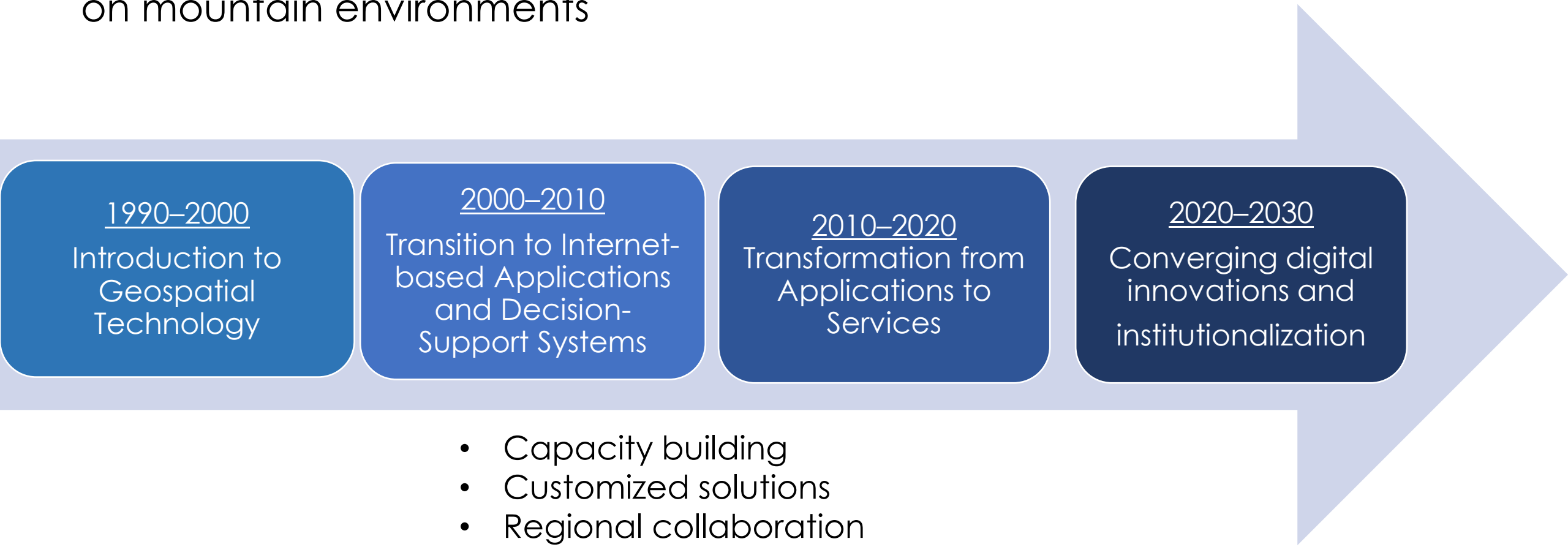
Earth observation for DRR applications at ICIMOD

Birendra Bajracharya

November 2022

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

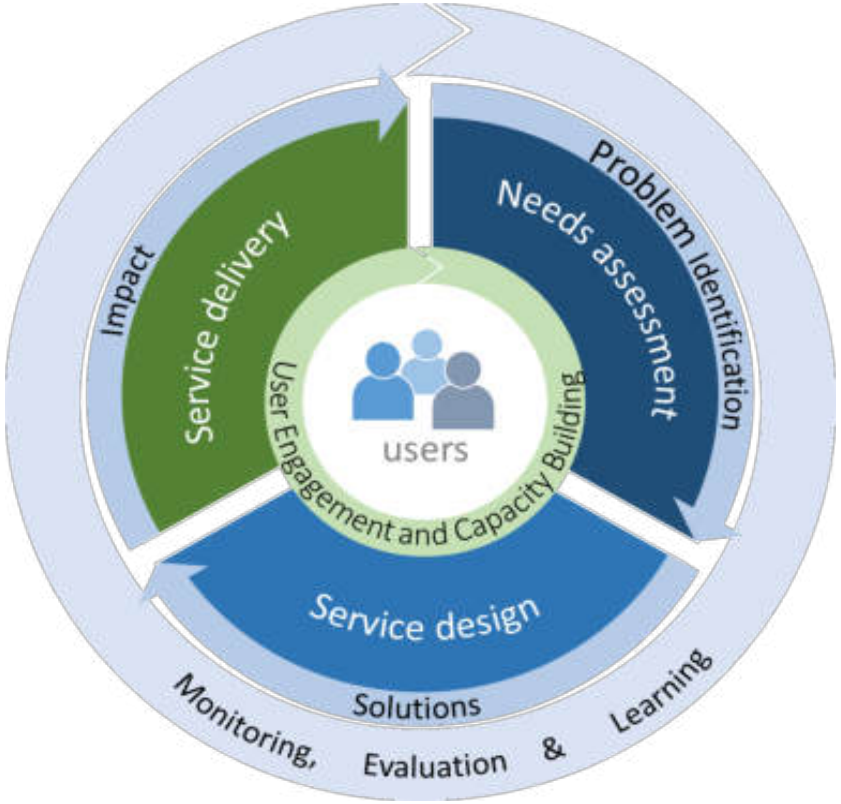


- Capacity building
- Customized solutions
- Regional collaboration

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



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.

Thematic Priorities

Agriculture and food security

LULC and Ecosystems

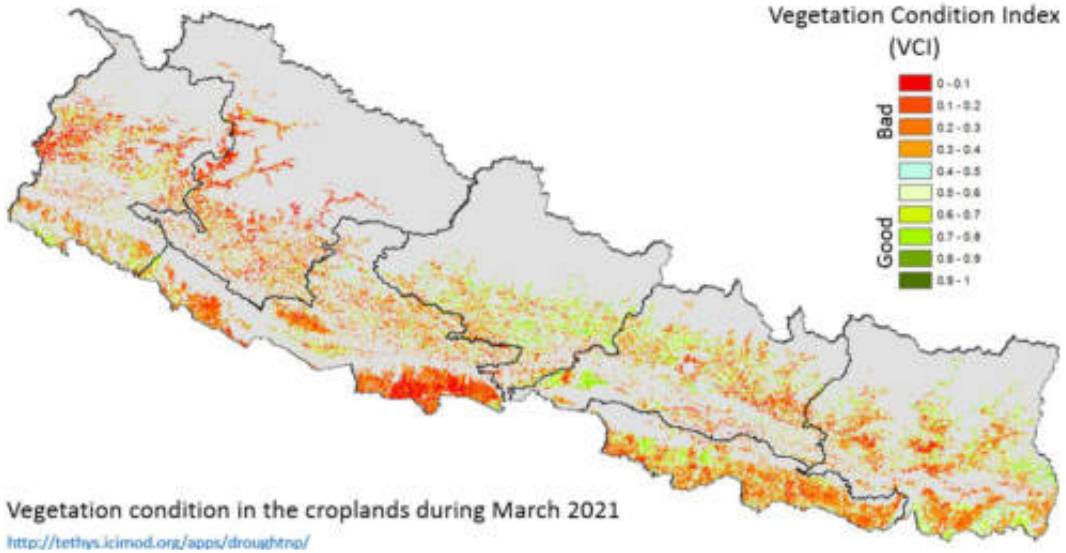
Water resources and hydro-climatic disasters

Weather and climate

Major focus

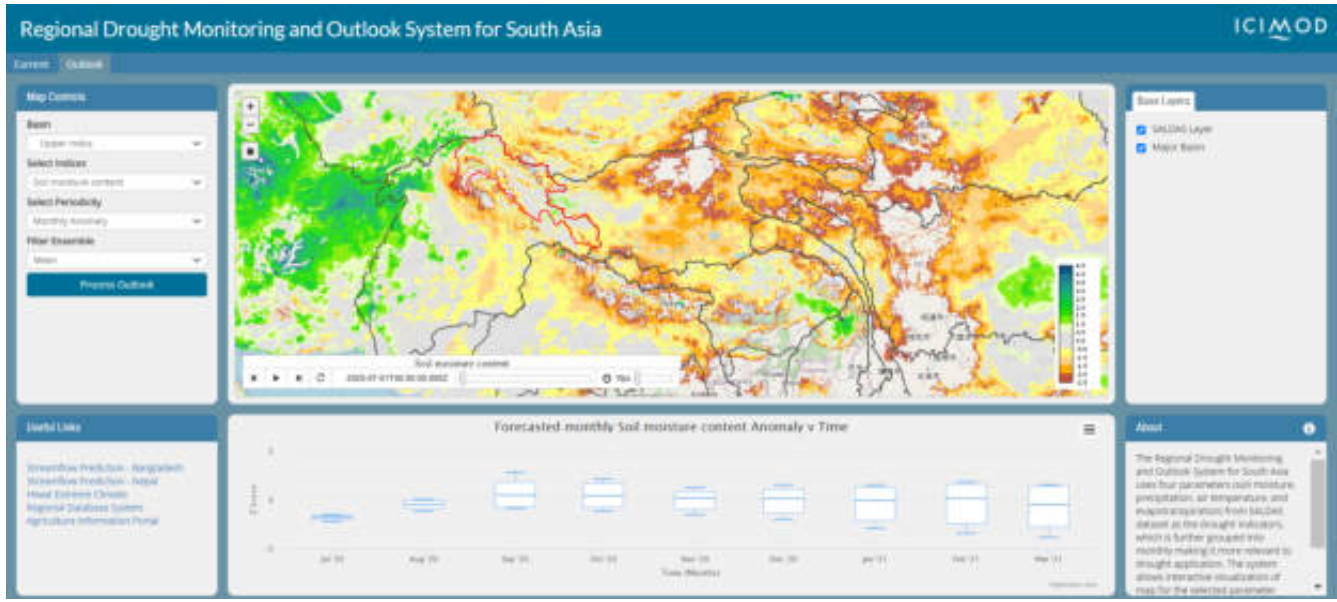
- Build capacity of people and institutions to integrate EO science and technology
- Science and technology innovations/advances to solve development challenges
- Foster strategic collaborations across scales and sectors to achieve sustainable solutions

