Upper Indus Basin Network

Country progress report

Progress of the 6 Technical working groups (TWGs)

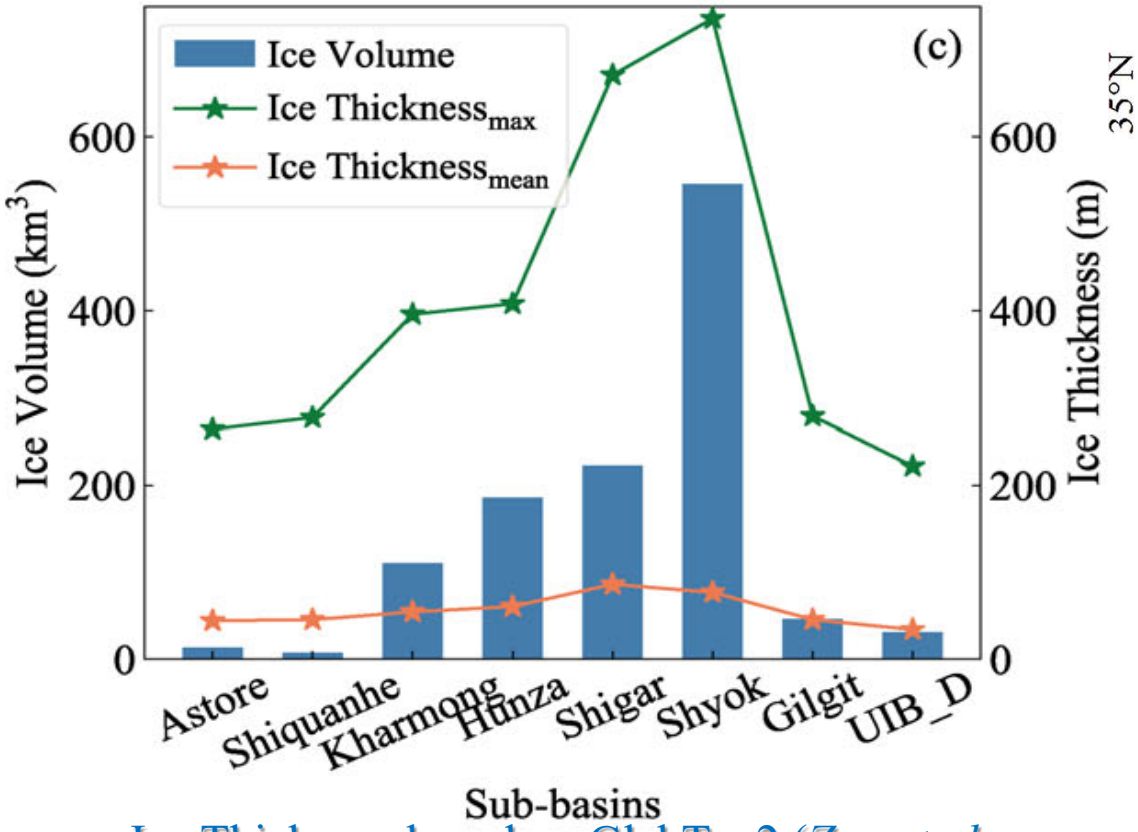
2 NSFC-Pakistan Science Foundation(2016-2019);
1 NSFC-ICIMOD joint project (2018-2020);
1 normal NSFC project (2018-2021);
2 youth NSFC project (2019-2021; 2021-2023).

