AOGEO

6TH ASIA-OCEANIA GROUP ON EARTH OBSERVATIONS (AOGEO) WORKSHOP

5.29-31 2023

MACAU CHINA

Earth observation for understanding our changing environments in the HKH

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International Centre for Integrated Mountain Development (ICIMOD)

Triple Planetary Crisis
Our common challenge

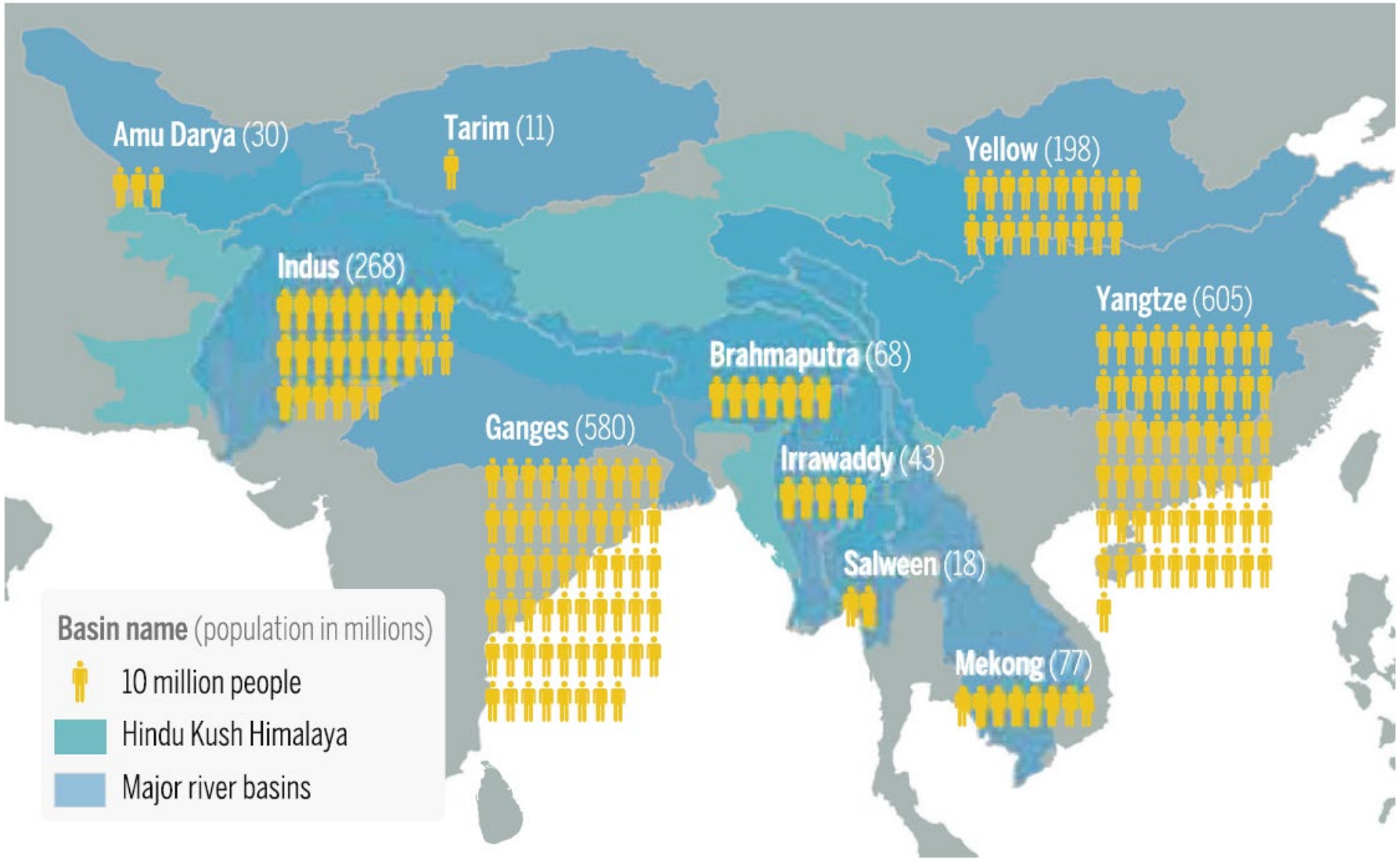
- Climate Change
- Air Pollution
- Biodiversity Loss

STOCKHOLM+50

UNDP


The Hindu Kush Himalaya
Global asset for food, energy, water, carbon, and cultural and biological diversity
Also known as the Third Pole
Hindu Kush Himalaya (HKH) and ICIMOD

What happens here affects one-fourth of humanity



240 million
population

1.6 billion
downstream

Source: HKH assessment

What is happening?

The HKH in a 1.5 ˚C world

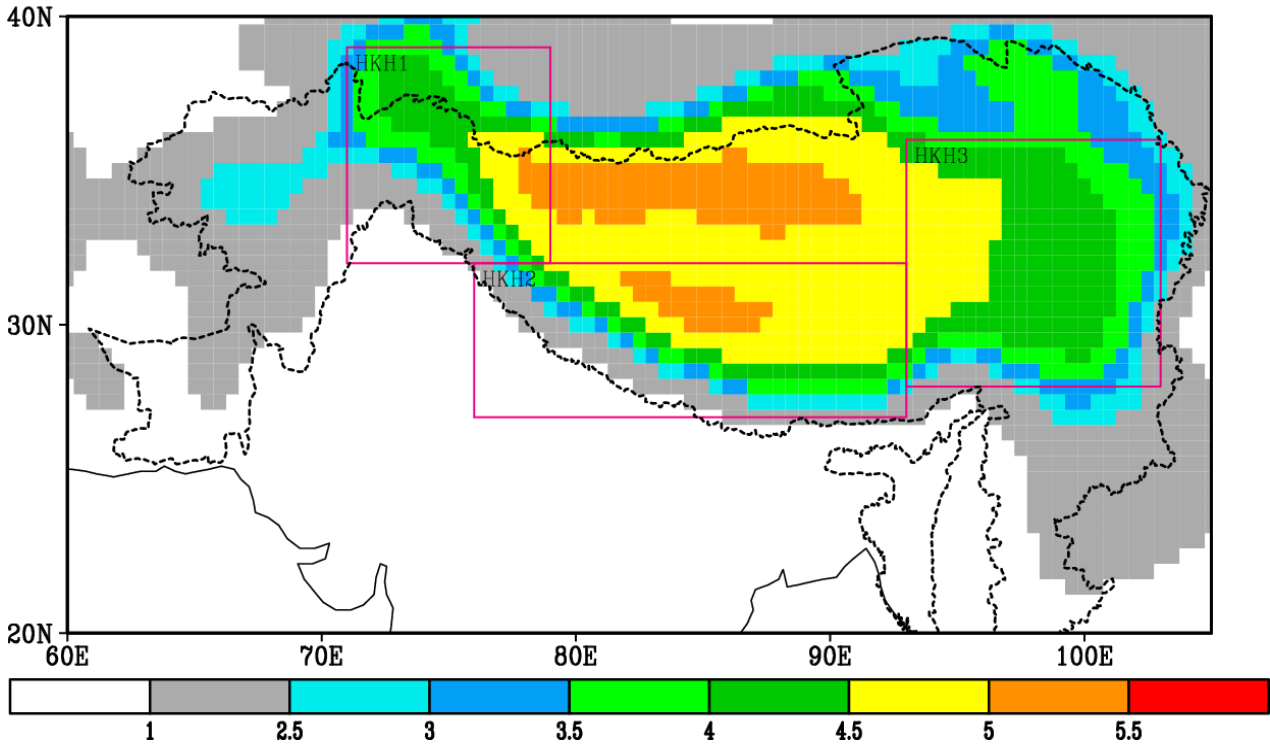
1.5 ˚C global temperature increase is **too hot** for the HKH region, at least **0.3 °C** higher

Temperature increase of **1.8 ± 0.4 ˚C**
more pronounced in **mountain regions**
when compared with 2071-2100 vs 1851-80

Karakoram: 2.2 ± 0.4 ˚C

Central Himalayas: 2.0 ± 0.5 ˚C

Southeast Himalayas: 2.0 ± 0.5 ˚C



Krishnan et al., 2019 (HKH Assessment)

HKH glaciers

The HKH region has the highest snow and glaciers concentration outside the polar region