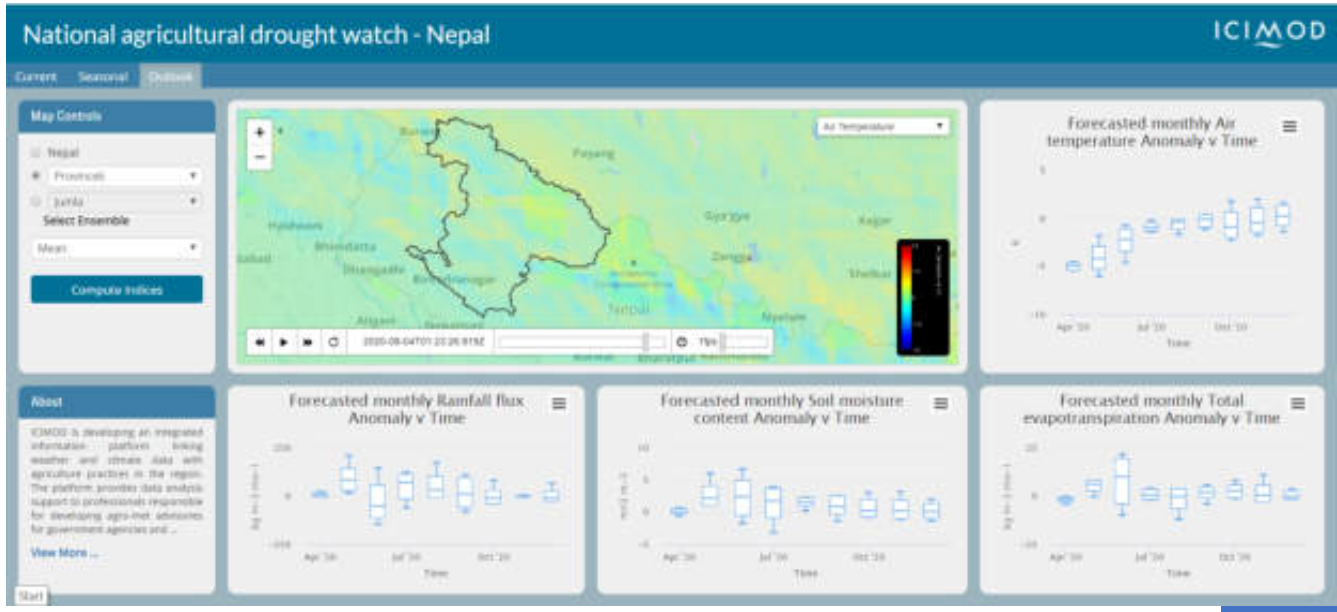
Drought monitoring and early warning



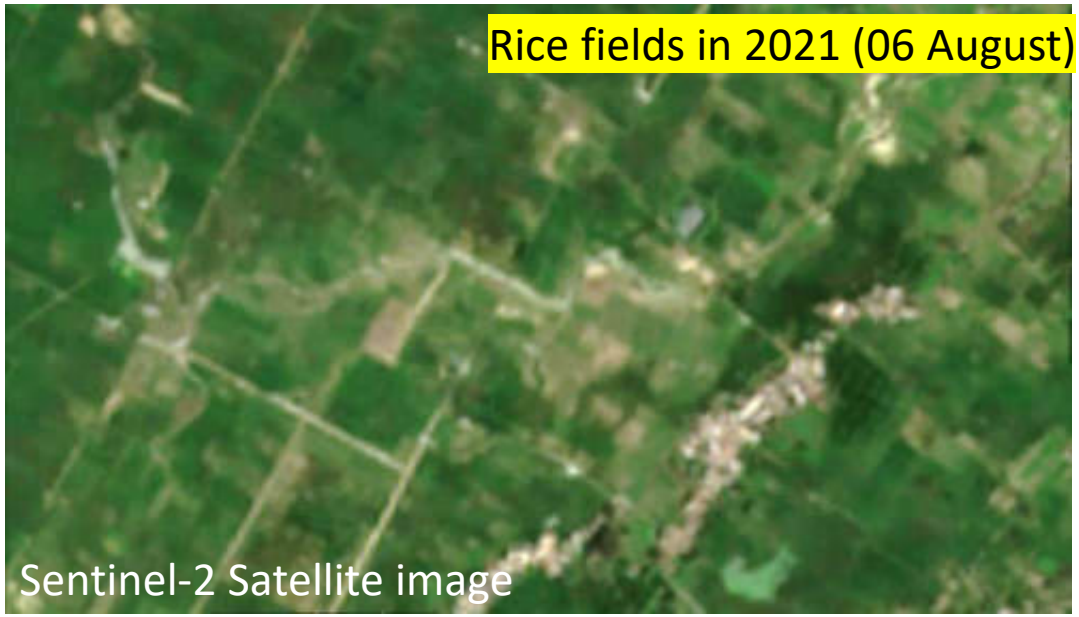
Vegetation condition in the croplands during March 2021

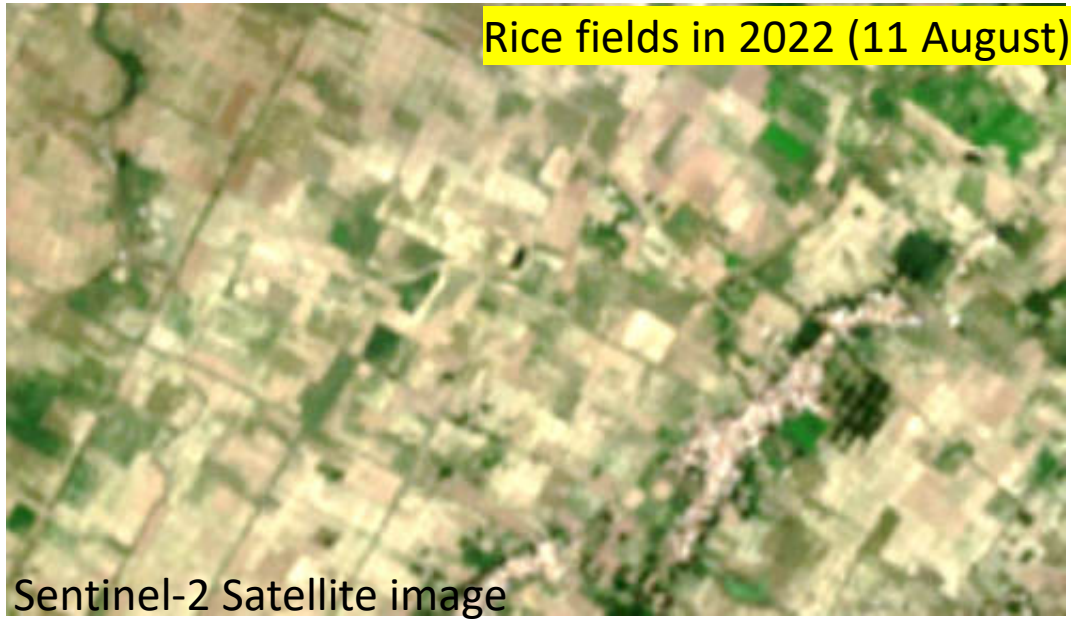
http://tethys.icimod.org/apps/droughtnp/



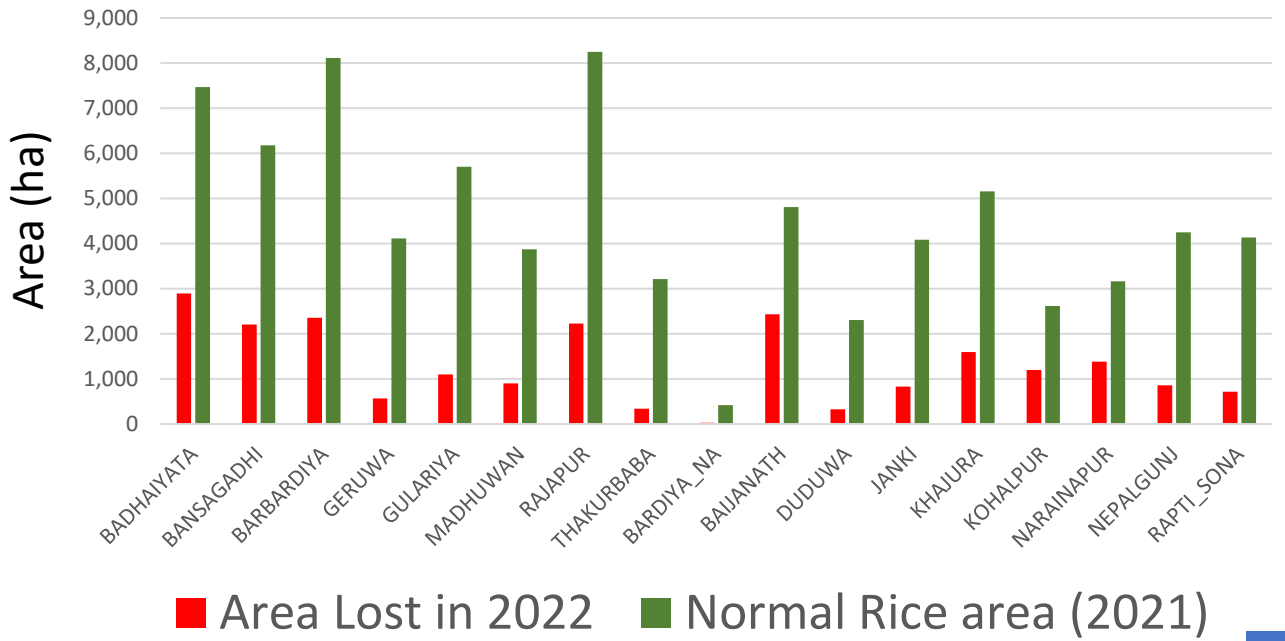


Rice crop plantation loss in Banke and Bardiya districts under ongoing drought conditions