24 papers by China chapter members

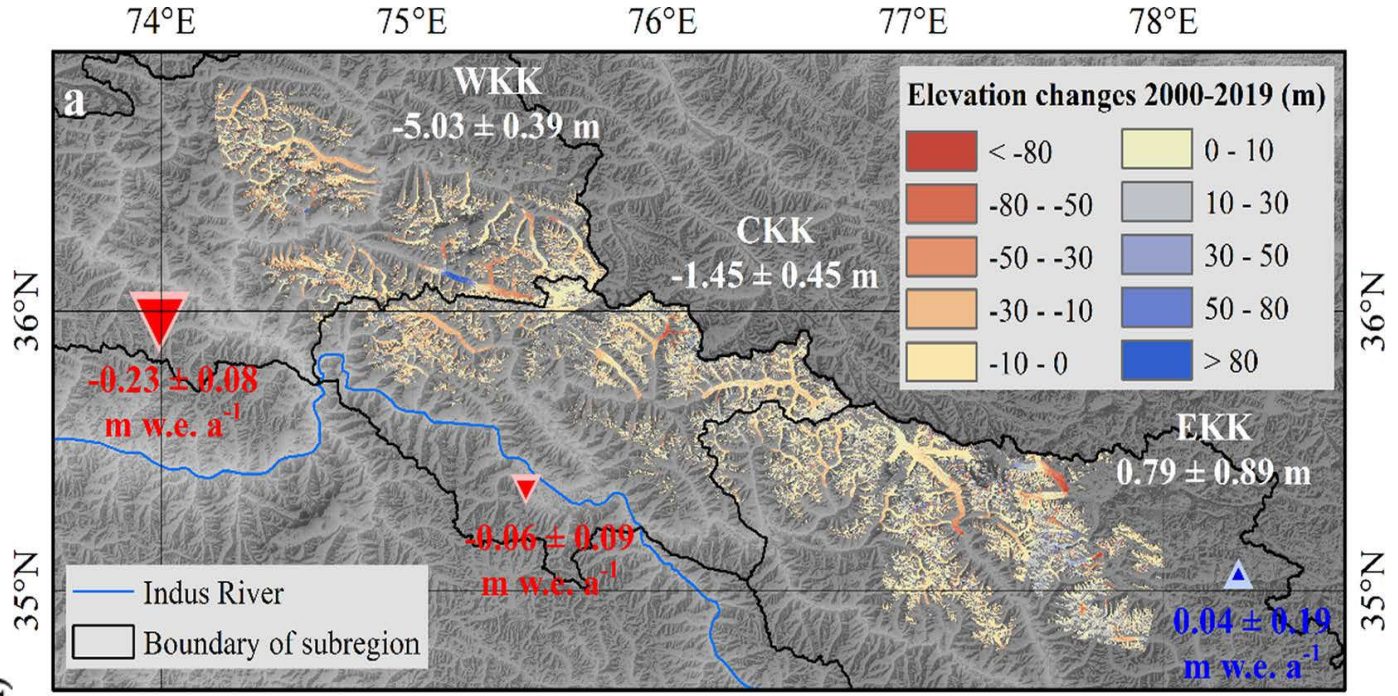
1. climatic trends and variability： 4 papers
2. cryosphere components： 8 papers
3. impact of climate and cryosphere dynamics on the water availability： 2 papers
4. Future water demand： 4 papers
5. natural hazards： 6 papers

Glacier & snow

- Glaciers in the UIB experienced a balanced or slight negative mass budget of 0.08 ± 0.07 m w.e. a^{-1} in the early 21st century. (*Wu et al., 2021*)



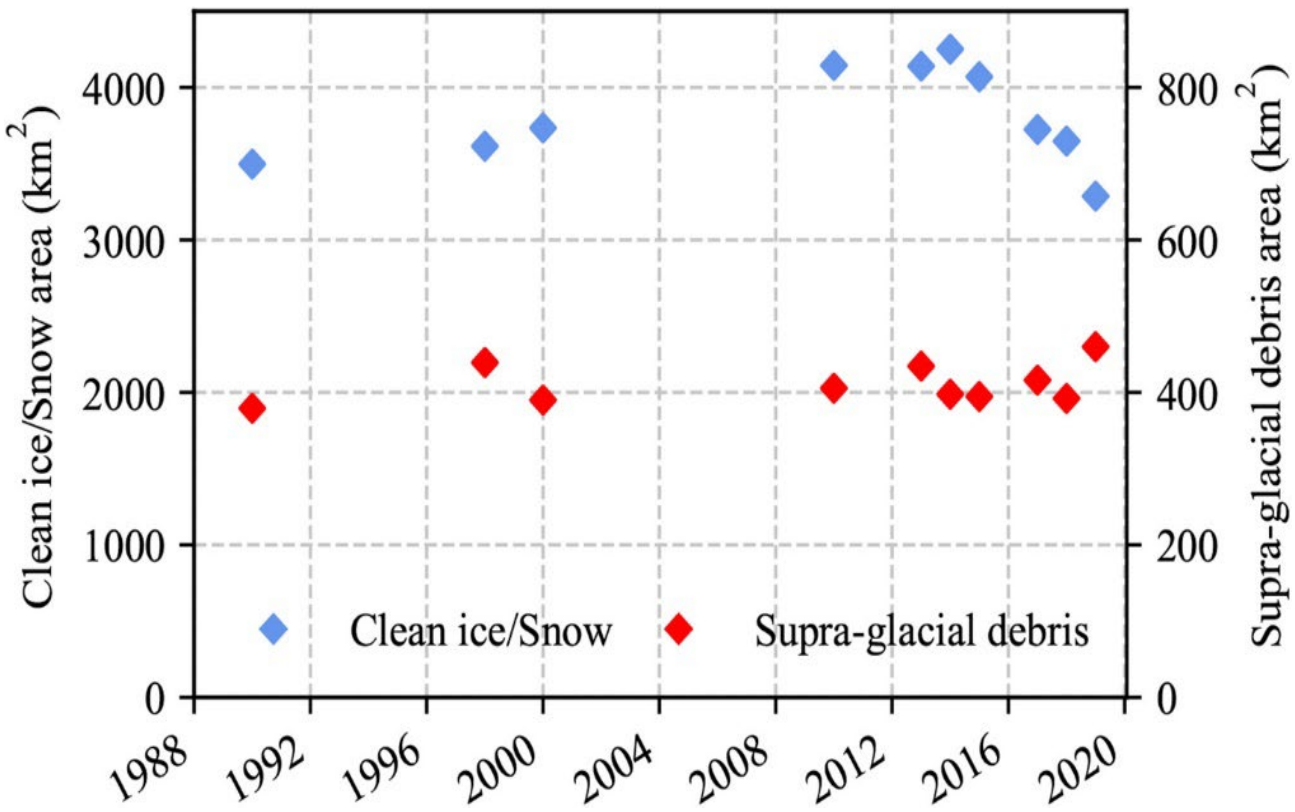
Ice Thickness based on GlabTop2 (*Zou et al., 2021 ,Hydro. Proce.*)