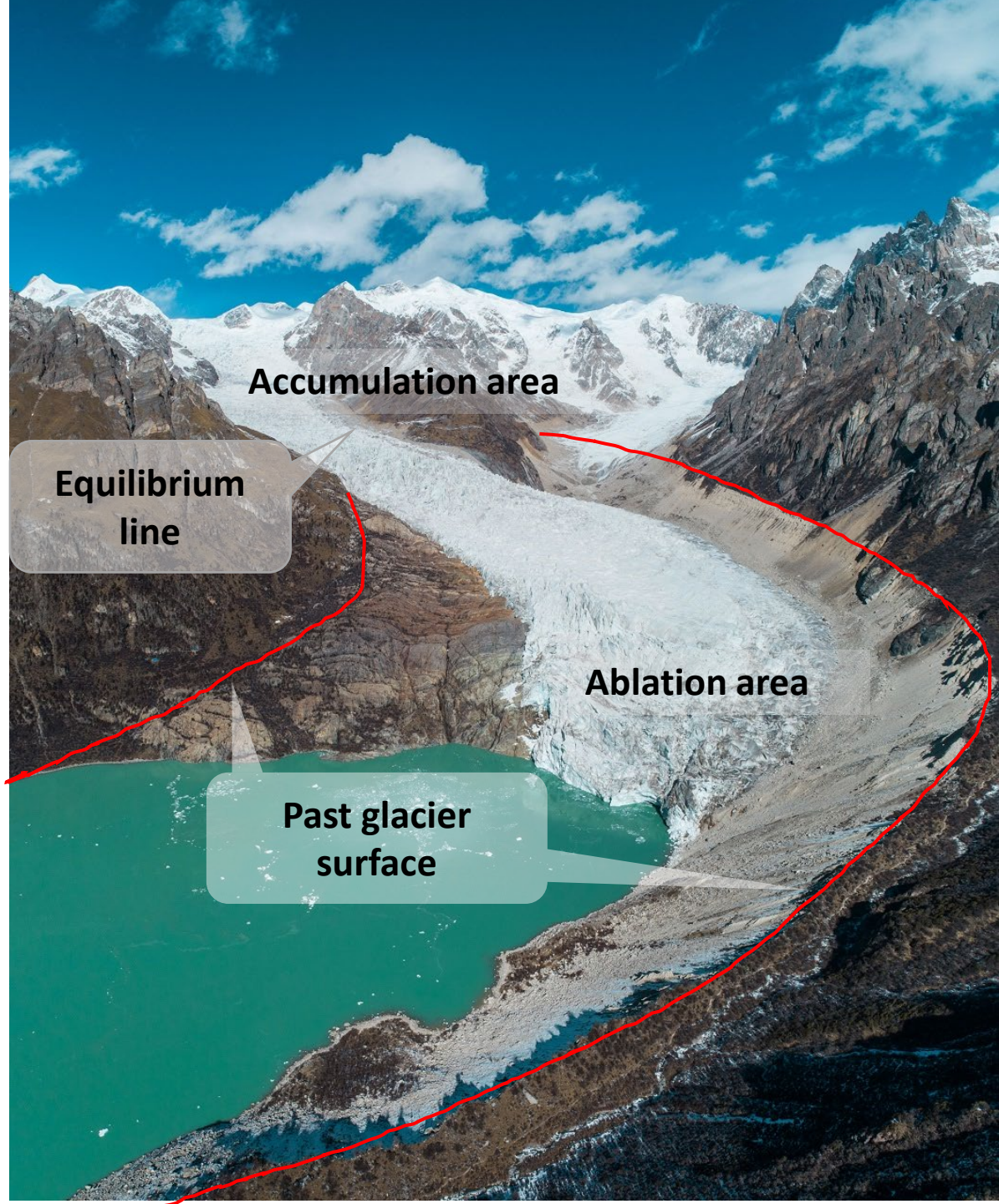
~ 54,000 glaciers (60,000 km^2)

Glaciers are declining faster in the Eastern Himalayas than the in the central or western Himalayas.

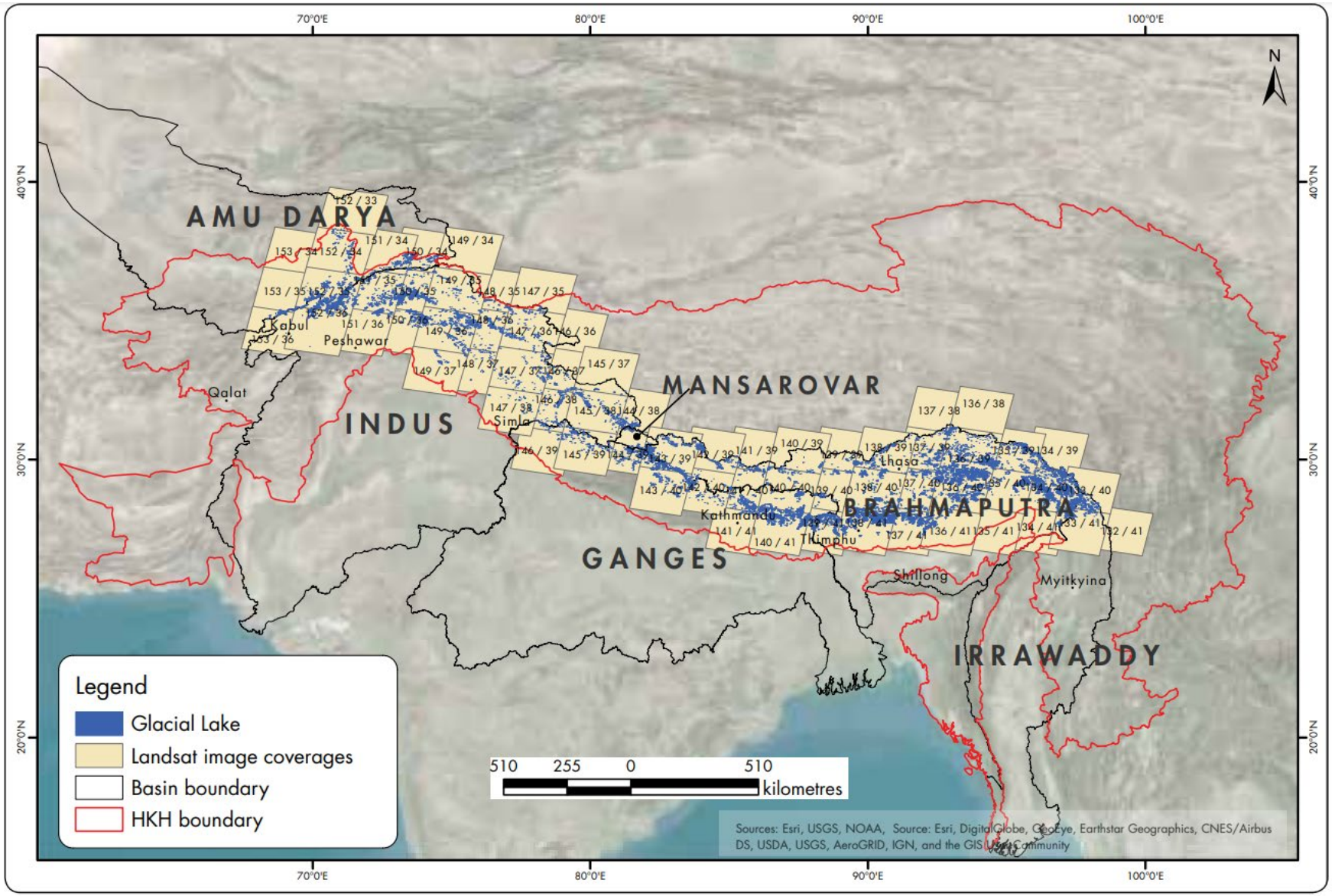
The region lost about **a quarter of the total glacier area** in 30 years

Some glaciers in Karakorum and Pamir are increasing (Karakorum anomaly)

(Bajracharya et al., 2015; Bajracharya et al., 2020; Bolch et al., 2019)



