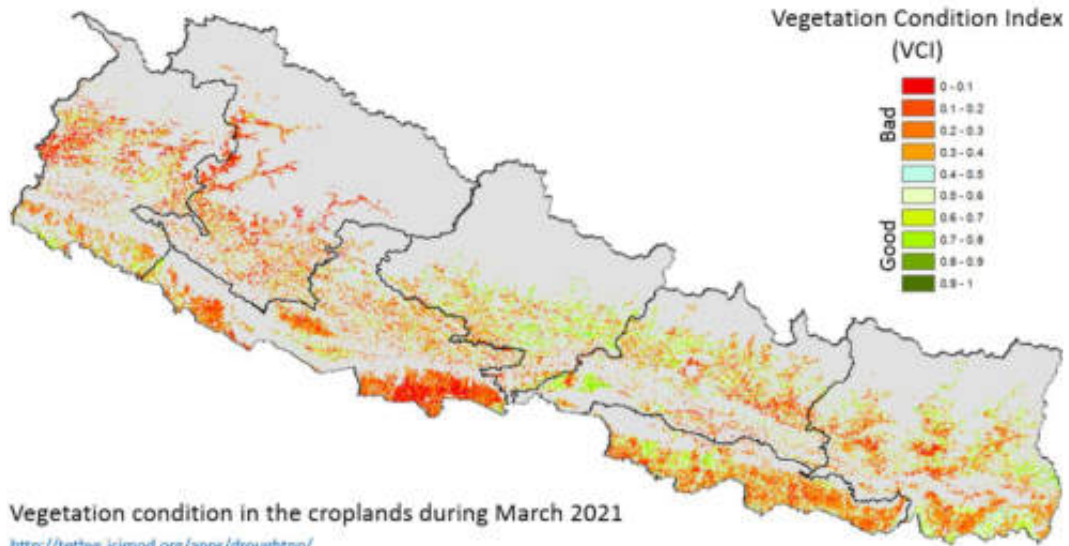
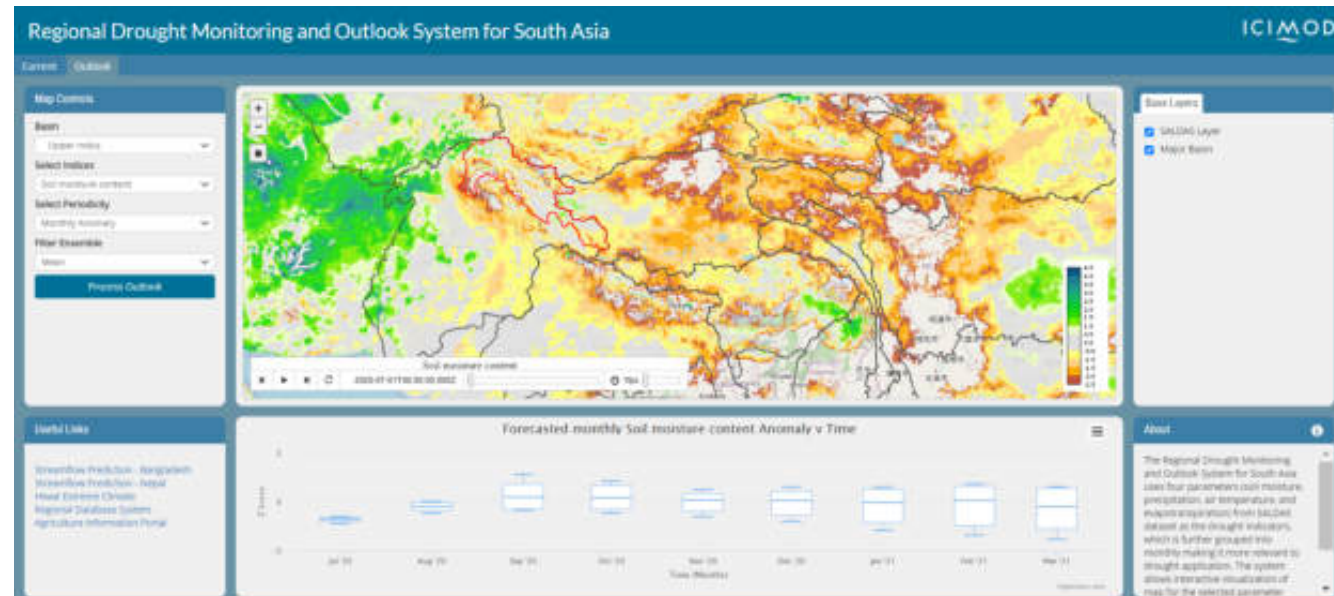
Capacity-building activities help maximize the benefits of Earth observation and geospatial technology in the region. SERVIR-HKH provides technical support, conducts customized trainings, and shares opportunities according to the needs of its regional partners.



### INTEGRATING GENDER AND YOUTH

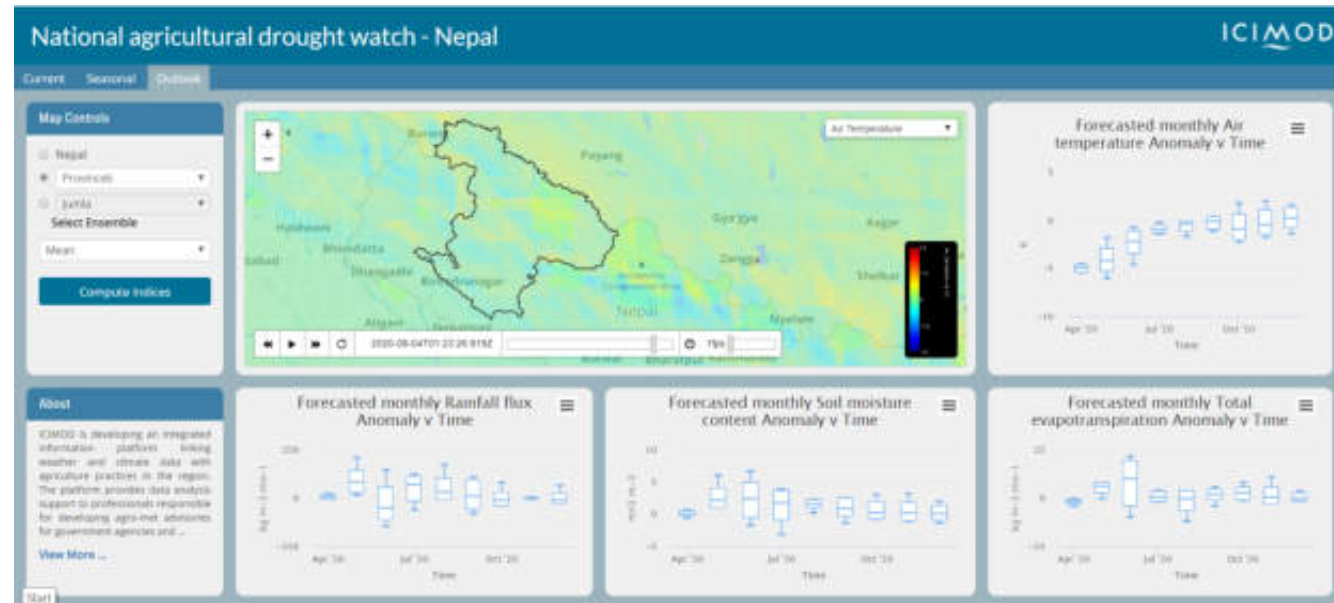
SERVIR-HKH supports the integration of gender concerns in its design and implementation as well as in the monitoring and evaluation processes across its services. Through university-level exchanges, internships, and hackathons, the Initiative engages young people in geospatial science applications.