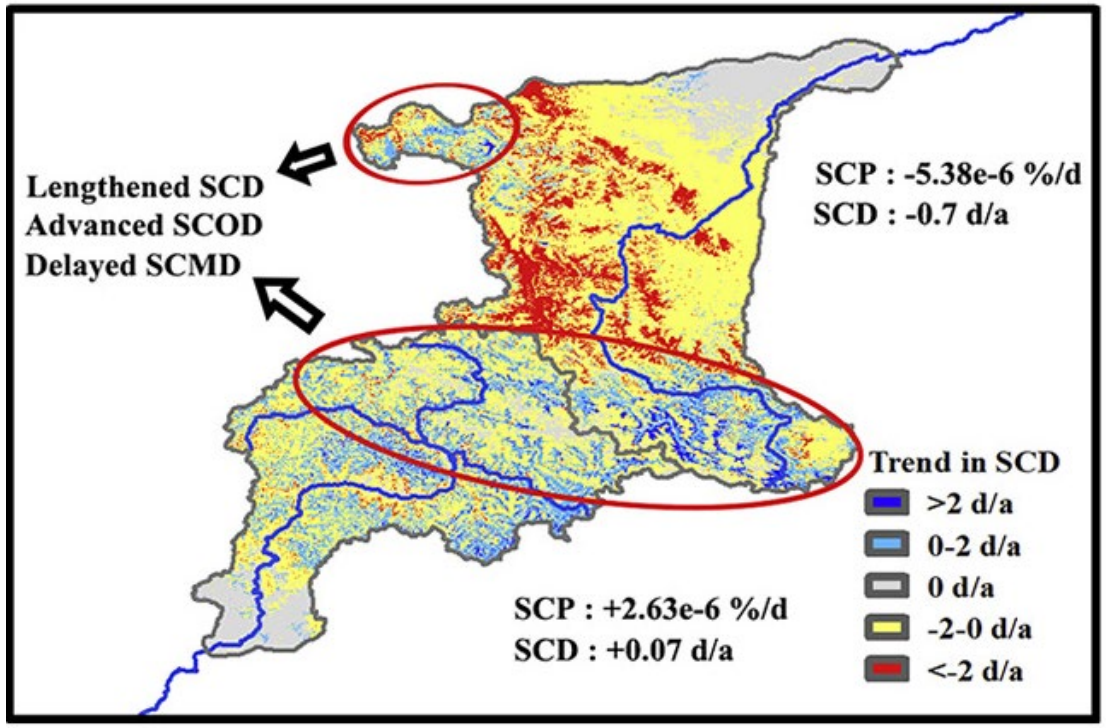
Elevation changes from 2000-2019 (*Wu et al., 2021 ,JoH*)

- The ice thickness of the UIB varied from 0 to 736.0 ± 110.0 m, with an average value of 74.5 ± 11.2 m. (*Zou et al., 2021*)

- Snow cover extent exhibited an increase in the UIB. (*Yi et al., 2021*)