Mapping and monitoring glaciers and glacial lakes

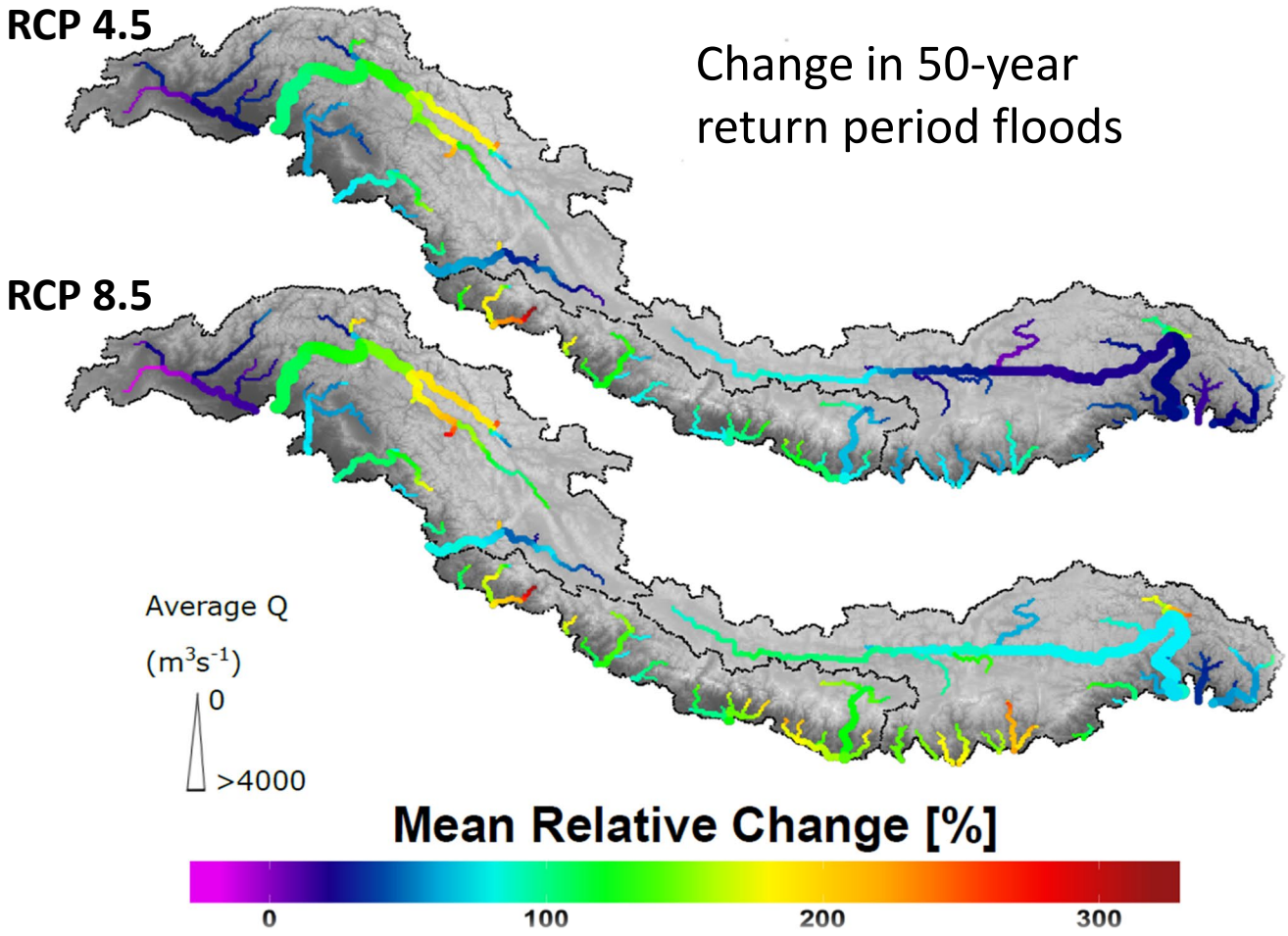


(e) = end-moraine-dammed lake, M(l) = lateral moraine-dammed lake, M(o) = other moraine-dammed lake, I(s) = supra-glacial lake, I(v) = ice-dammed lake dammed by tributary valley glacier, B(c) = cirque lake, B(o) = other bedrock-dammed lake, and O = other glacial lake

Maharjan, SB et.al. (2018) ICIMOD

Changes in extremes: Floods

Extremes will increase strongly in the 21st century, almost doubling in magnitude by the end of the century



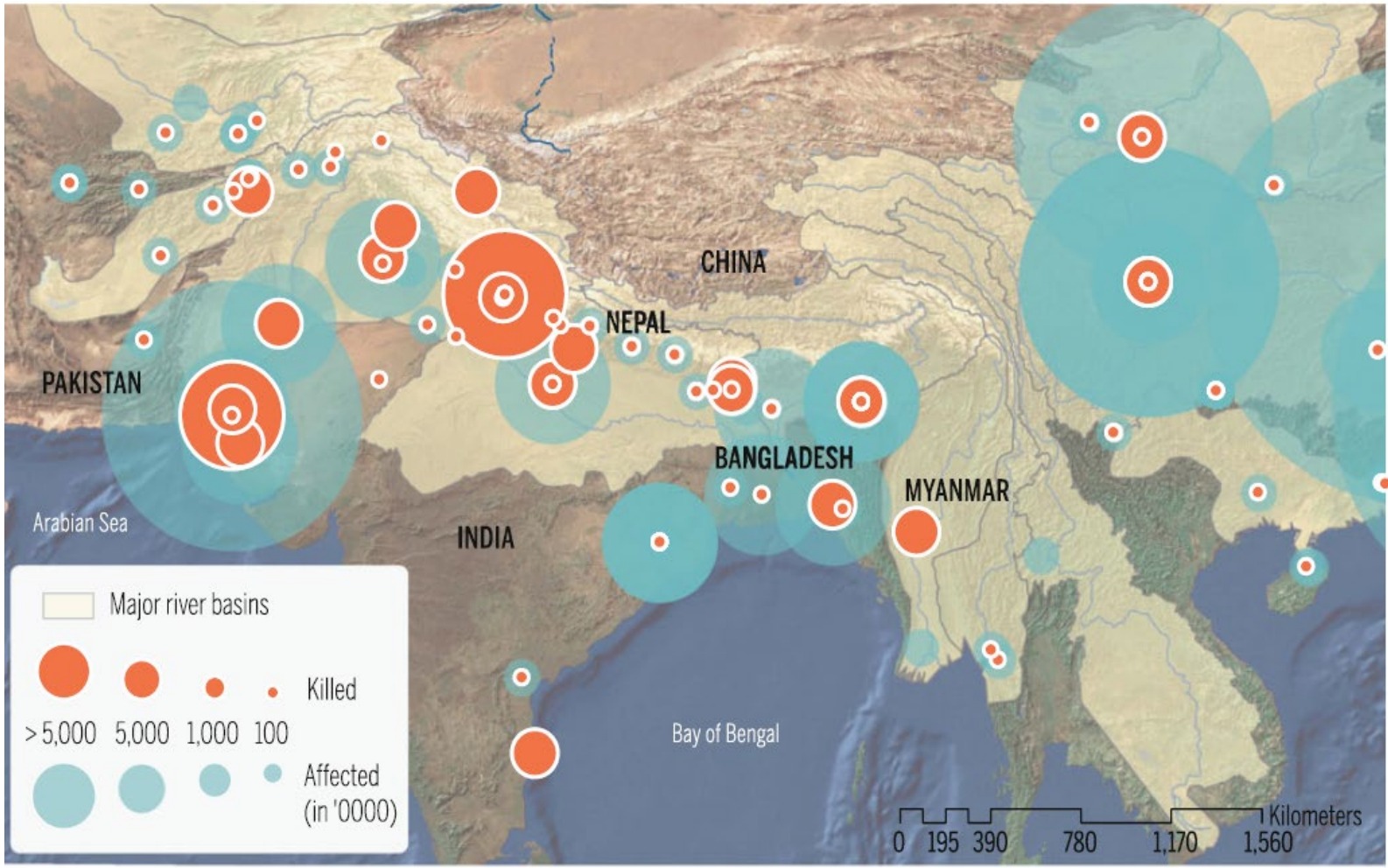
Floods

Floods: 1/3rd share of all disasters

The 2010 floods in Pakistan: **killed > 2,000**;
estimated loss: **USD 10 billion**