# Drought monitoring and early warning



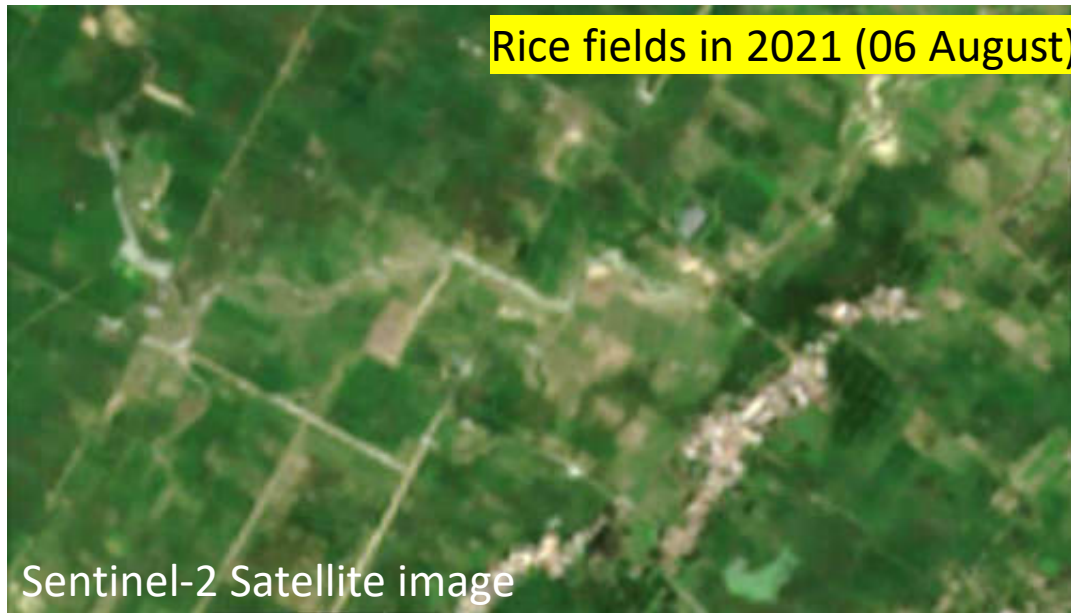
Vegetation condition in the croplands during March 2021

<http://tethys.icimod.org/apps/droughtnpl/>



# Rice crop plantation loss in Banke and Bardiya districts under ongoing drought conditions

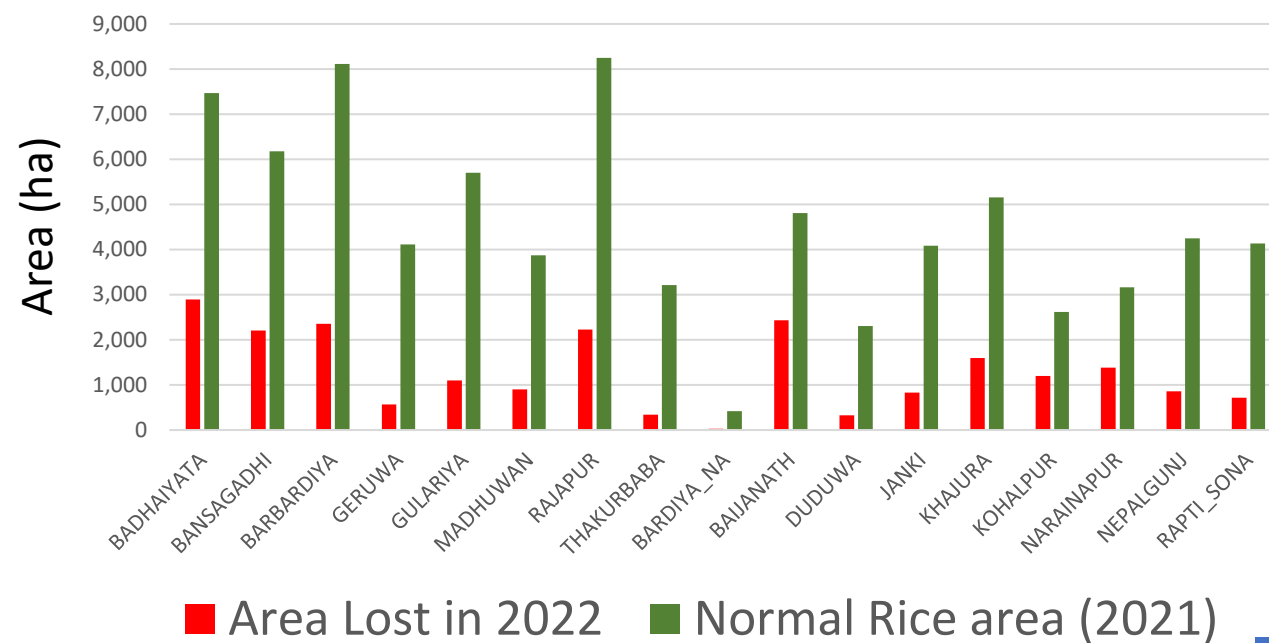
Rice fields in 2021 (06 August)



Rice fields in 2022 (11 August)



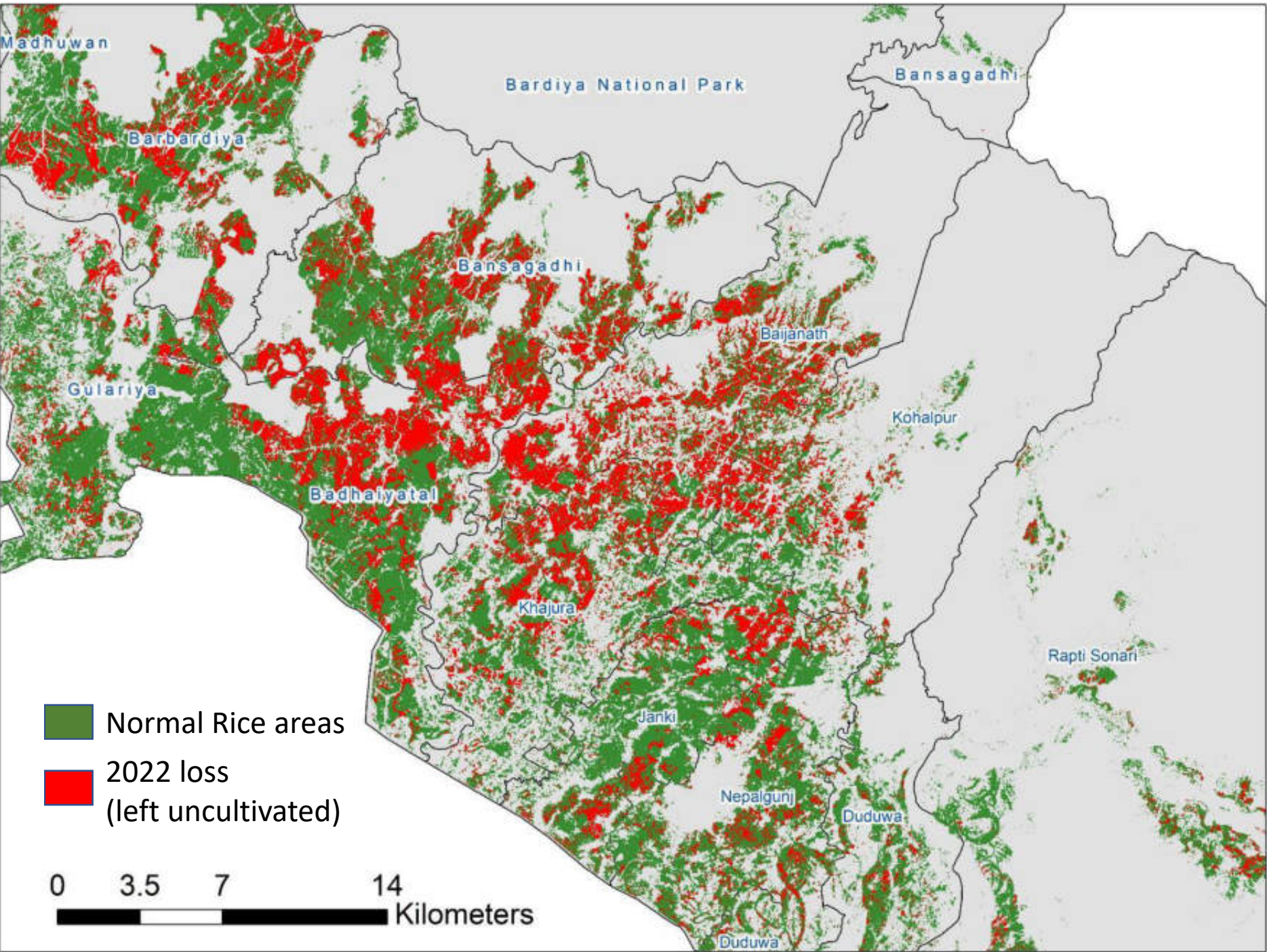
Satellite image based assessment of Banke and Bardiya districts shows that at least 30% of the area which was being cultivated in recent years is left uncultivated (fallow) this year due to lack of water at the transplantation stage.