Debris cover in Hunza from 1990~2020
(Xie *et al., 2020 ,Font. in Ear.*)



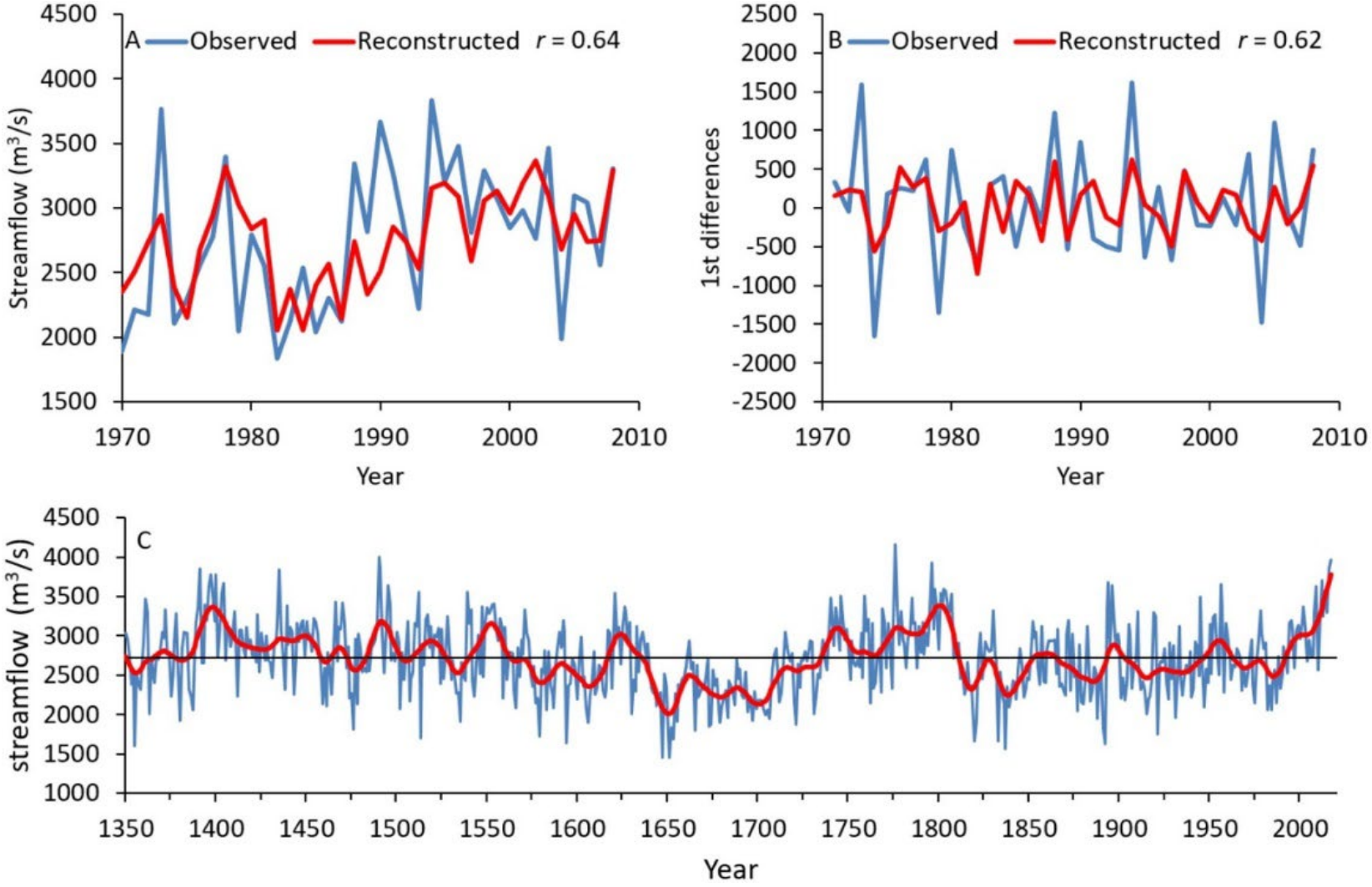
Snow cover characteristics in the Western and central Karakoram Mountains. (snow covered days, SCD; snow cover percentage, SCP; snow cover melting dates, SCMD; snow cover onset dates, SCOD) (*Yi et al., 2021 ,Atmos. Res.*)

- The supraglacial debris cover in the Hunza valley expanded by 8.1–21.3% from 1990 to 2019. (*Xie et al., 2020*)