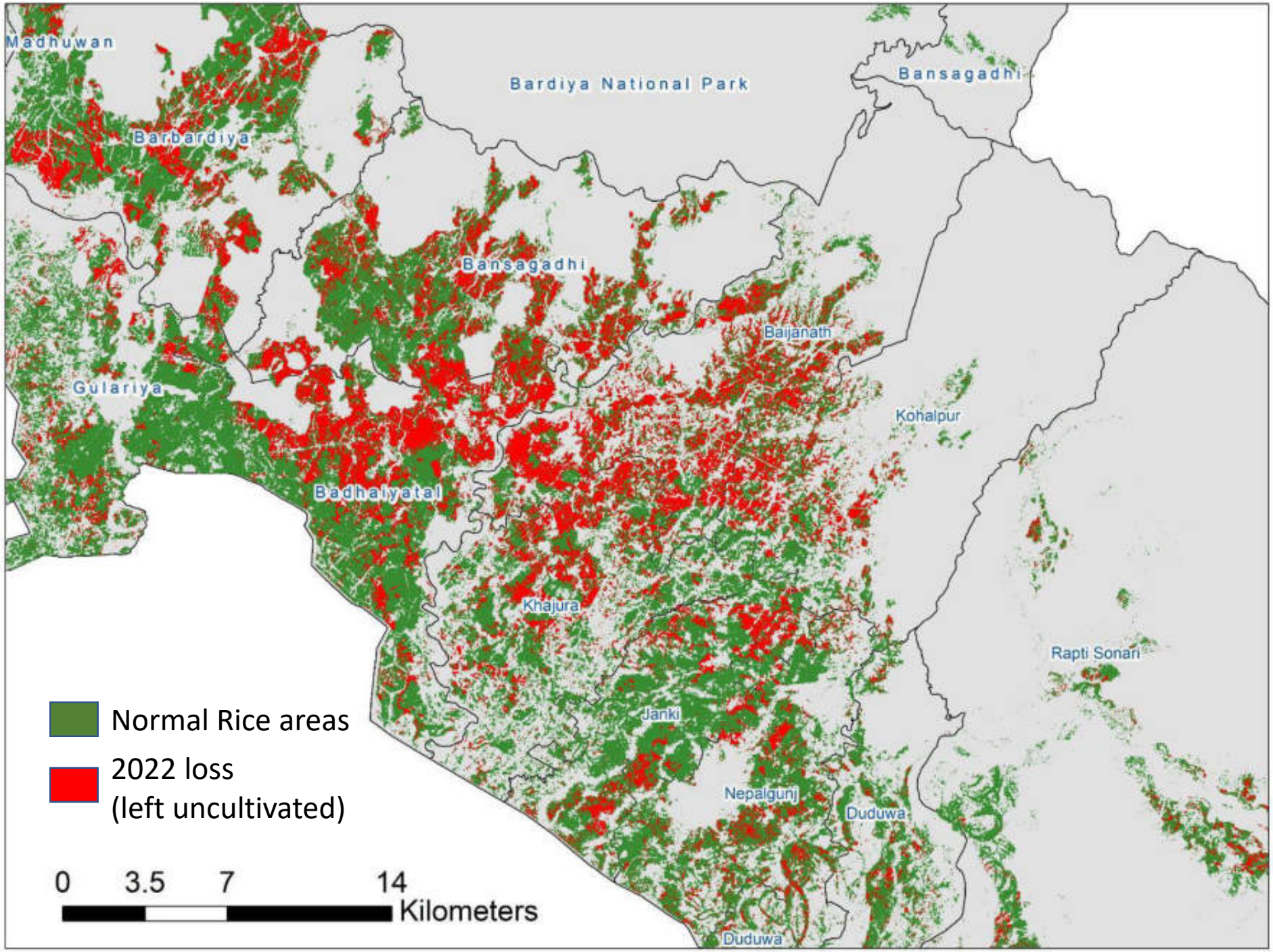




Satellite image based assessment of Banke and Bardiya districts shows that at least 30% of the area which was being cultivated in recent years is left uncultivated (fallow) this year due to lack of water at the transplantation stage.

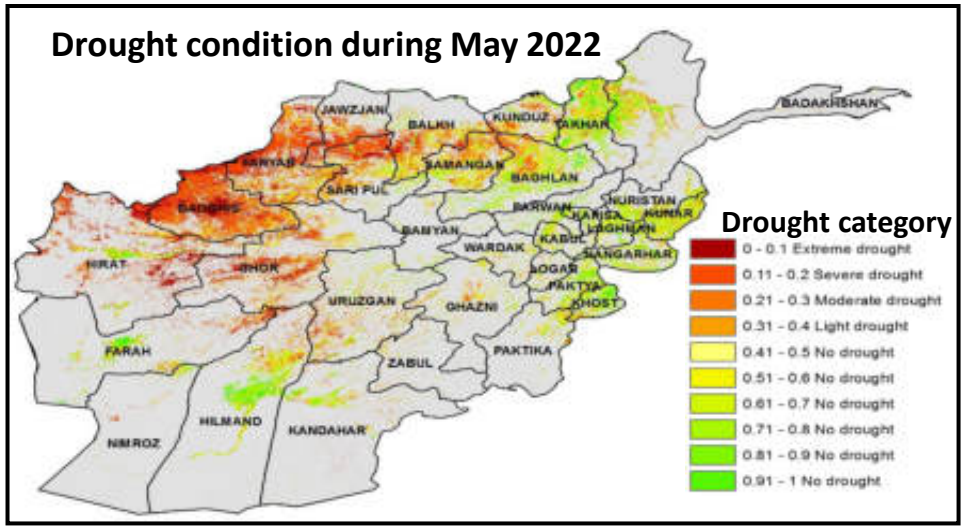


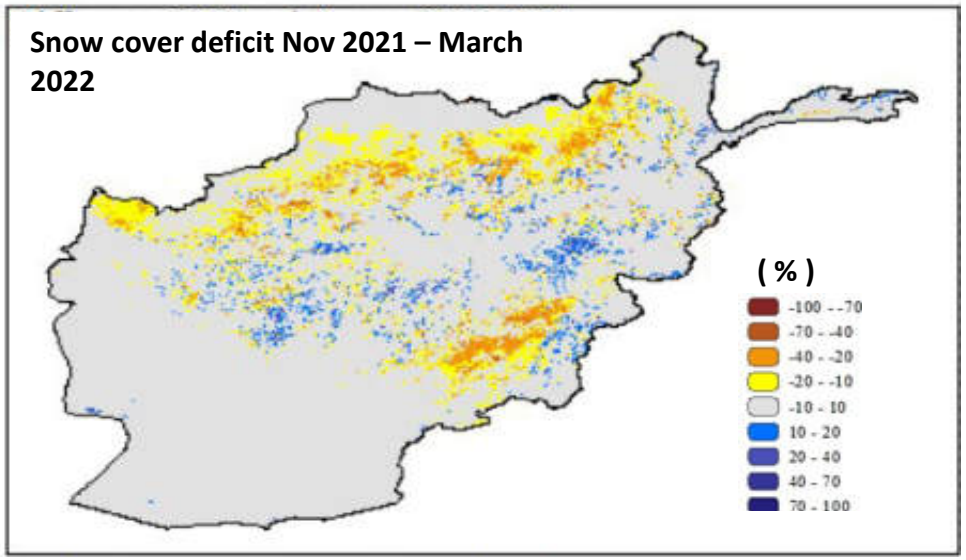
Palika wise crop area loss as of 11 August 2022



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

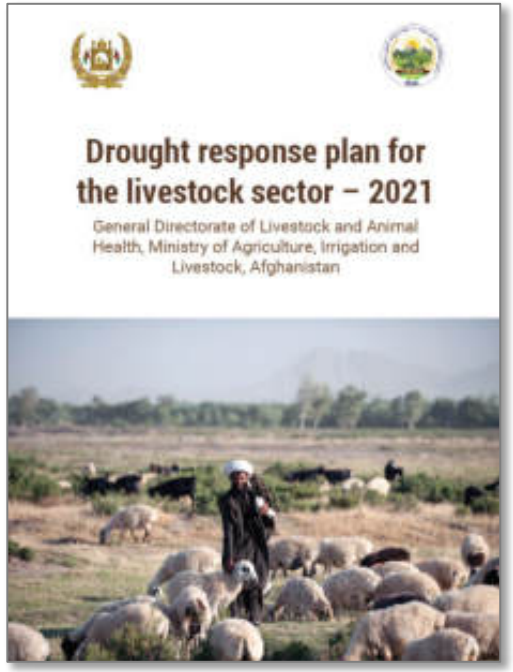
Use of drought service by humanitarian aid agencies for anticipatory actions in Afghanistan