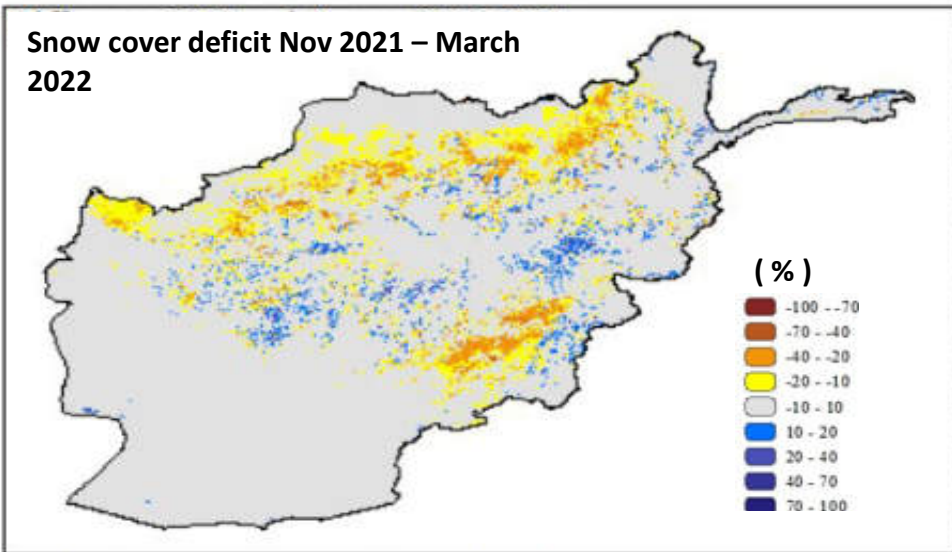
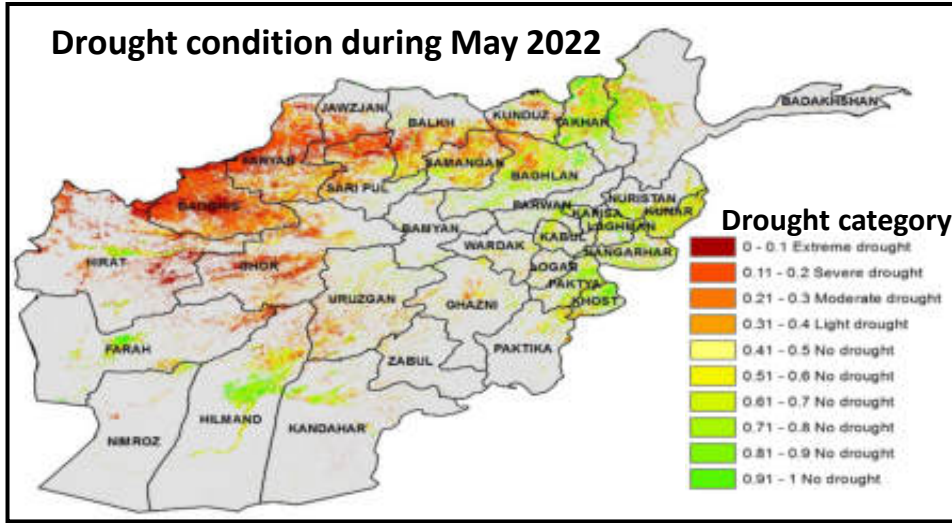
Palika wise crop area loss as of 11 August 2022



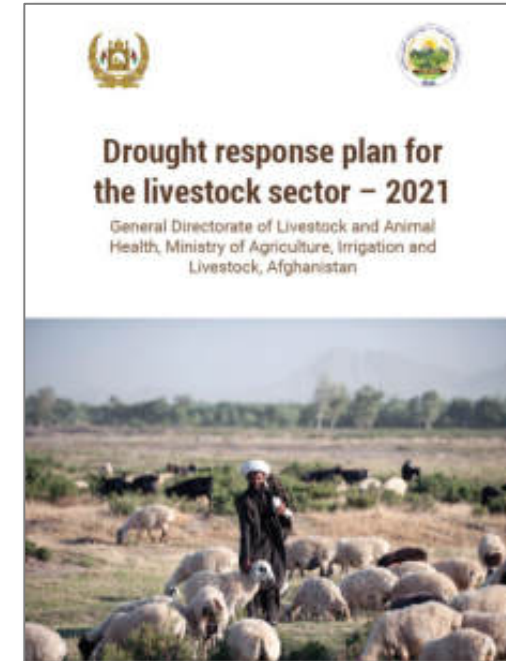
Satellite based identification of rice crop areas left fallow this year.