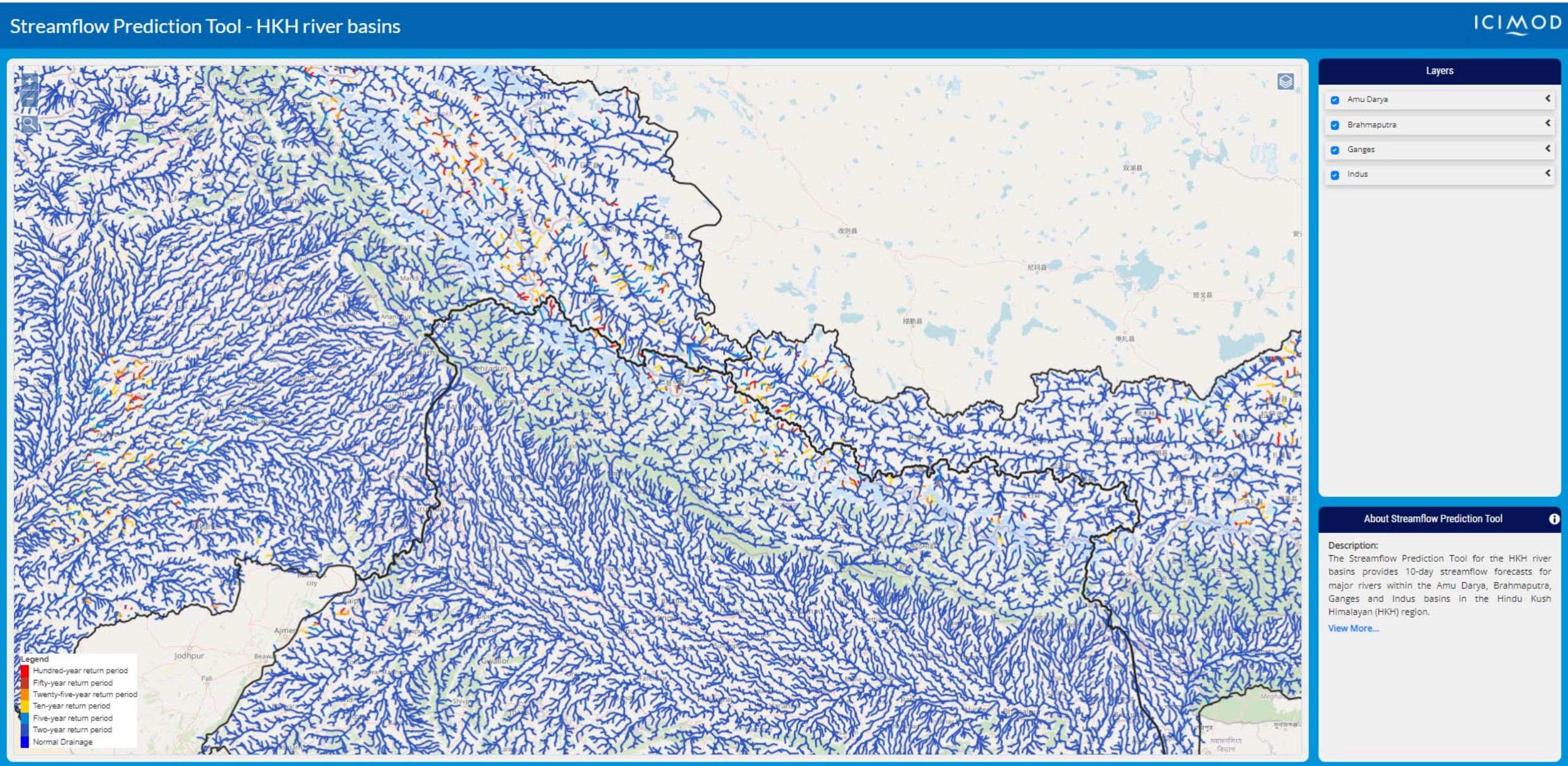
The 2013 flood in Uttarakhand: **killed > 5,000**