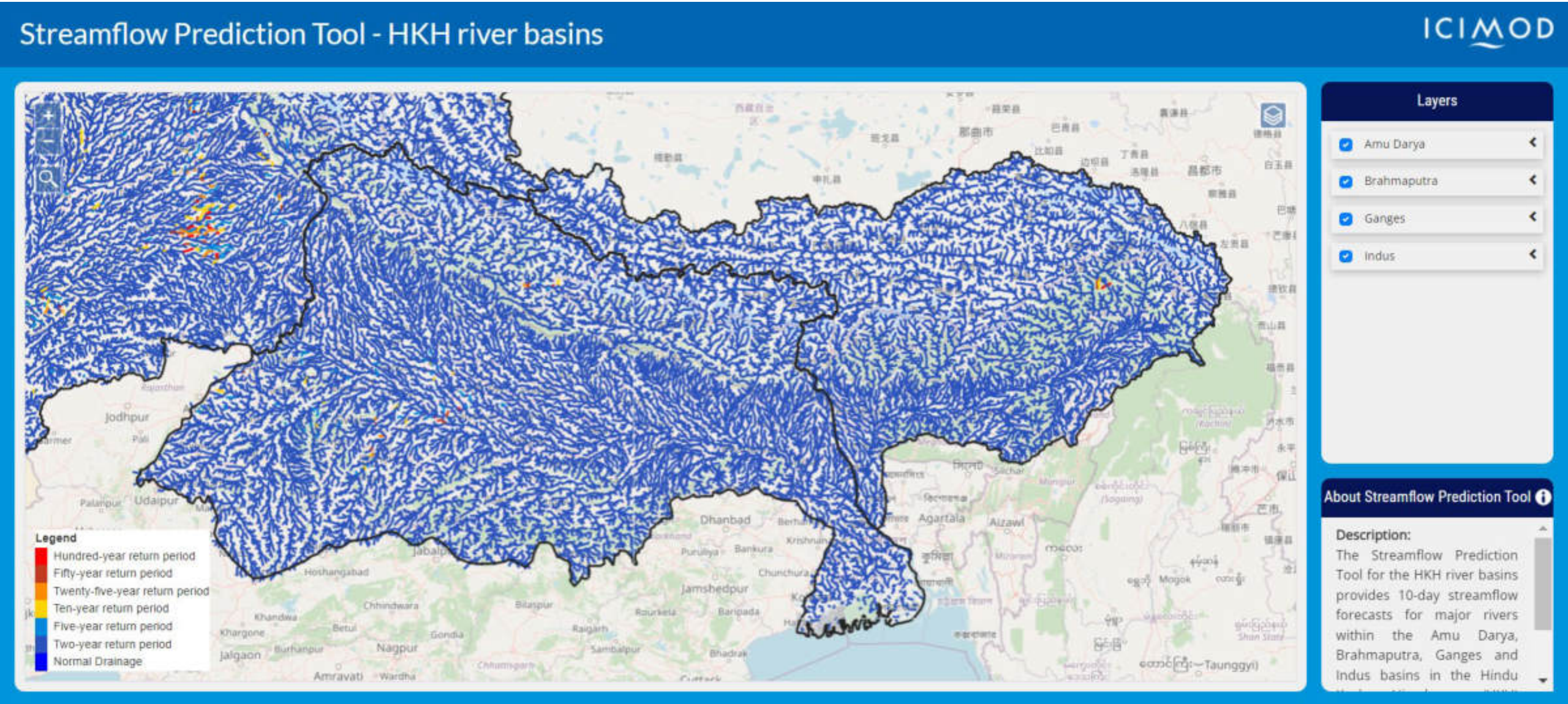


Aga Khan Agency for Habitat

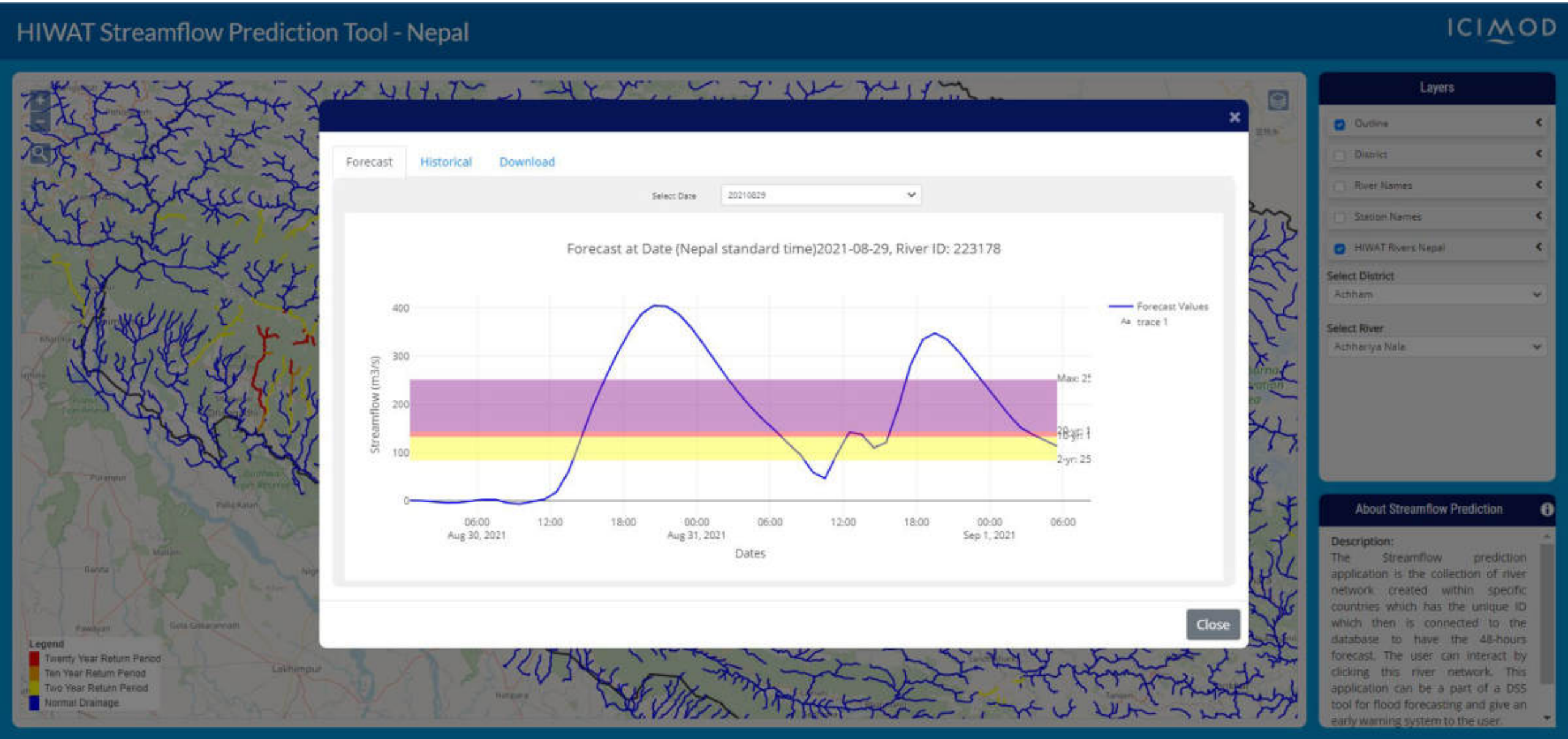
INTERNATIONAL RESCUE COMMITTEE



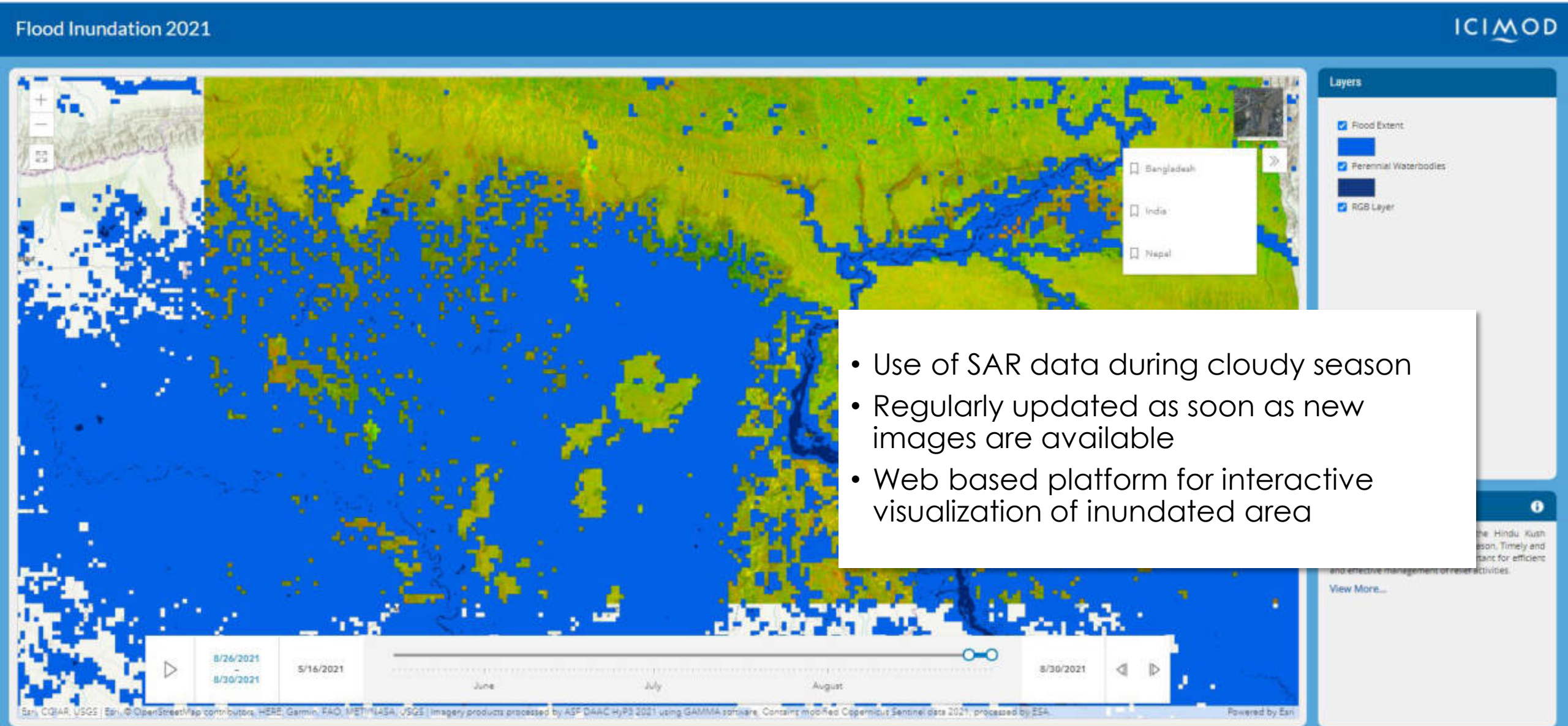
Improving flood forecasting and early warning



Improving flood forecasting and early warning



Flood inundation monitoring



- 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