# Use of drought service by humanitarian aid agencies for anticipatory actions in Afghanistan



Aga Khan Agency for Habitat

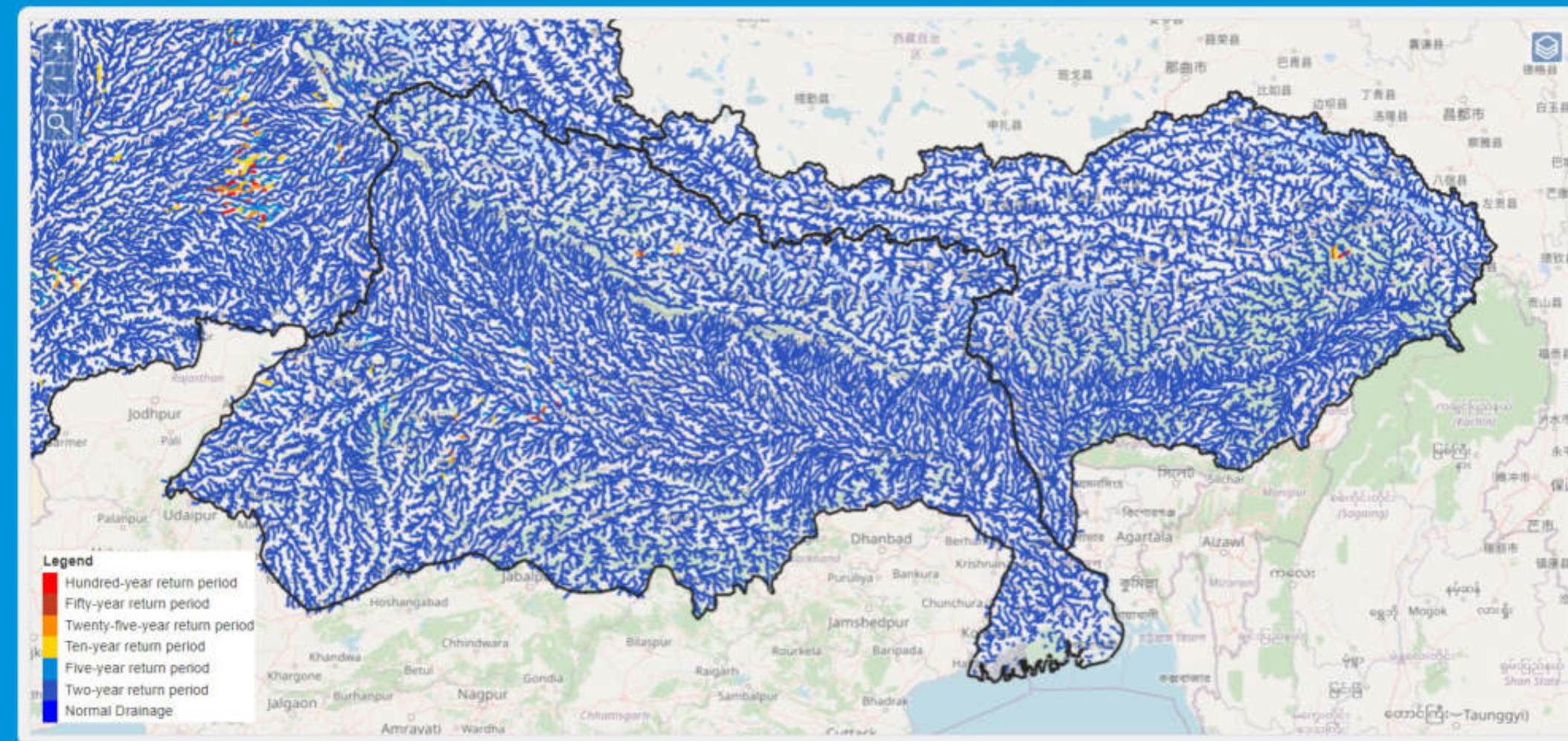




# Improving flood forecasting and early warning

## Streamflow Prediction Tool - HKH river basins

ICIMOD



### Layers

- Amu Darya
- Brahmaputra
- Ganges
- Indus

### About Streamflow Prediction Tool

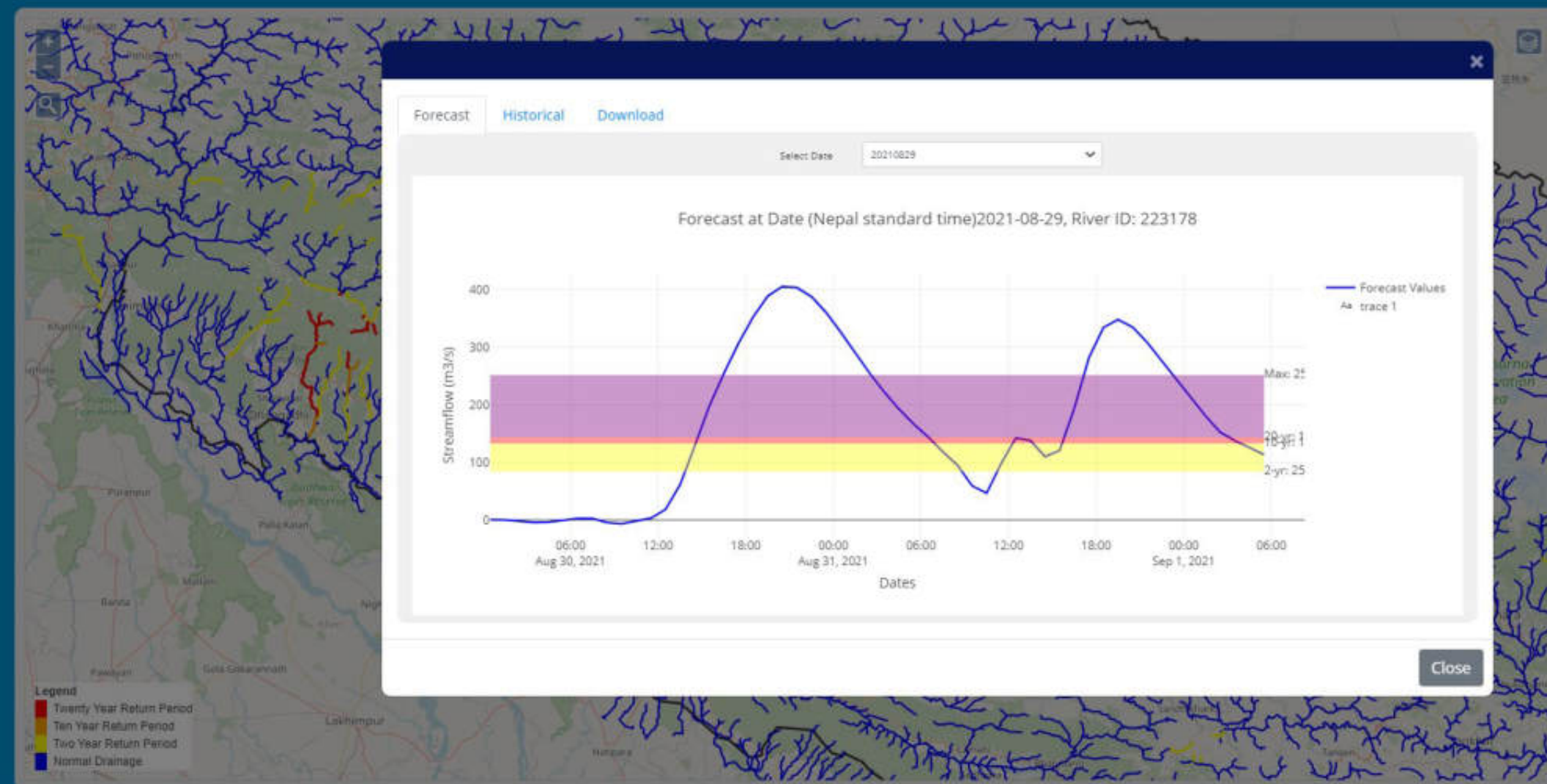
#### Description:

The Streamflow Prediction Tool for the HKH river basins provides 10-day streamflow forecasts for major rivers within the Amu Darya, Brahmaputra, Ganges and Indus basins in the Hindu

# Improving flood forecasting and early warning

HIWAT Streamflow Prediction Tool - Nepal

ICIMOD



Layers

- Outline
- District
- River Names
- Station Names
- HIWAT Rivers Nepal

Select District  
Achham

Select River  
Achhariya Nala

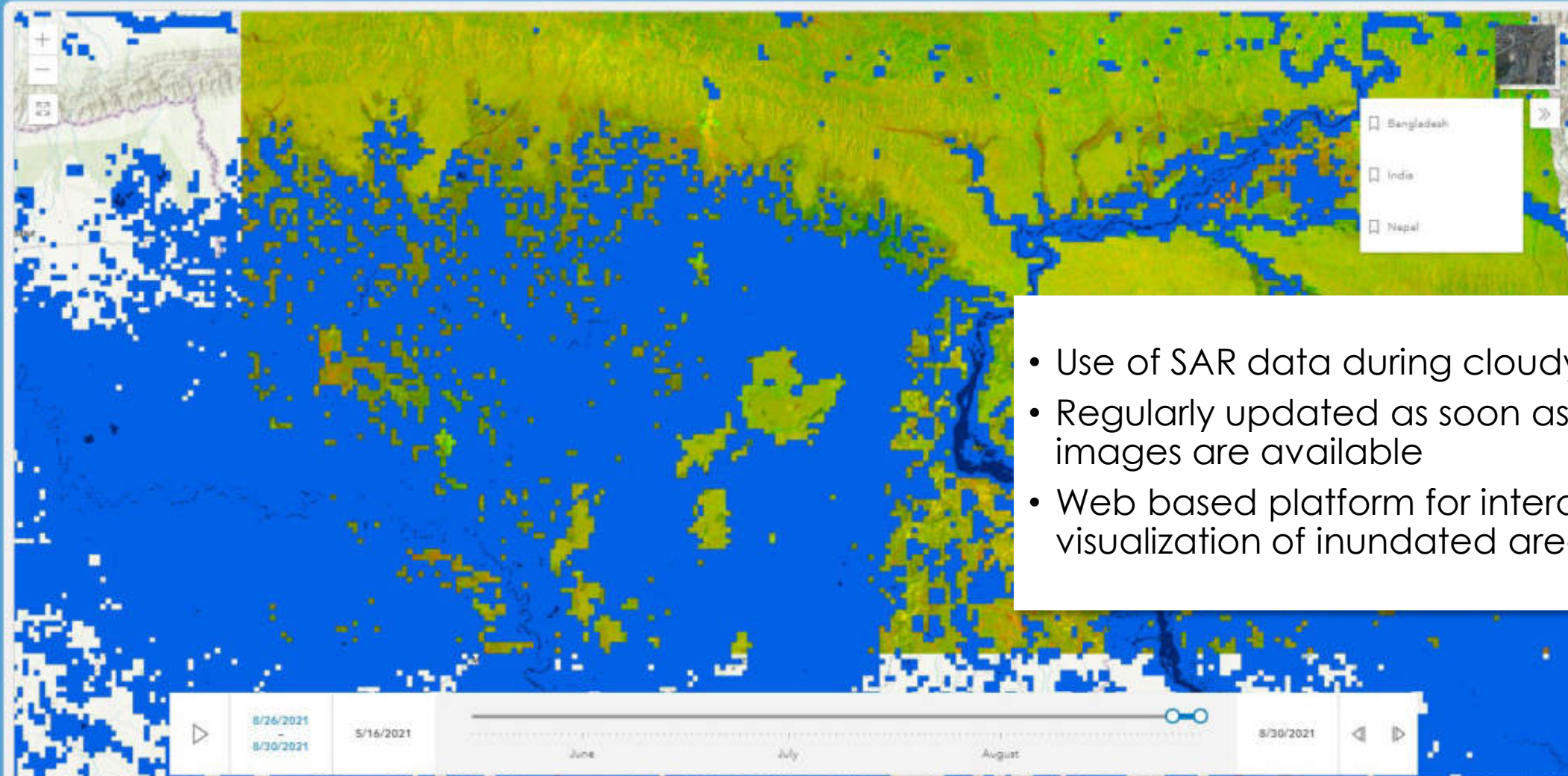
About Streamflow Prediction

Description:  
The Streamflow prediction application is the collection of river network created within specific countries which has the unique ID which then is connected to the database to have the 48-hours forecast. The user can interact by clicking this river network. This application can be a part of a DSS tool for flood forecasting and give an early warning system to the user.