The 2022 Pakistan floods: **killed >1700 people**

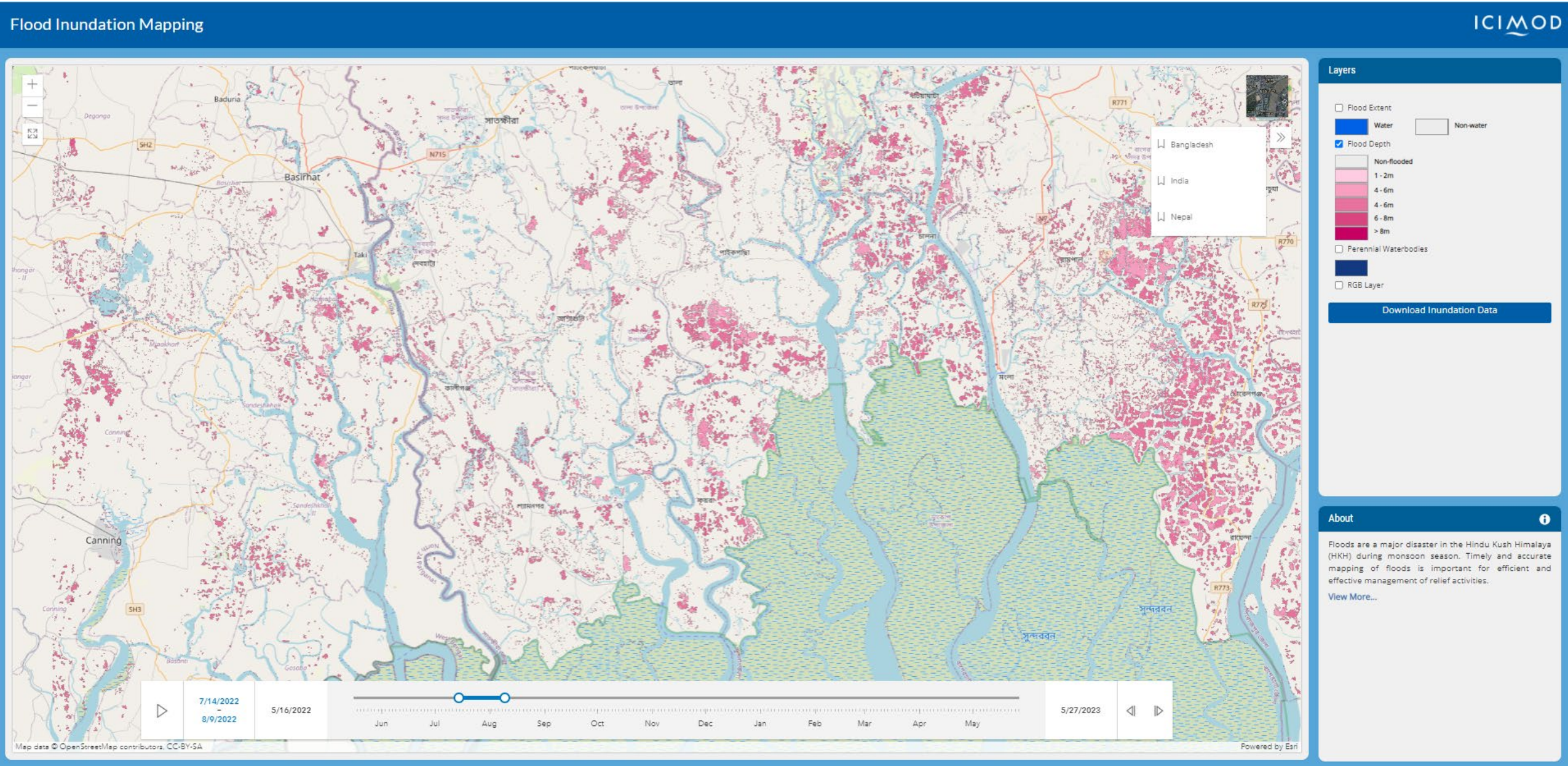


Monitoring weather systems

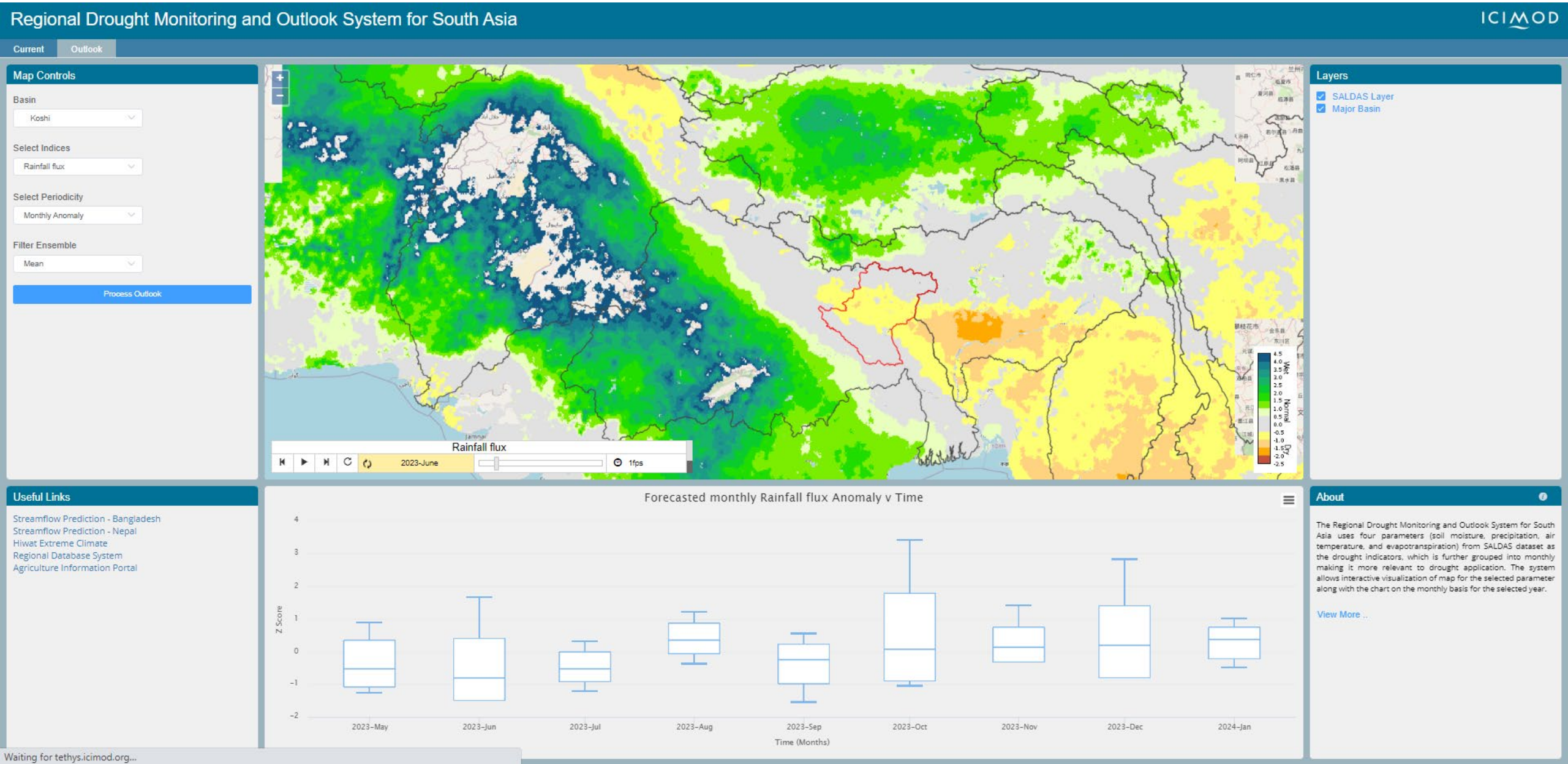
Stream flow prediction – enhancing early warning