Pakistan floods 2022
Rapid assessment of crop loss in Sindh province

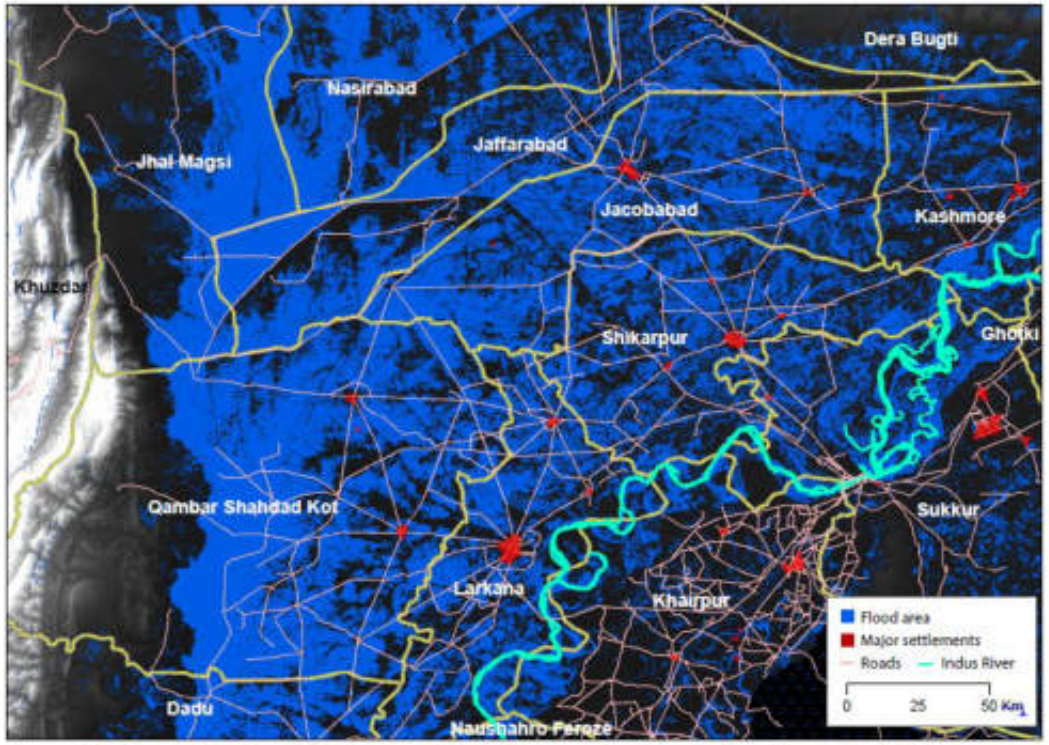


Figure 6: Flood water extent, derived from satellite data, across the largest rice crop zone in Sindh Province (blue indicates water and red indicates major settlements of the district)

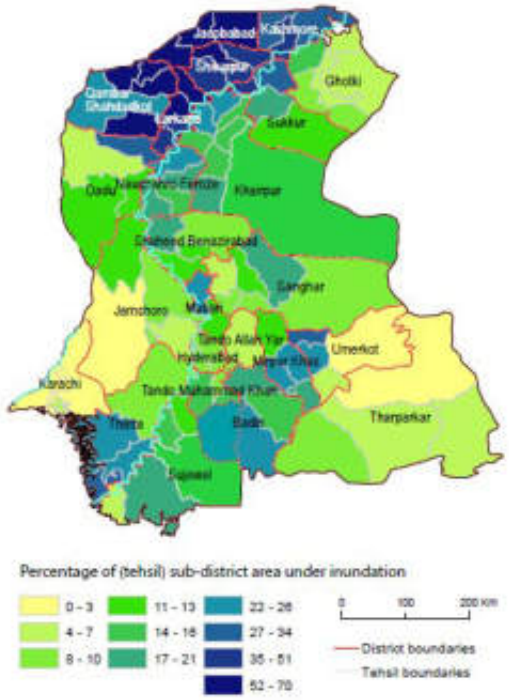
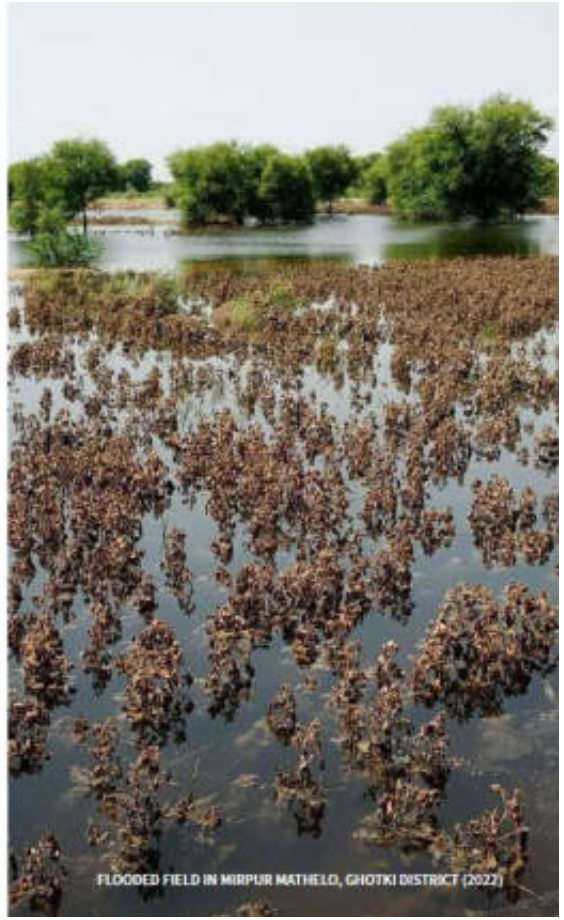