# Flood inundation monitoring

Flood Inundation 2021

ICIMOD



**Layers**

- Flood Extent
- Perennial Waterbodies
- RGB Layer

View More...

- Use of SAR data during cloudy season
- Regularly updated as soon as new images are available
- Web based platform for interactive visualization of inundated area

the Hindu Kush  
season. Timely and  
stant for efficient  
and effective management of reservoirs.

# Pakistan floods 2022

## Rapid assessment of crop loss in Sindh province

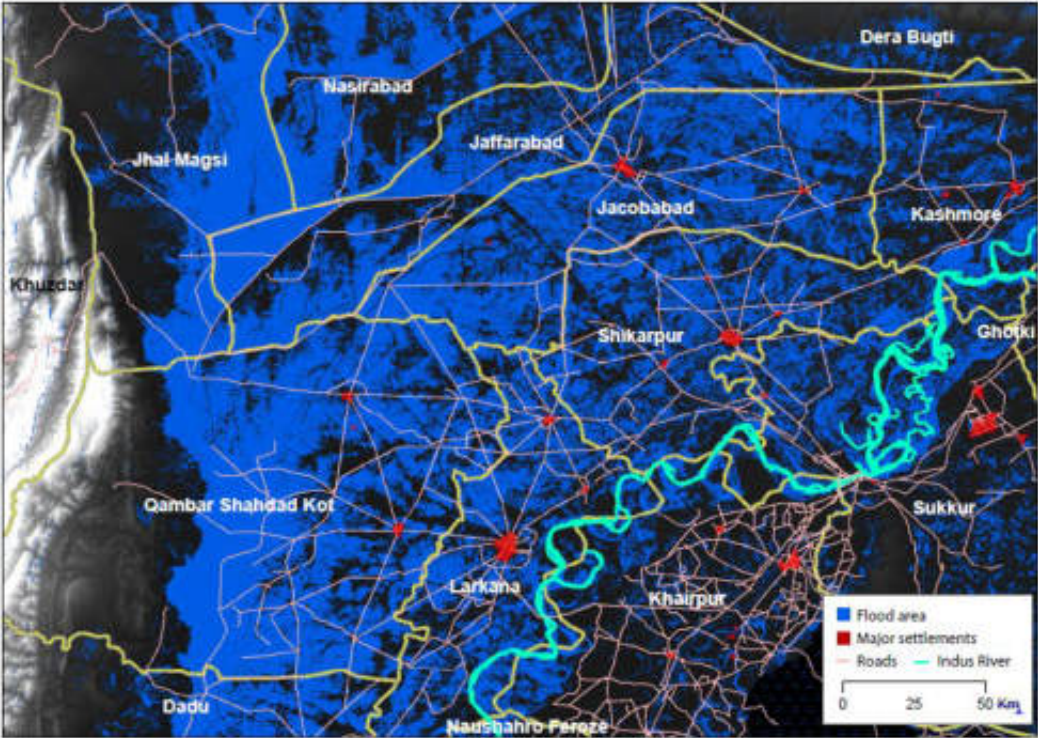


Figure 6: Flood water extent, derived from satellite data, across the largest rice crop zone in Sindh Province (blue indicates water and red indicates major settlements of the district)

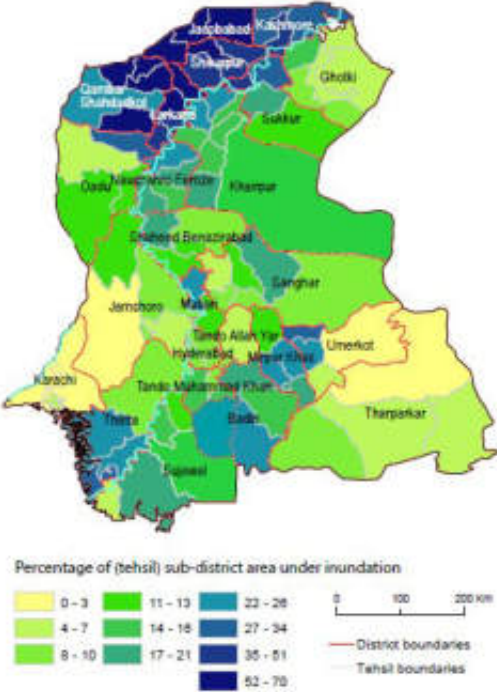


Figure 7: Flood intensity across Sindh Province aggregated at the subdistrict (tehsil) level

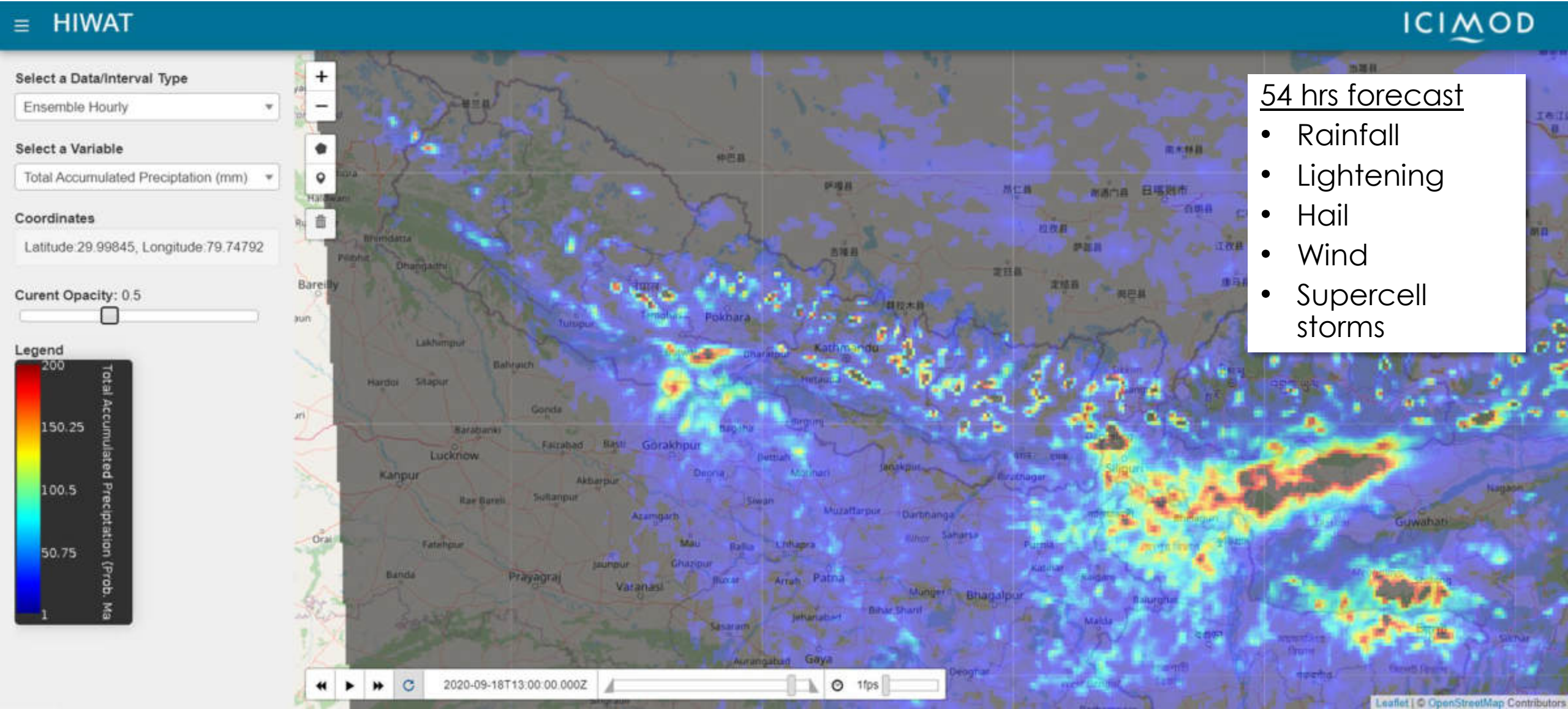


FLOODED FIELD IN MIRPUR MATHIELD, GHOTKI DISTRICT (2022)