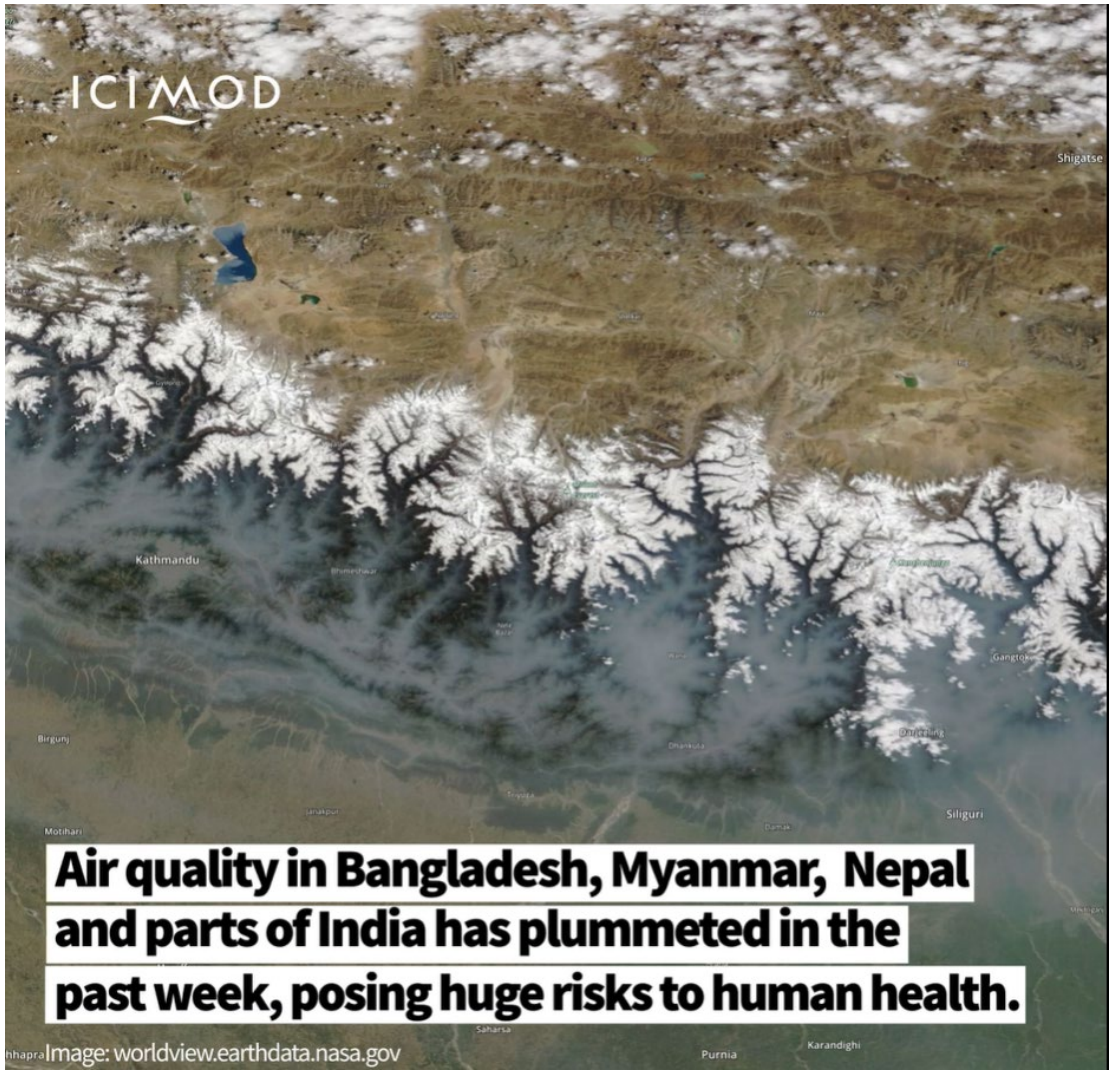
Flood inundation monitoring

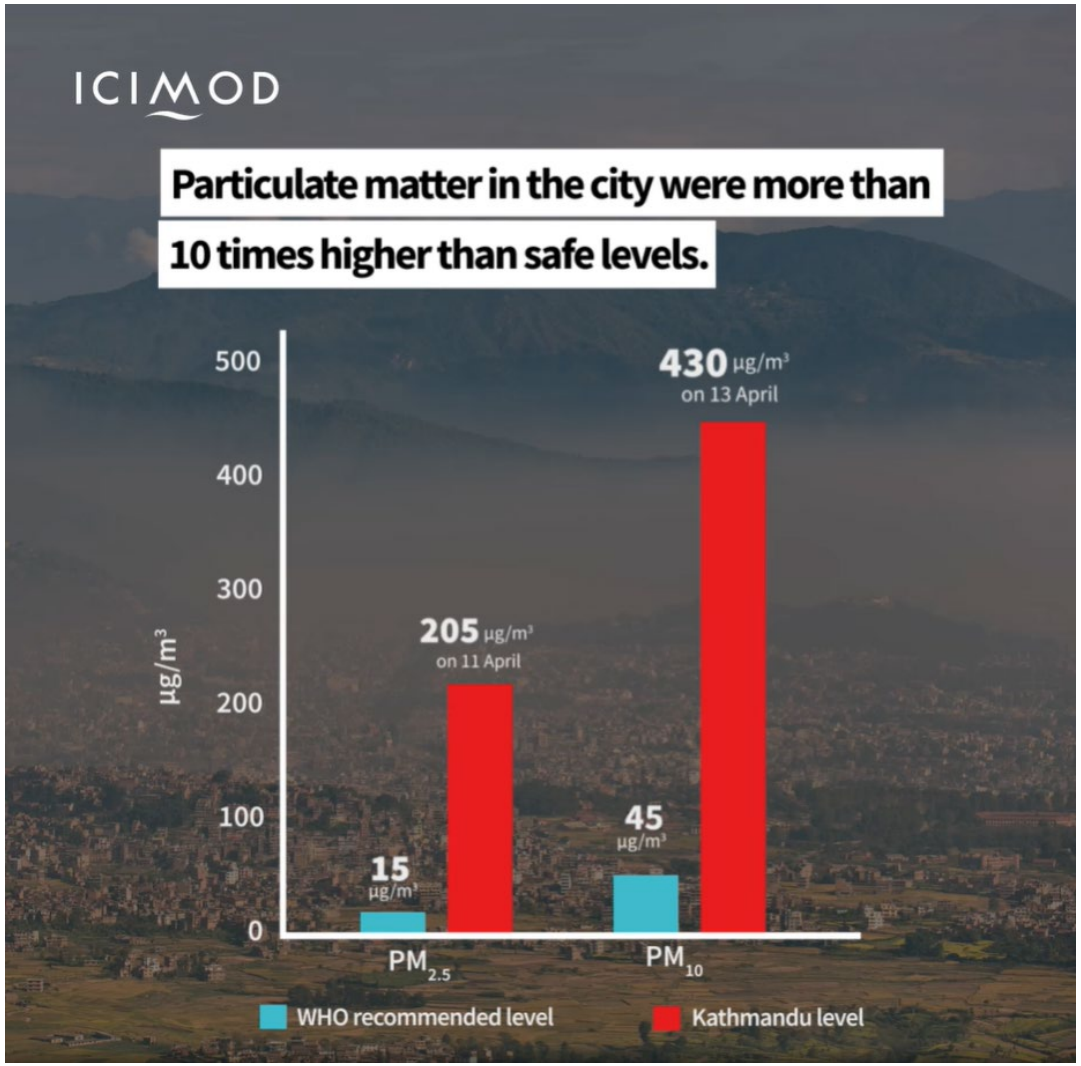


Regional drought monitoring

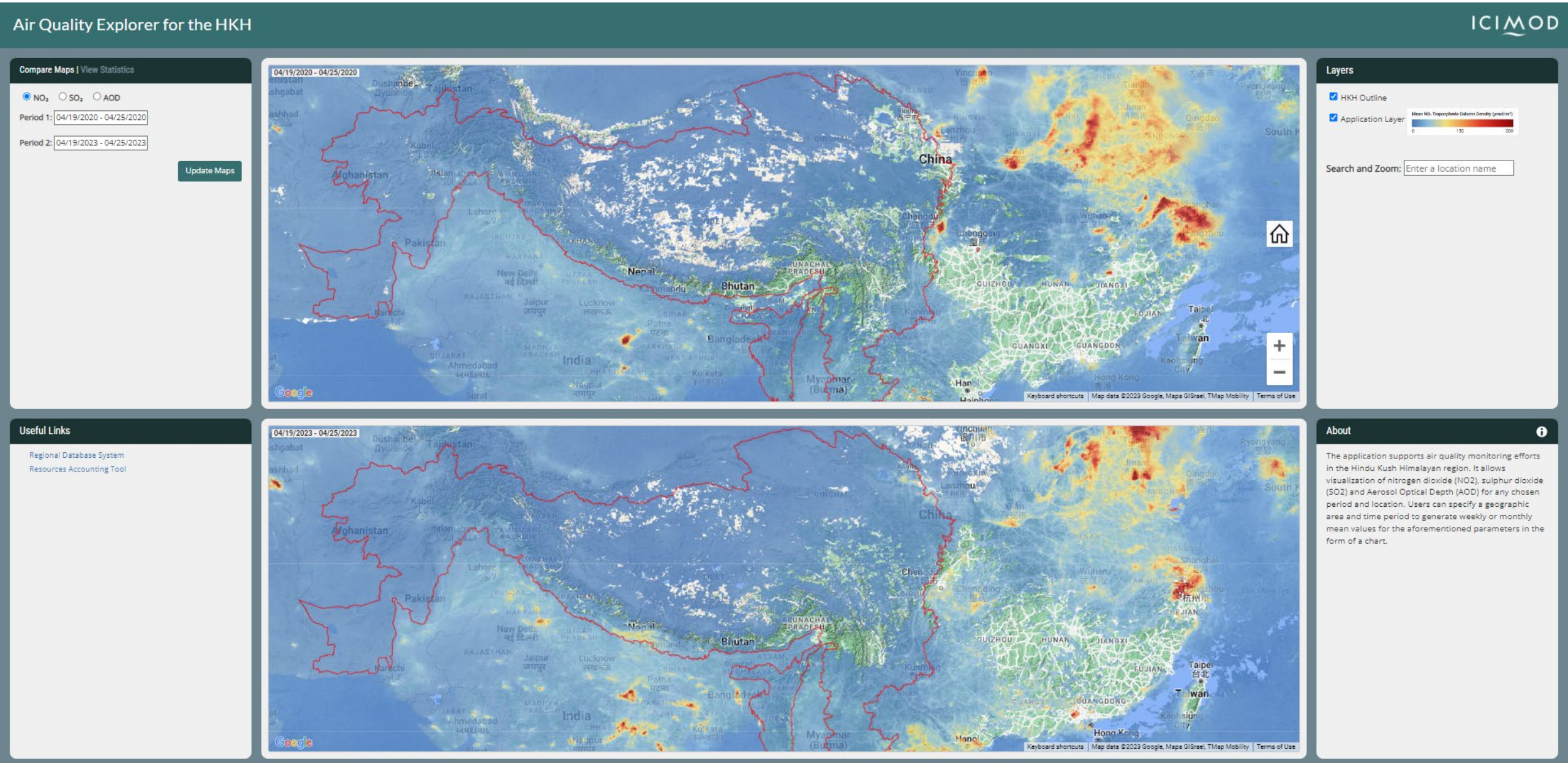


Air quality – a real health concern

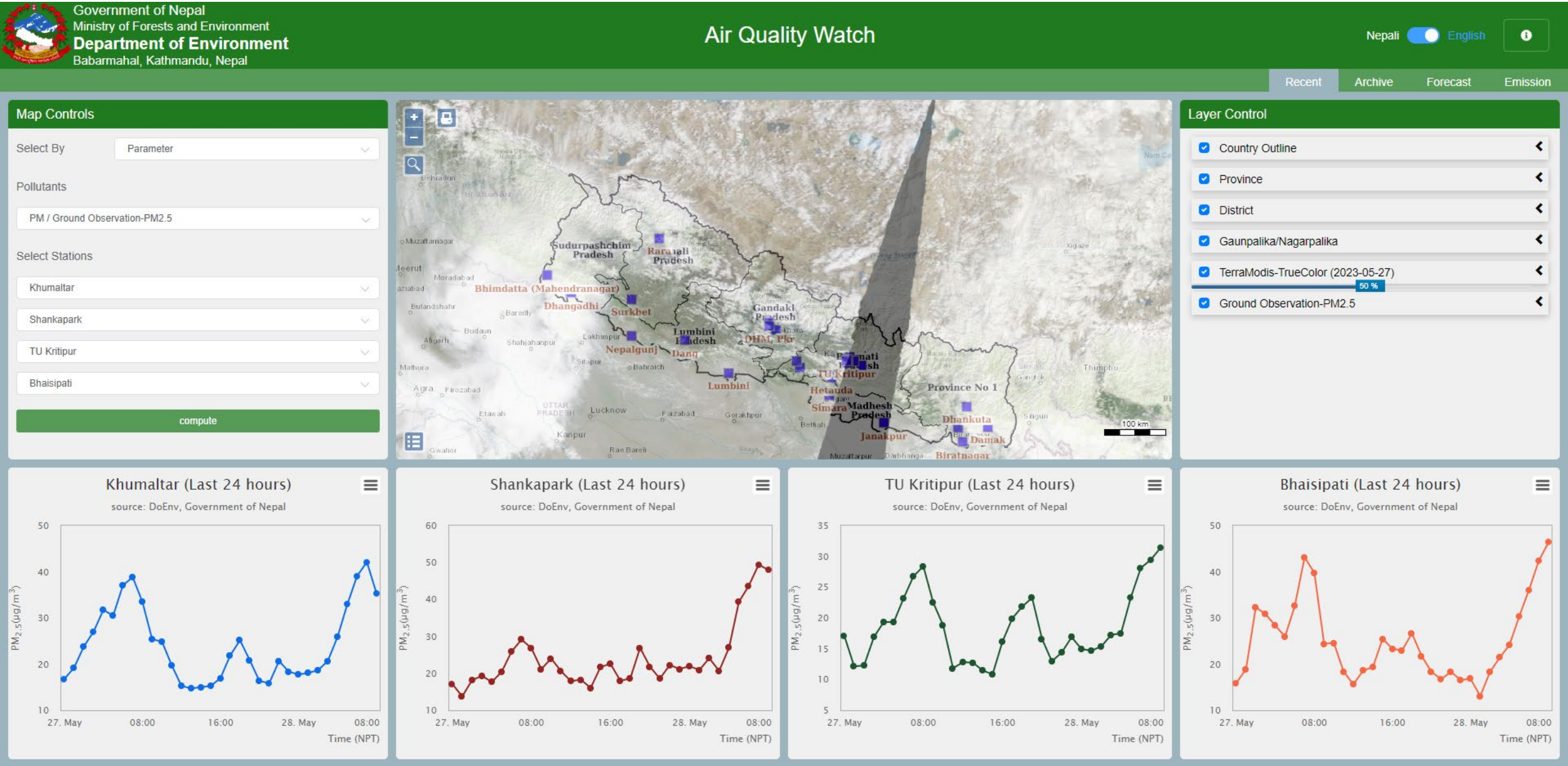




Air quality monitoring



Air quality monitoring



Land degradation and loss of biodiversity

The mountain ecosystems of the HKH have one of the highest diversity of flora and fauna