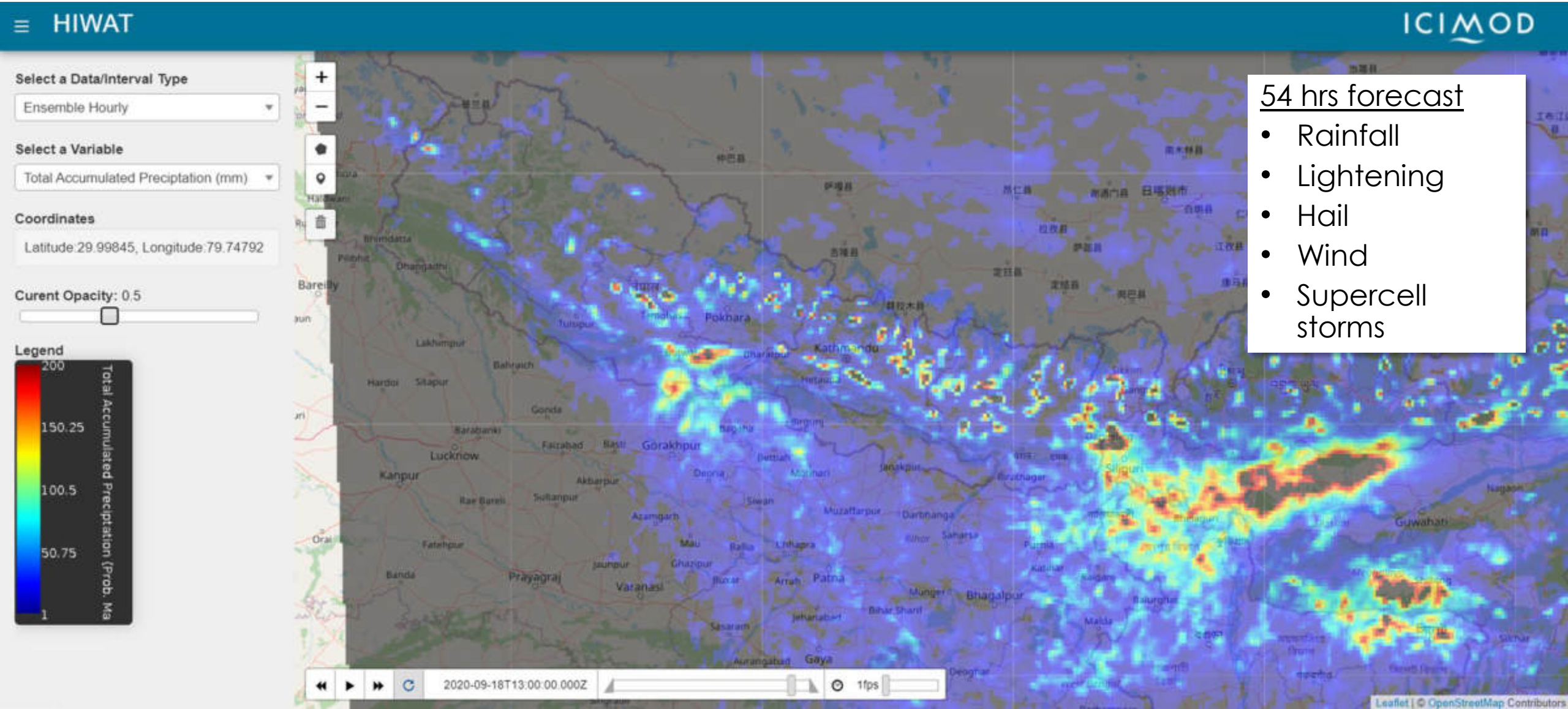
Figure 7: Flood intensity across Sindh Province aggregated at the subdistrict (tehsil) level



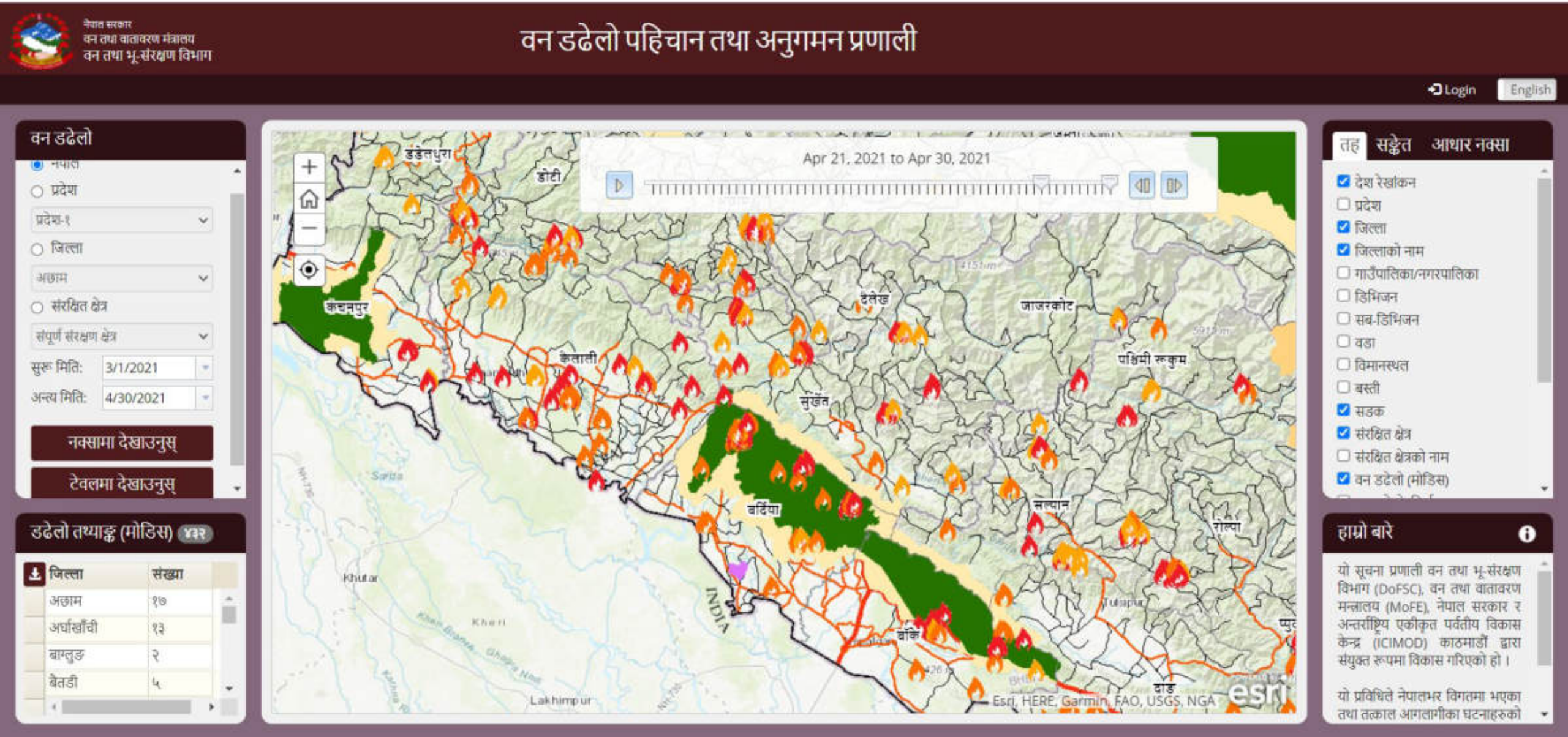
FLOODED FIELD IN MIRPUR MATHELO, GHOTKI DISTRICT (2022)

Weather and climate

High Impact Weather Assessment Tool (HIWAT)