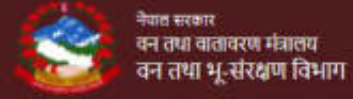


# Weather and climate

High Impact Weather Assessment Tool (HIWAT)



# Forest fire monitoring system



## वन डढेलो पहिचान तथा अनुगमन प्रणाली

Login English

### वन डढेलो

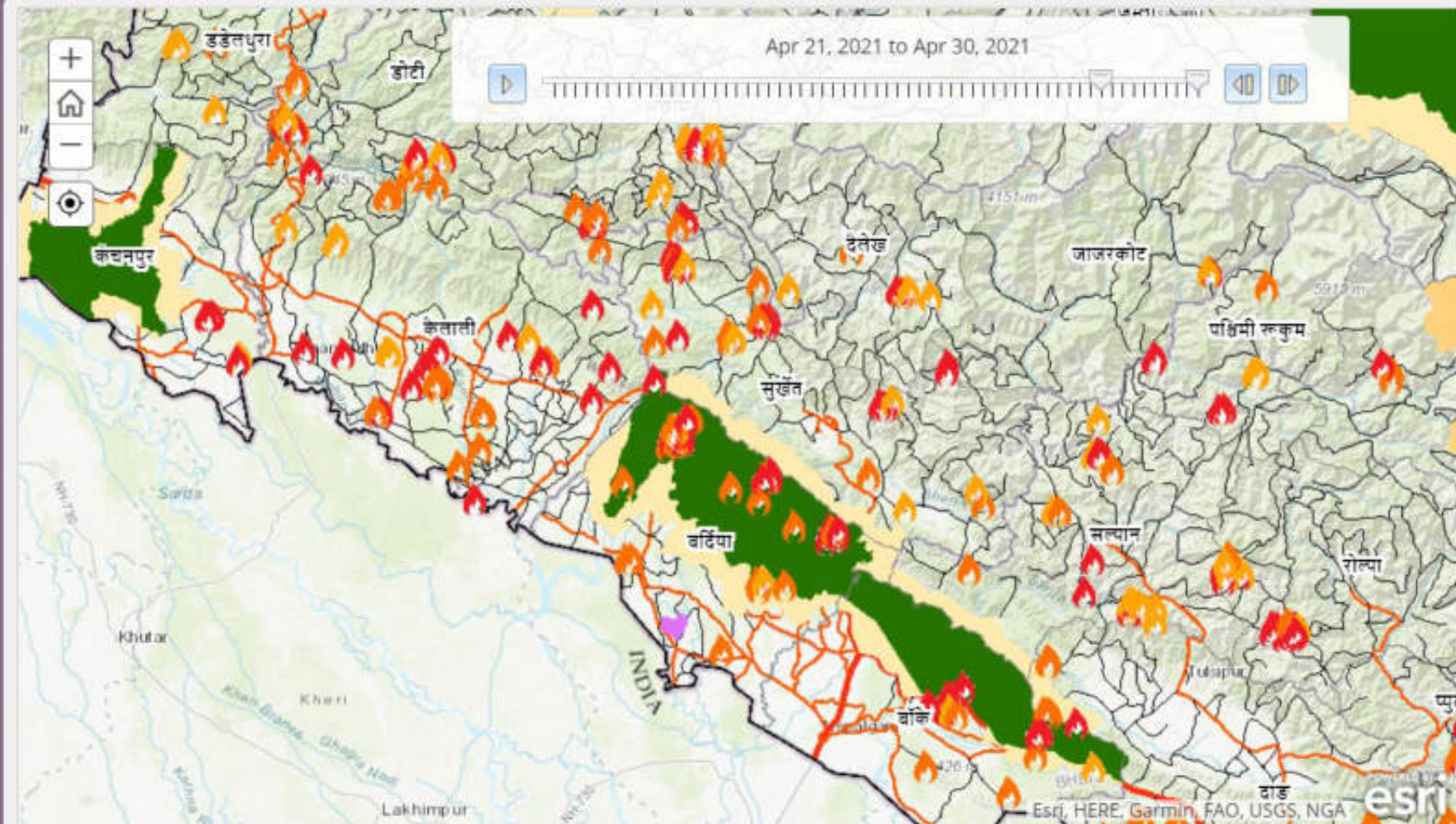
नेपाल  
 प्रदेश  
प्रदेश-१  
 जिल्ला  
अछाम  
 संरक्षित क्षेत्र  
संपूर्ण संरक्षित क्षेत्र  
सुरु मिति: 3/1/2021  
अन्त्य मिति: 4/30/2021

नक्सामा देखाउनुस्

टेबलमा देखाउनुस्

### डढेलो तथ्याङ्क (मोडिस) ४३२

जिल्ला	संख्या
अछाम	१७
अर्घाखाँची	१३
बाग्लुङ	२
बैतडी	५



### तह सङ्केत आधार नक्सा

- देश रेखांकन
- प्रदेश
- जिल्ला
- जिल्लाको नाम
- गाउँपालिका/नगरपालिका
- डिभिजन
- सब-डिभिजन
- वडा
- विमानस्थल
- बस्ती
- सडक
- संरक्षित क्षेत्र
- संरक्षित क्षेत्रको नाम
- वन डढेलो (मोडिस)

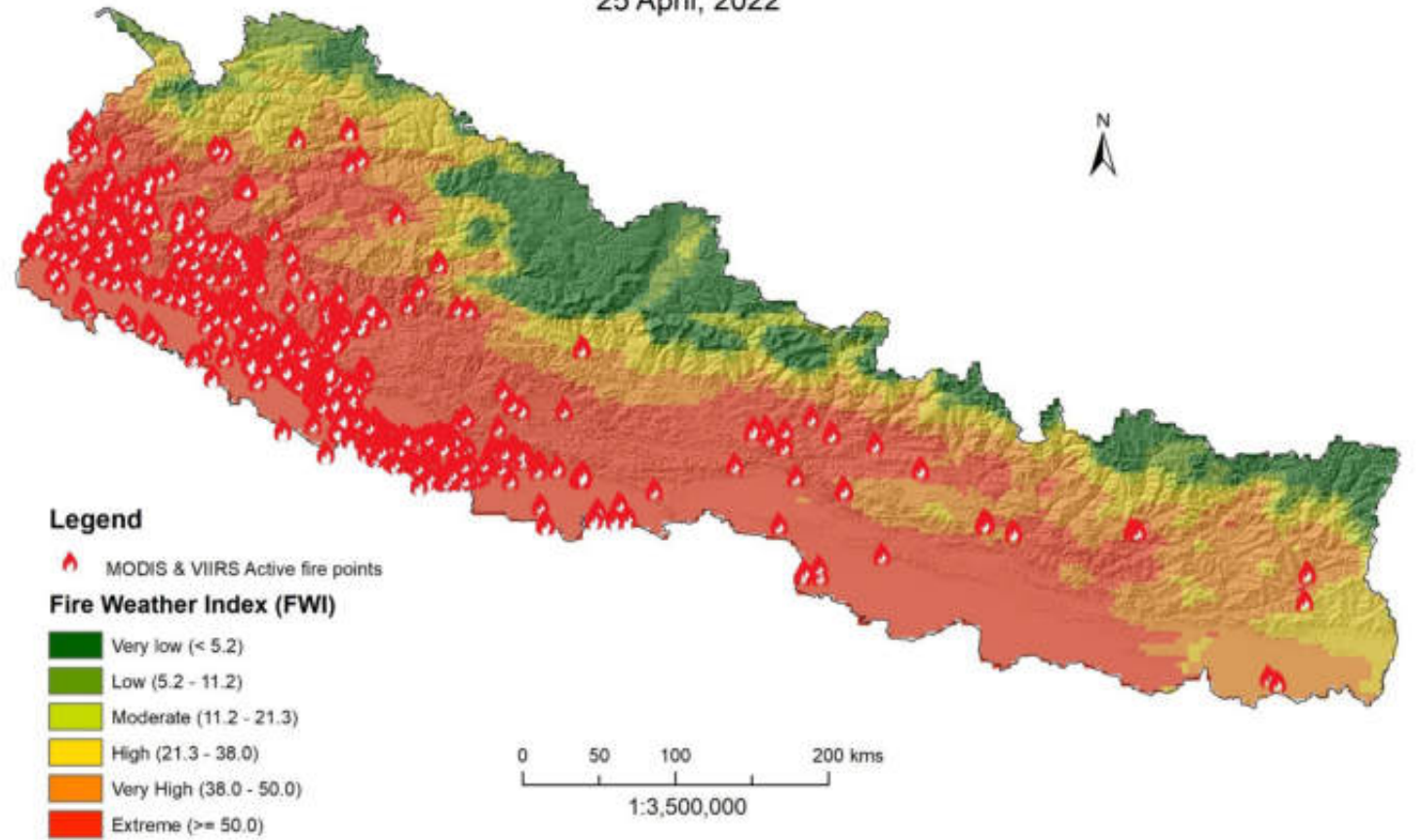
### हाम्रो बारे

यो सूचना प्रणाली वन तथा भू-संरक्षण विभाग (DoFSC), वन तथा वातावरण मन्त्रालय (MoFE), नेपाल सरकार र अन्तर्राष्ट्रिय एकीकृत पर्वतीय विकास केन्द्र (ICIMOD) काठमाडौं द्वारा संयुक्त रूपमा विकास गरिएको हो।