Four out of 36 global biodiversity hotspots are in the HKH with 35,000+ species of plants and 200+ species of animals

At least 353 new species—242 plants, 16 amphibians, 16 reptiles, 14 fish, two birds, and two mammals, and at least 61 invertebrates—have been discovered in the Eastern Himalaya between 1998 and 2008, equating to an average of 35 new species finds every year

(HKH Assessment)

Monitoring our land

Regional Land Cover Monitoring System

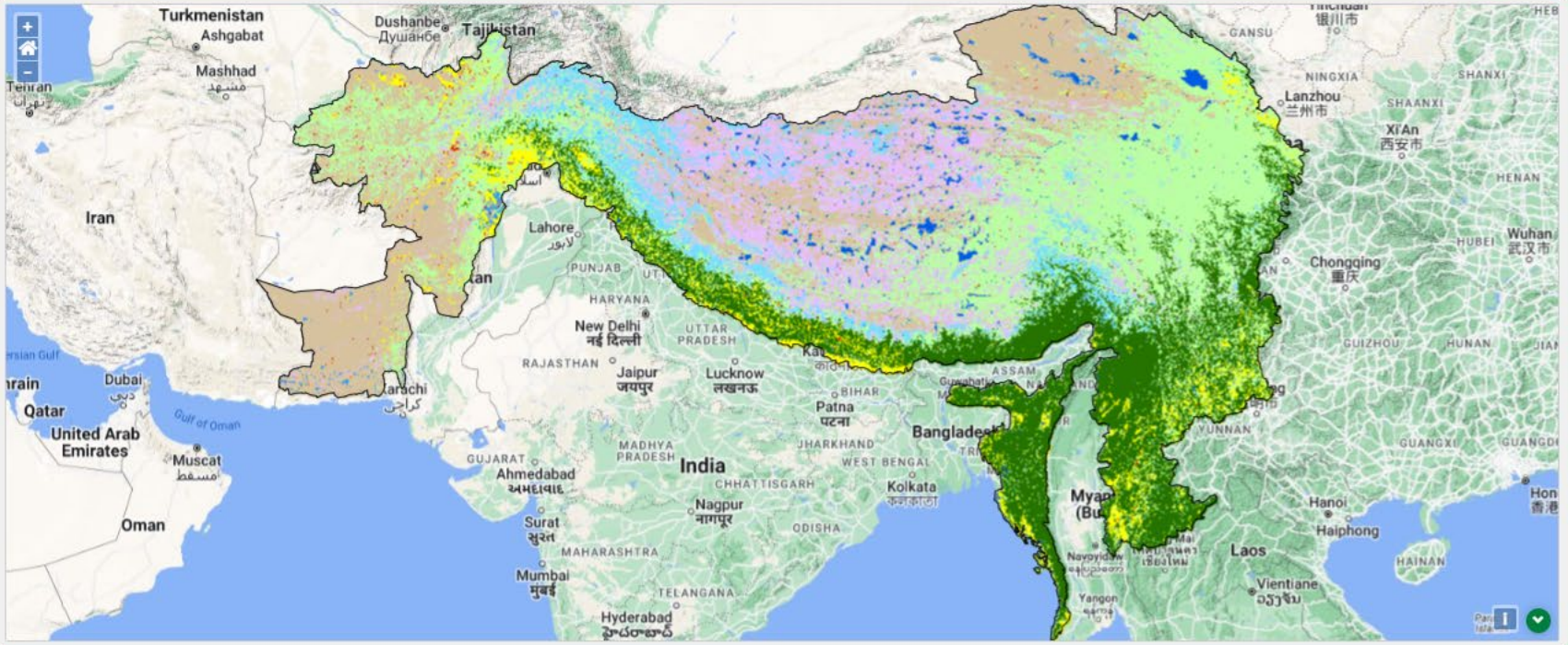
ICIMOD

Parameters

- Hindu Kush Himalaya region
- Ecoregion
  - Eastern Himalayan Alpine Meadows
- Biodiversity hotspot
  - Himalaya
- Draw polygon

Year: 2021

Show trend



Layers

- HKH boundary
- Ecoregion
- Biodiversity hotspot
- Land cover
  - Forest
  - Grassland
  - Cropland
  - Bare soil
  - Bare rock
  - Built-up
  - Snow and glacier
  - Water body
  - Riverbed