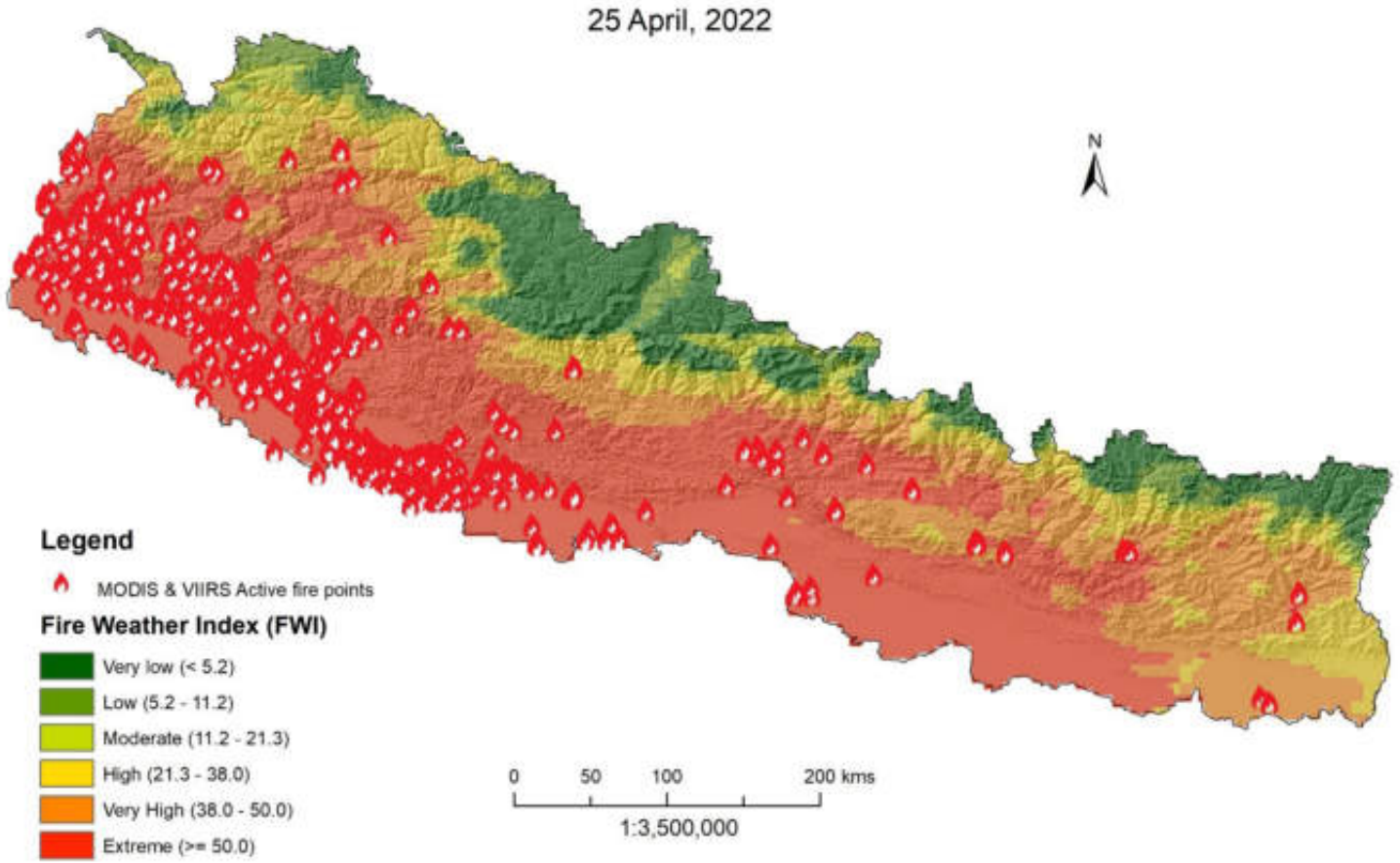


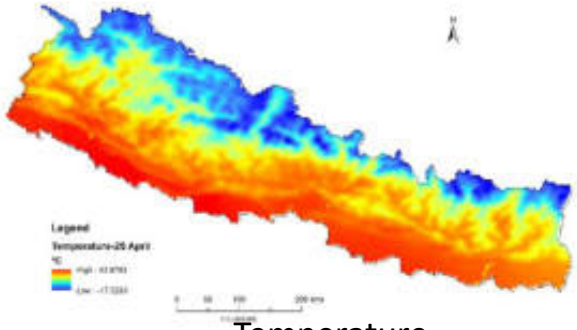
Forest fire monitoring system



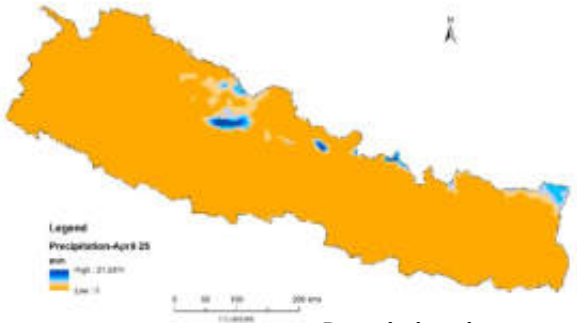
Fire Weather Index

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

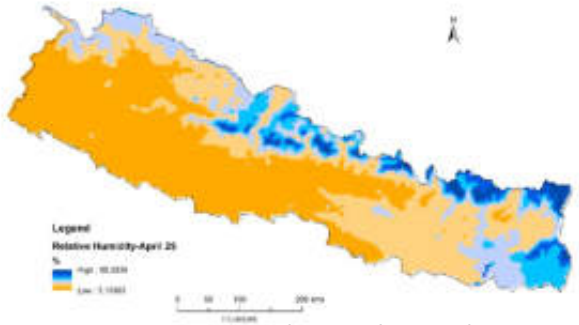




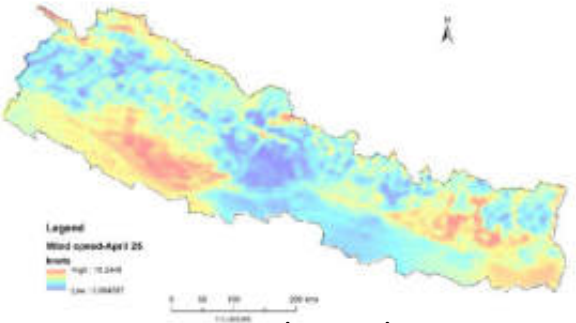
Temperature



Precipitation



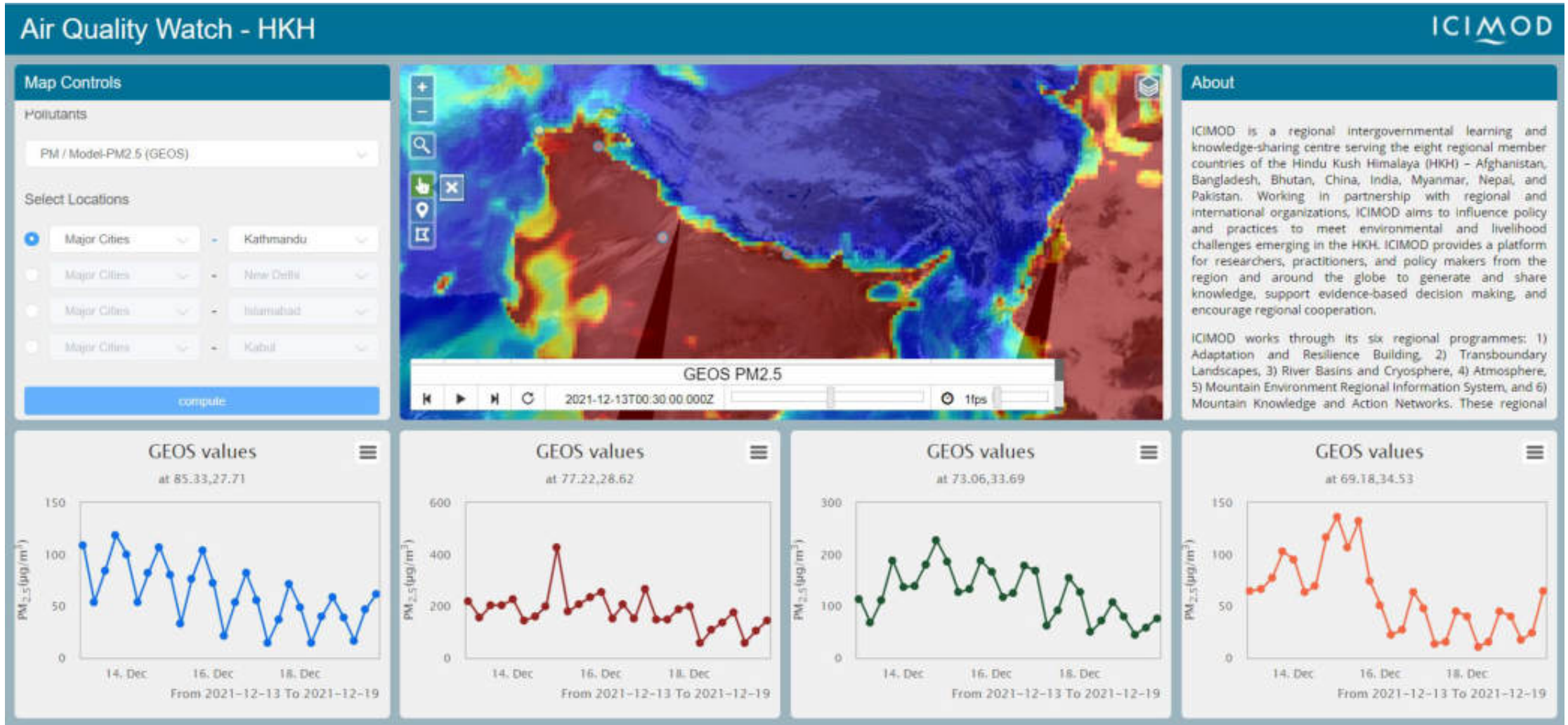
Relative humidity



Wind speed

Air quality monitoring

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

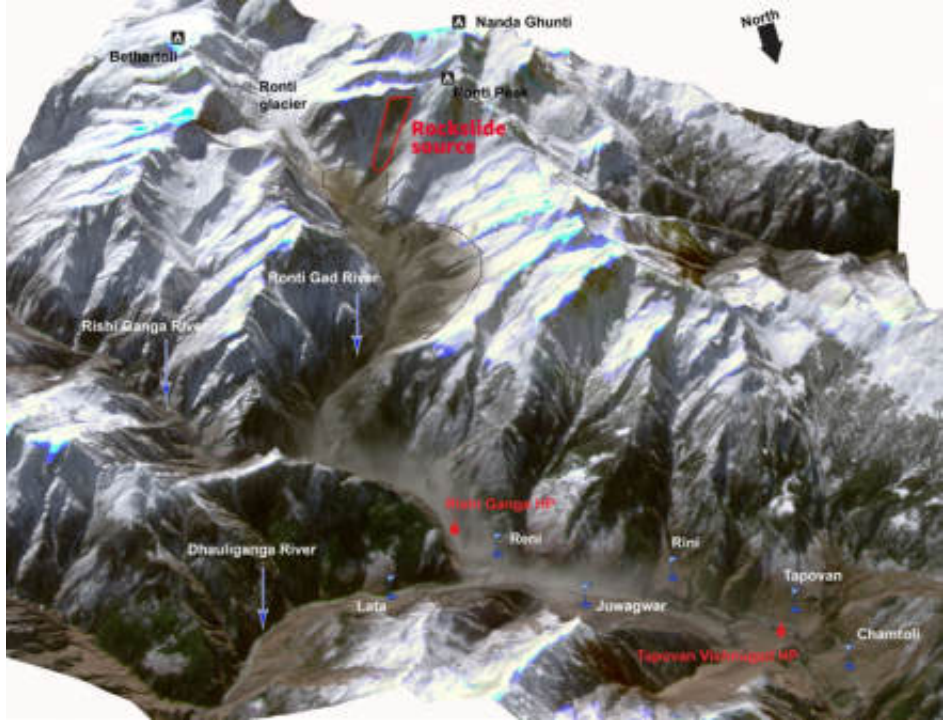


Landslide mapping and forecasting

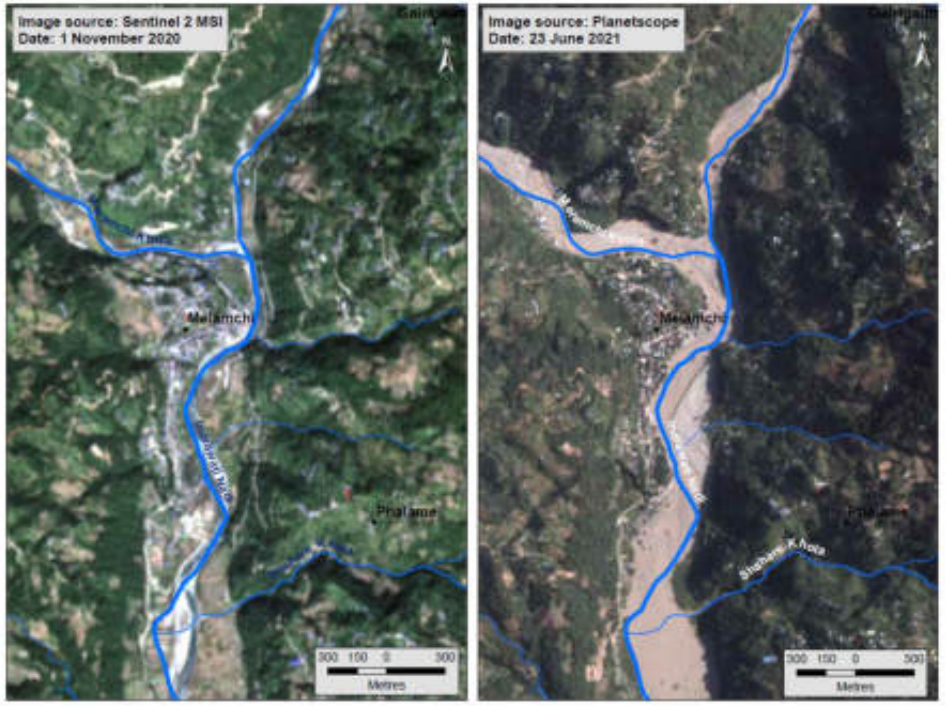