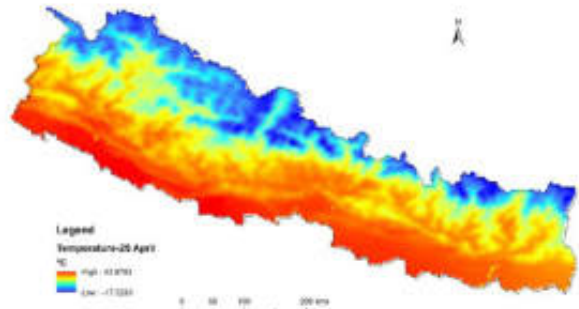
यो प्रविधिकले नेपालभर विगतमा भएका तथा तत्काल आगलागीका घटनाहरूको

# Fire Weather Index

25 April, 2022



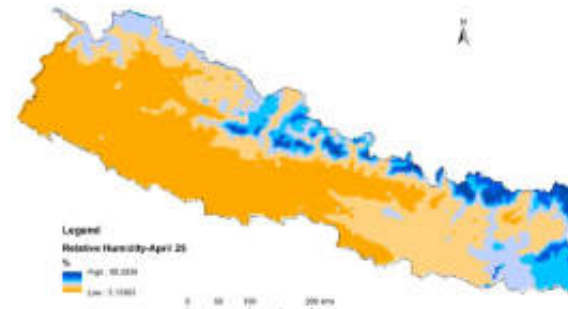
MODIS and VIIRS fire incidents overlaid on 24 hour FWI forecast derived from HIWAT



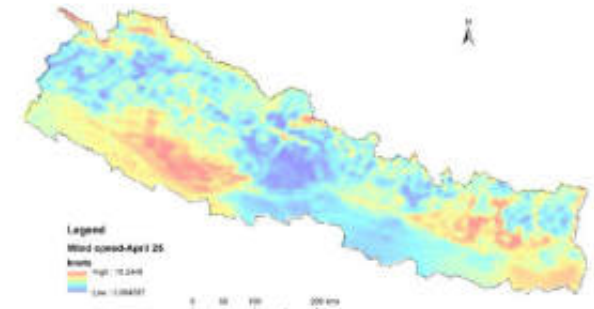
Temperature



Precipitation



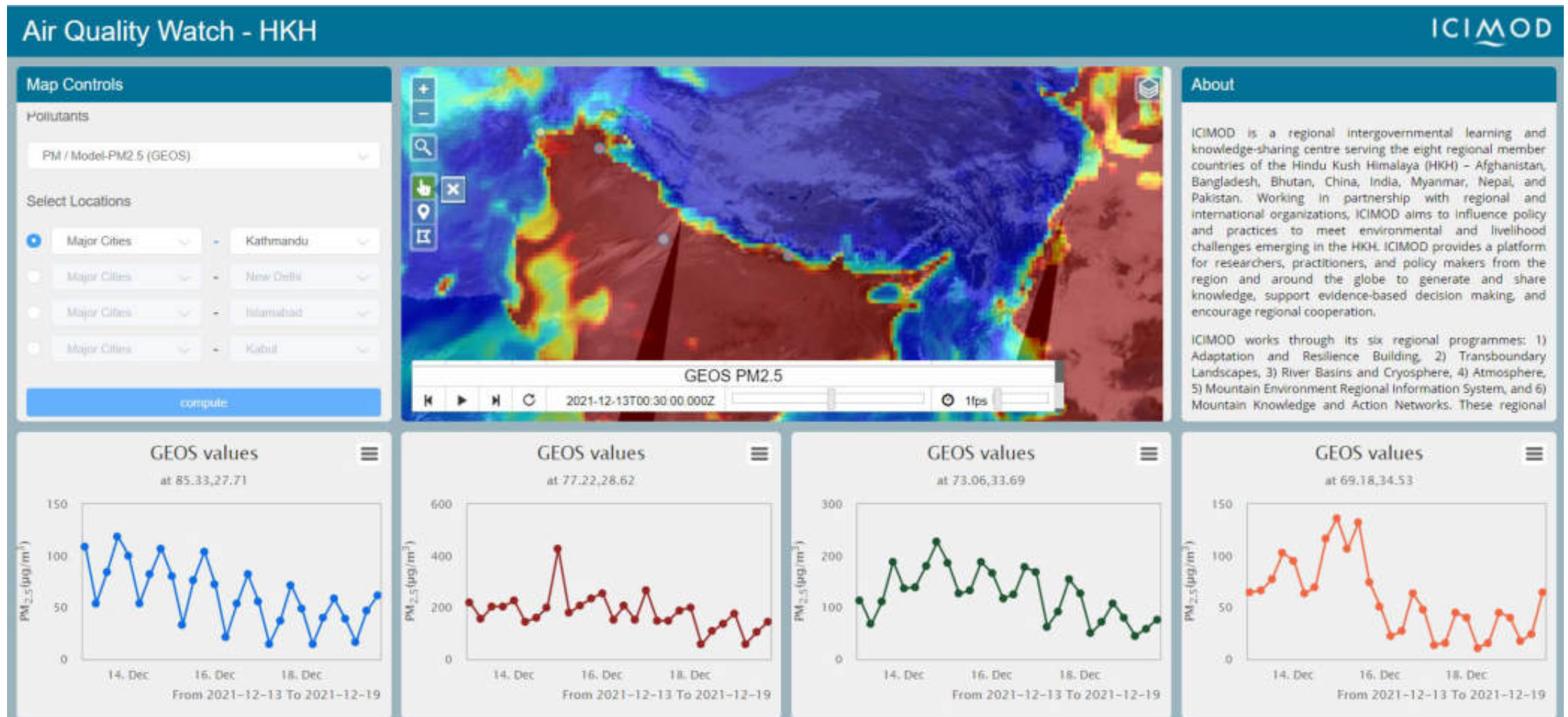
Relative humidity



Wind speed

# Air quality monitoring

Innovative air quality products using models, satellite data, and monitoring stations for dust, AOD and trace gases