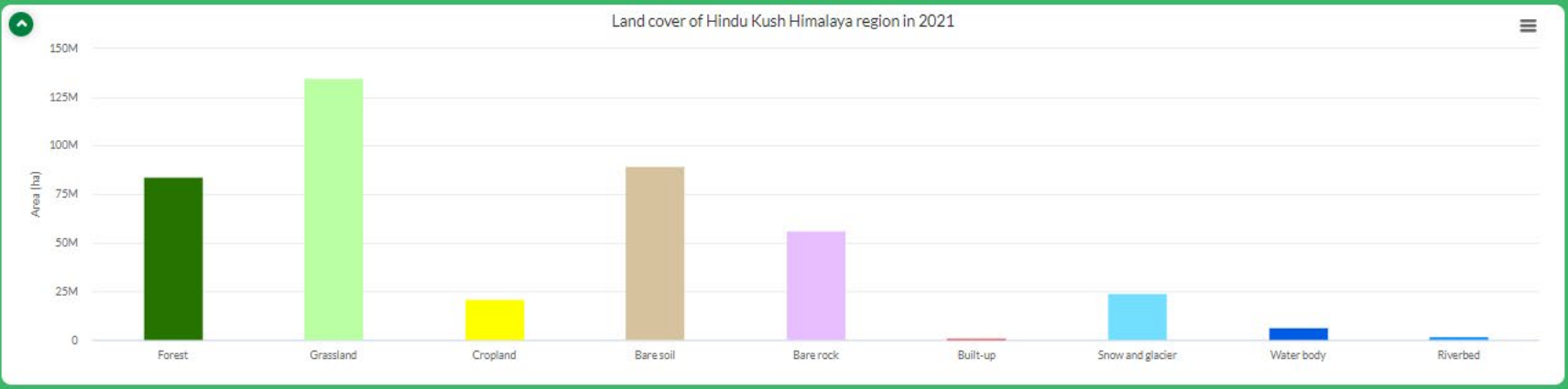
Useful links

Data

Land cover of HKH region

Application guide

RLCMS user guide

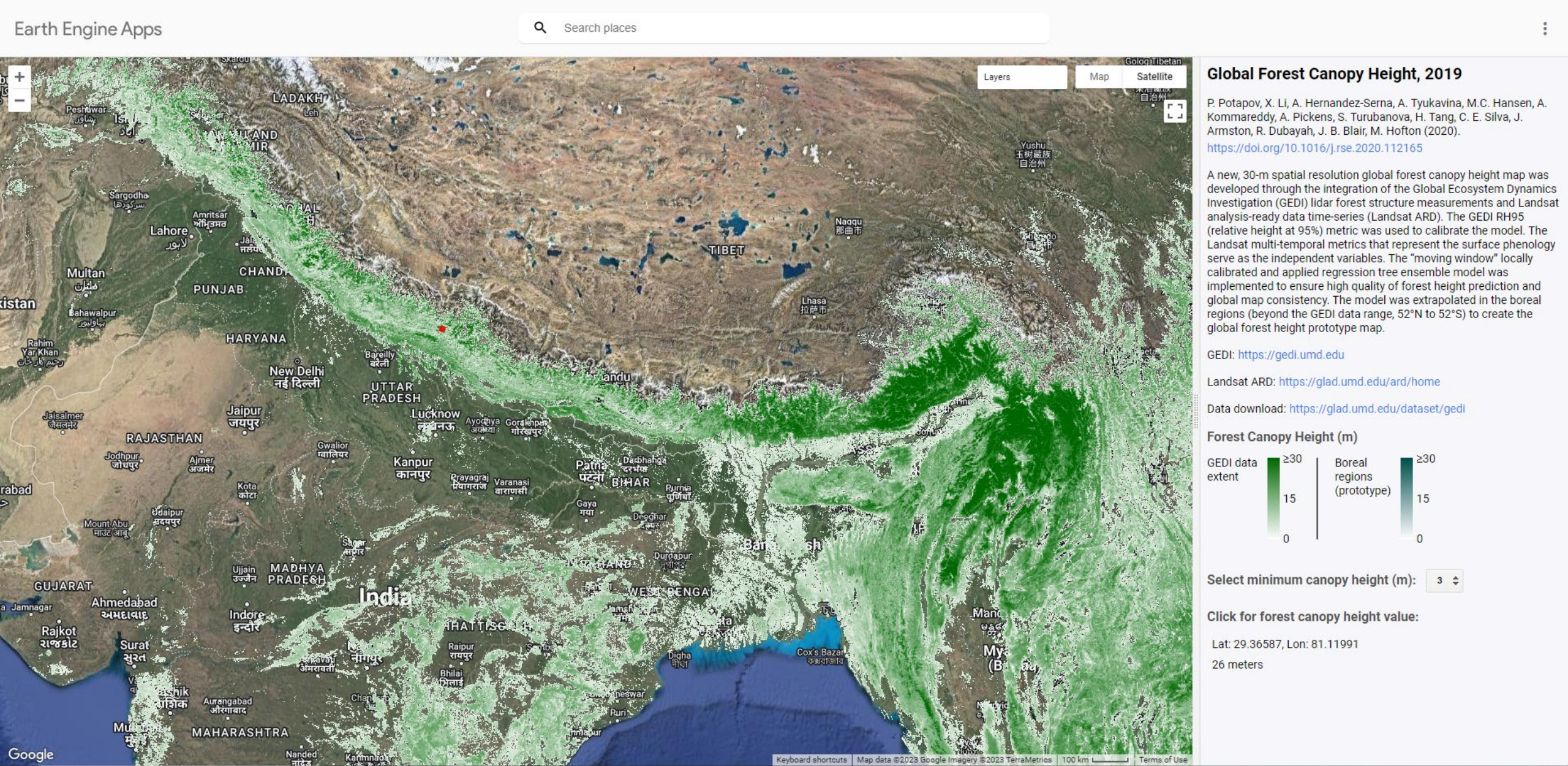


About

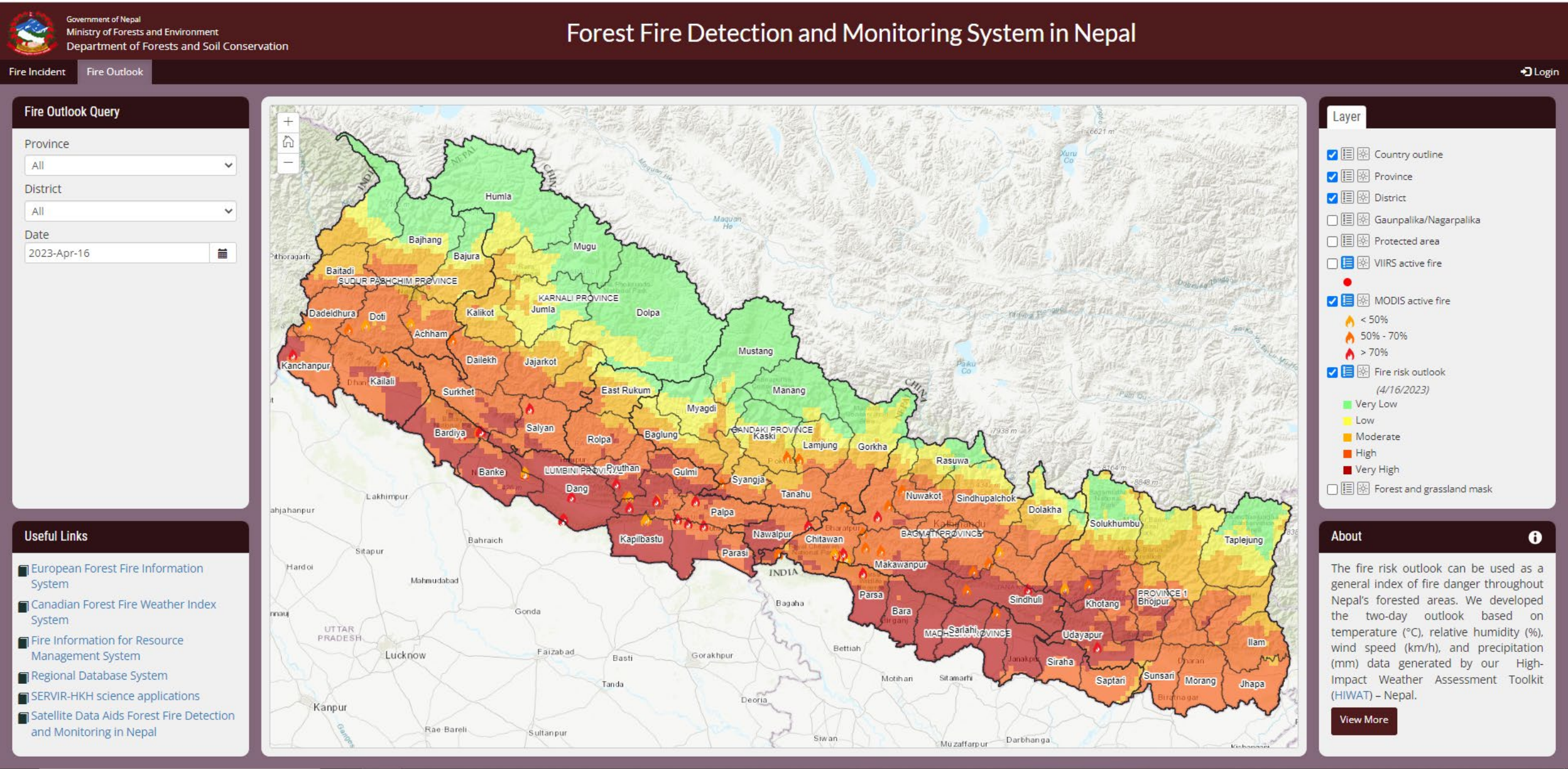
The web-based application provides easy access to the harmonized land cover database for the entire HKH region over 2000–2018.

View More...

Monitoring forests



Forest fires as a major cause of forest degradation



Challenges

- Triple planetary crisis involves complex and interconnected issues
- Advancements in EO provides more options for data, however, data on human dimension still a major gap
- Diverse mountain environments make it more challenging for finding fit for purpose EO data and analysis
- Capacity of institutions limited to adopt the emerging tools and utilize the volume of information for meaningful actions

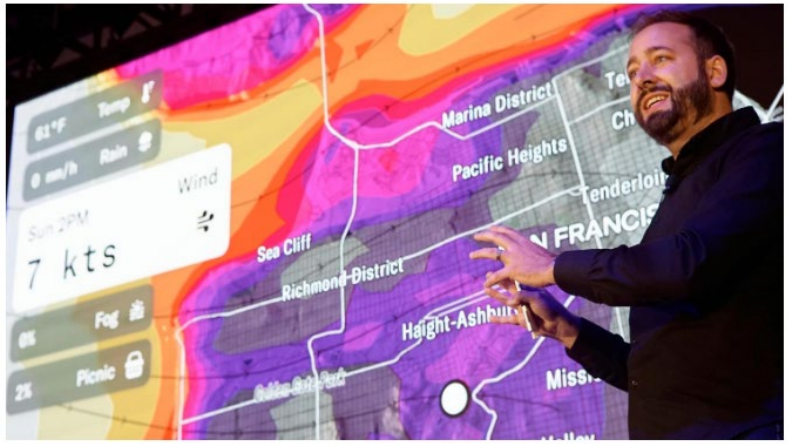
Opportunities

- Triple planetary crisis accepted as a global problem by nations
- More EO data available with free access making it possible to develop new services
- Advancement in platforms and analytics (AI, big data, cloud computing etc) have made generation and dissemination of information more efficient
- Global digital literacy increased significantly after the pandemic

SCIENCE

AI set to take the world of weather forecasting by storm

A revolution in meteorology means far more reliable predictions may be on the horizon



Alex Levy is the co-founder of Atmo, a start-up that claims to have developed the first live global medium-range weather forecast based purely on an AI model


Thank You