- Landslides are a major natural hazard occurring together as cascading disaster

- 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

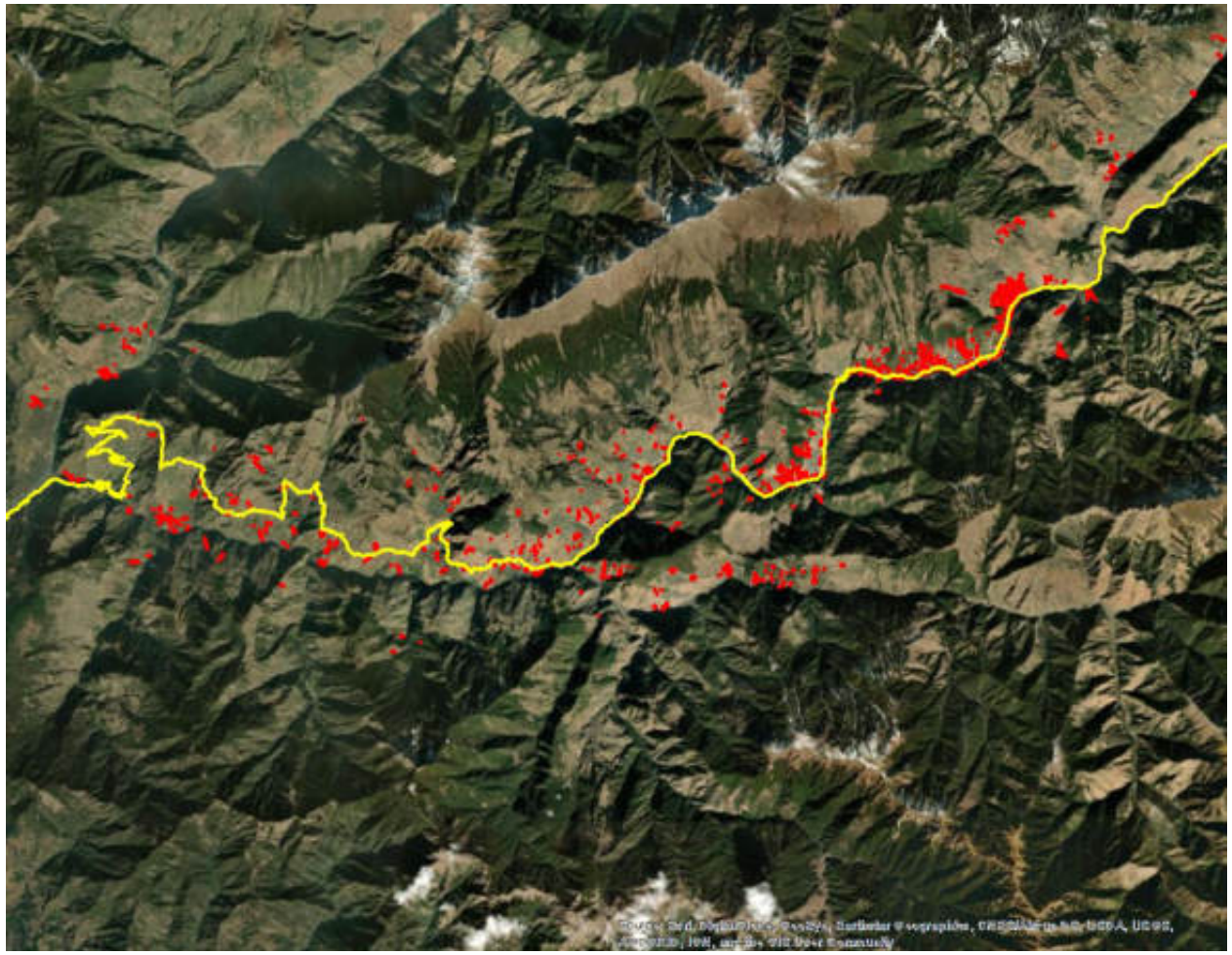
(SALaD/U-net) on the cloud

PlanetScope, Sentinel 2 and other available satellite imageries.

Landslide Forecast System

Geology/lithology, Faults, Drainage, Morphology

HiWAT, IMERG, GPM, SMAP

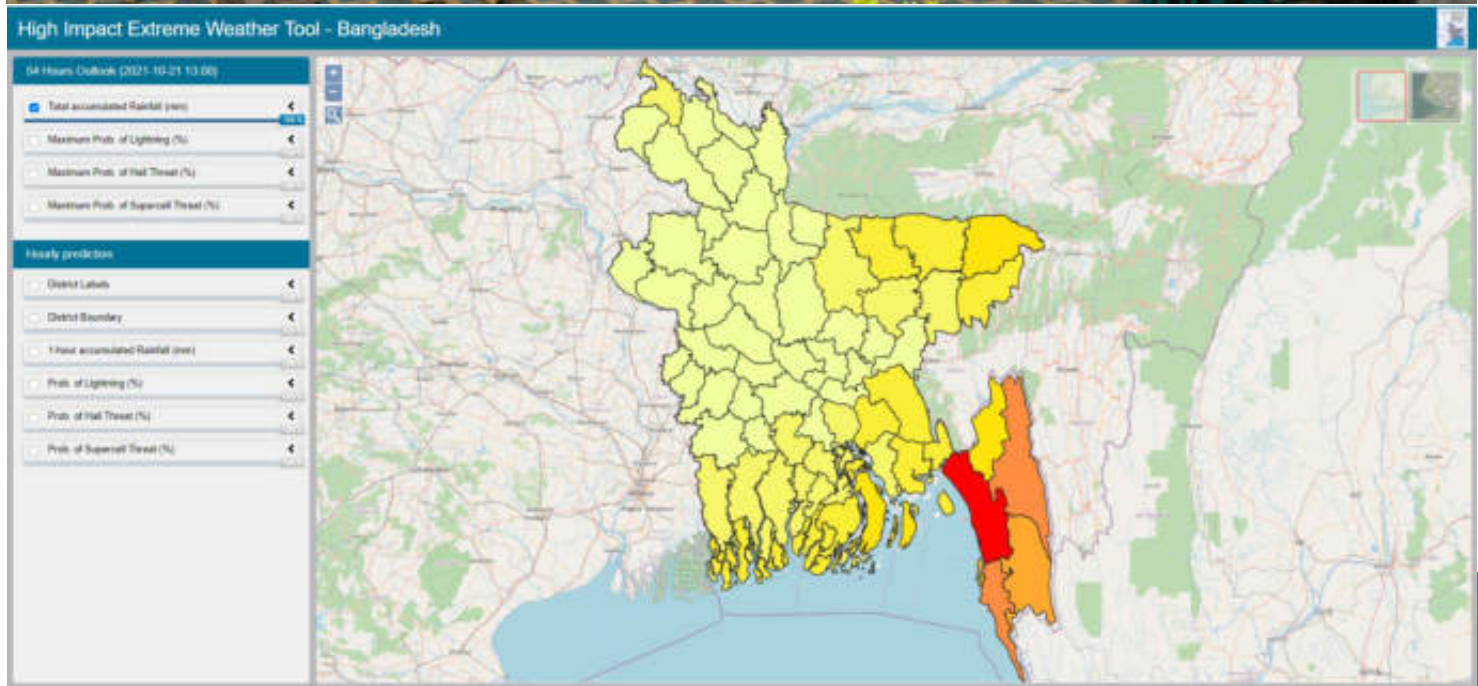


Landslides between Manma and Jumla section directly impacting the Karnali highway – mapped using recent Planet imagery and SALaD-CD

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


বৃষ্টি হতে পারে, বন্যা নয়

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