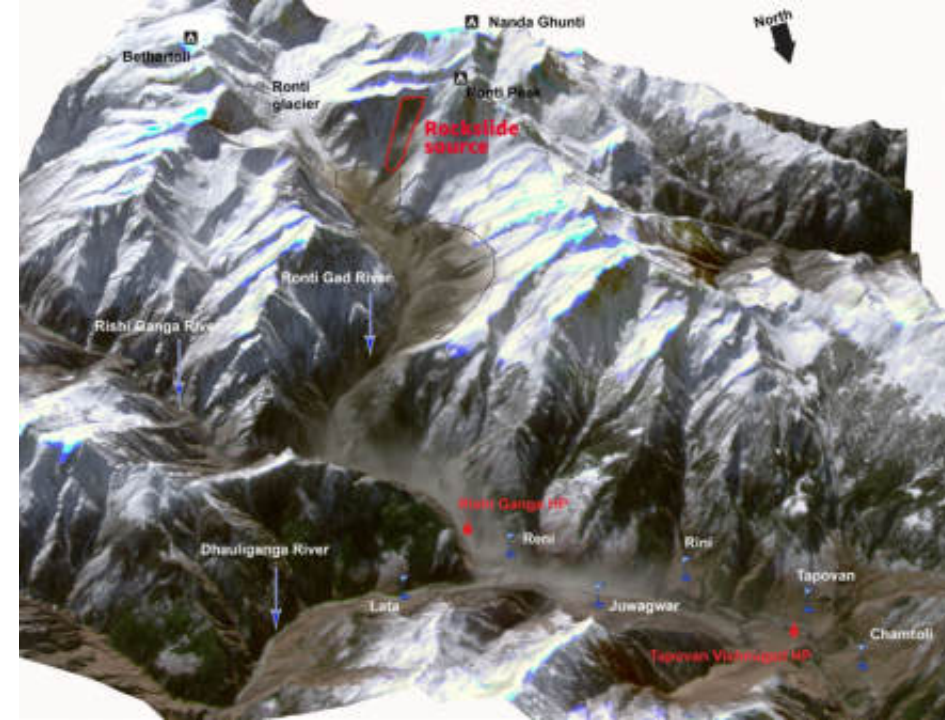




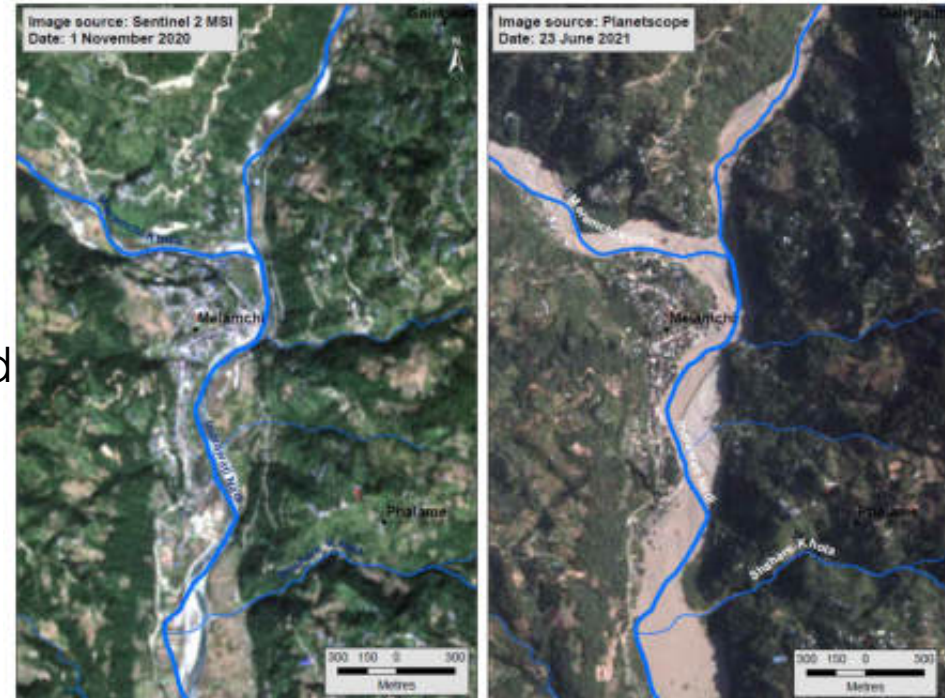
# Landslide mapping and forecasting

- Landslides are a major natural hazard occurring together as cascading disaster
- Limited open access information on historical landslides, land surface characteristics, vulnerability, and rainfall – variables which are essential for effectively characterizing landslide hazards

Chamoli flood



Melamchi flood



# Landslide mapping and forecasting

## Landslide Mapping System

Generate event-based dated landslide inventories

(SALaD/U-net) on the cloud

PlanetScope, Sentinel 2 and other available satellite imageries.

## Landslide Forecast System

Geology/lithology, Faults, Drainage, Morphology

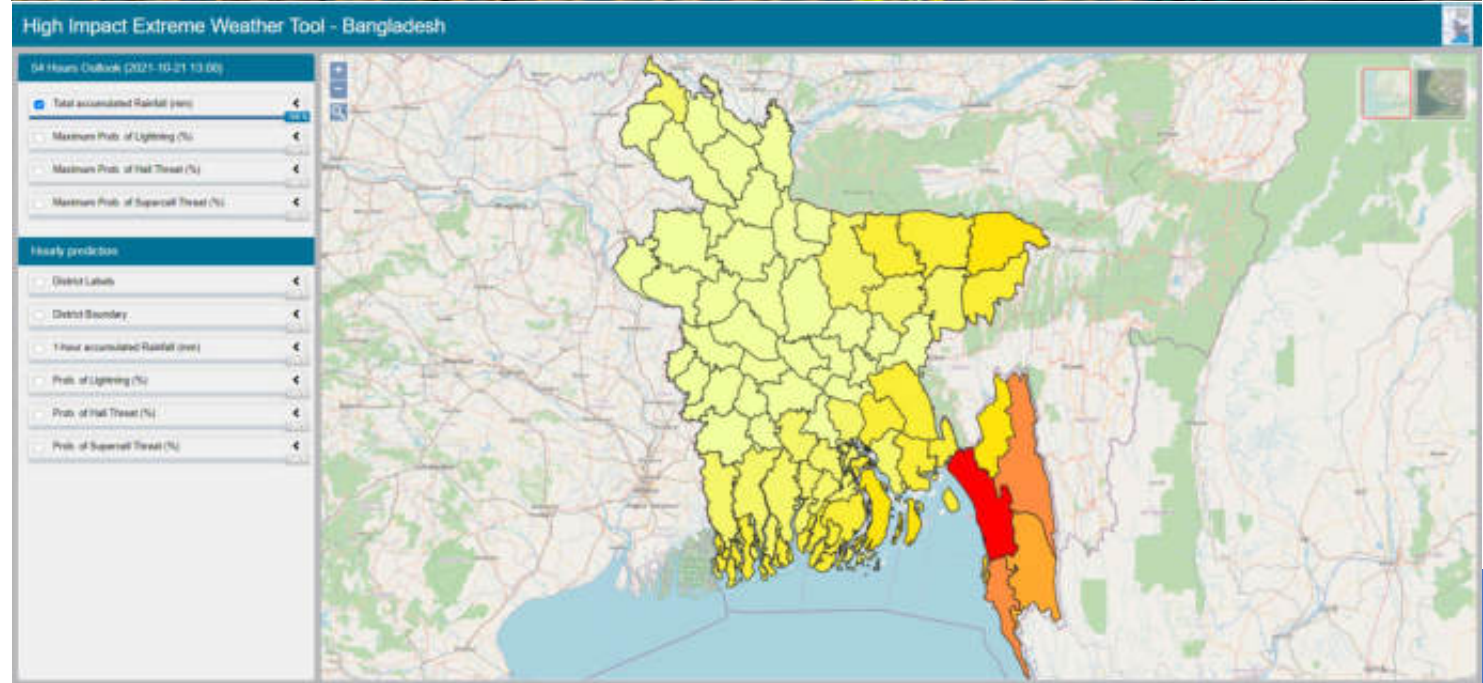
HiWAT, IMERG, GPM, SMAP



Landslides between Manma and Jumla section directly impacting the Karnali highway – mapped using recent Planet imagery and SALaD-CD

# Adoption by national partner

Launching of HIWAT at Bangladesh Meteorological Department (BMD)  
29 March 2022



# Localization of Early Warning System

- Partnership with Practical Action – EWS strategies for Karnali and Far West provinces; customization of HIWAT and Streamflow applications
- Partnership with Red Cross (Danish, Finnish and Nepal) for adoption at municipal levels
- Partnership with APF Disaster Training Center for adoption in regular curriculum
- Local level awareness with FFWC, Bangladesh



# Institutional capacity building

- co-development
- on-the-job trainings
- Training of Trainers



Training for REDD IC, April 2021



Training for Armed Police Force, 31 Aug 2021

# Enhancement of ICIMOD's GIT Infrastructure

- 2 servers for RDS and Information Systems
- 1 server for ERP mirroring
- 1 server for virtual machines for thematic staff members
- 1 GPU server for machine learning and artificial intelligence work
- 200 TB SAN storage
- 200 TB NAS storage



# Conclusion

- The recent advancements in Earth observation, Geospatial technologies and digital solutions provide unprecedented opportunities for timely and accurate assessments and monitoring
- Localization and capacity building are key to benefit the real user communities

**Thank you**