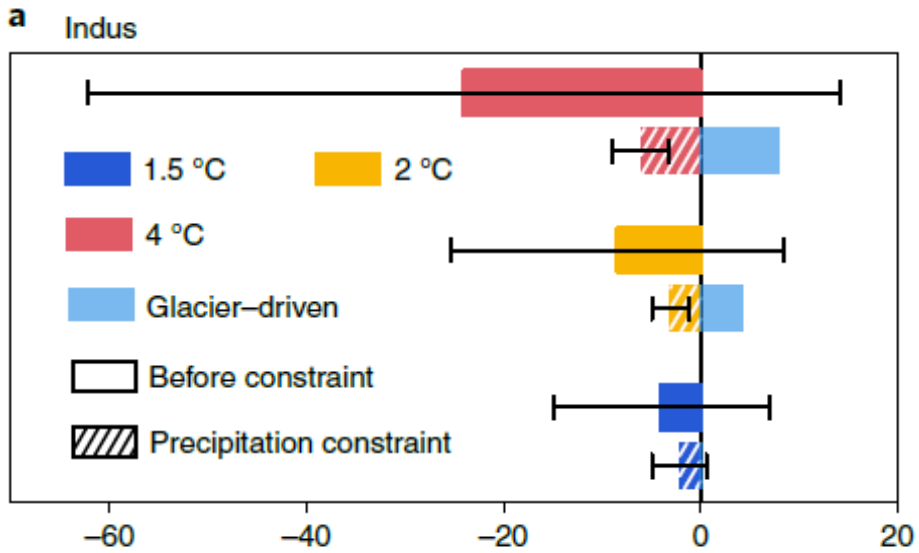
Hydrology & water

- The high level of streamflow (1990–2017) in the UIB exceeds that of any other time and is concurrent with the impact of recent climate warming that has resulted in accelerated glacier retreats across high Asia. (*Chen et al., 2021*)

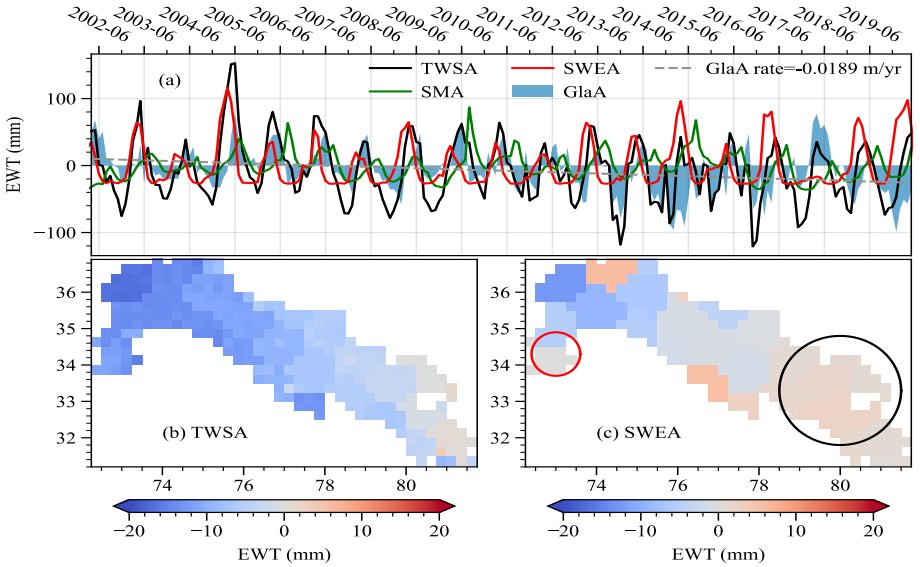
June–July streamflow reconstruction for the UIB by using a temperature-sensitive tree-ring width chronology(*Chen et al., 2021 ,ERL.*)



- In the upper Indus, glacier melt-induced runoff increase (0.2%) is not sufficient to compensate for precipitation-constrained runoff decrease (−2.1%) at 1.5 °C but the increase (4.5 and 7.9%) will override the decline in precipitation-constrained runoff (−3.0 and −6.1%) at 2 and 4 °C, respectively. (*Wang et al., 2021*)
- Accelerated melting of glacier resulted in a slight decrease in terrestrial water storage (TWS) in the UIB. (*Zhu et al, 2021*)
- The precipitation in UIB derived from reanalysis dataset (e.g., ERA5) should be corrected before its application. (*Sun et al, 2021, Environ. Res. Commun ; Shafeeque et al., 2019, JHM*)



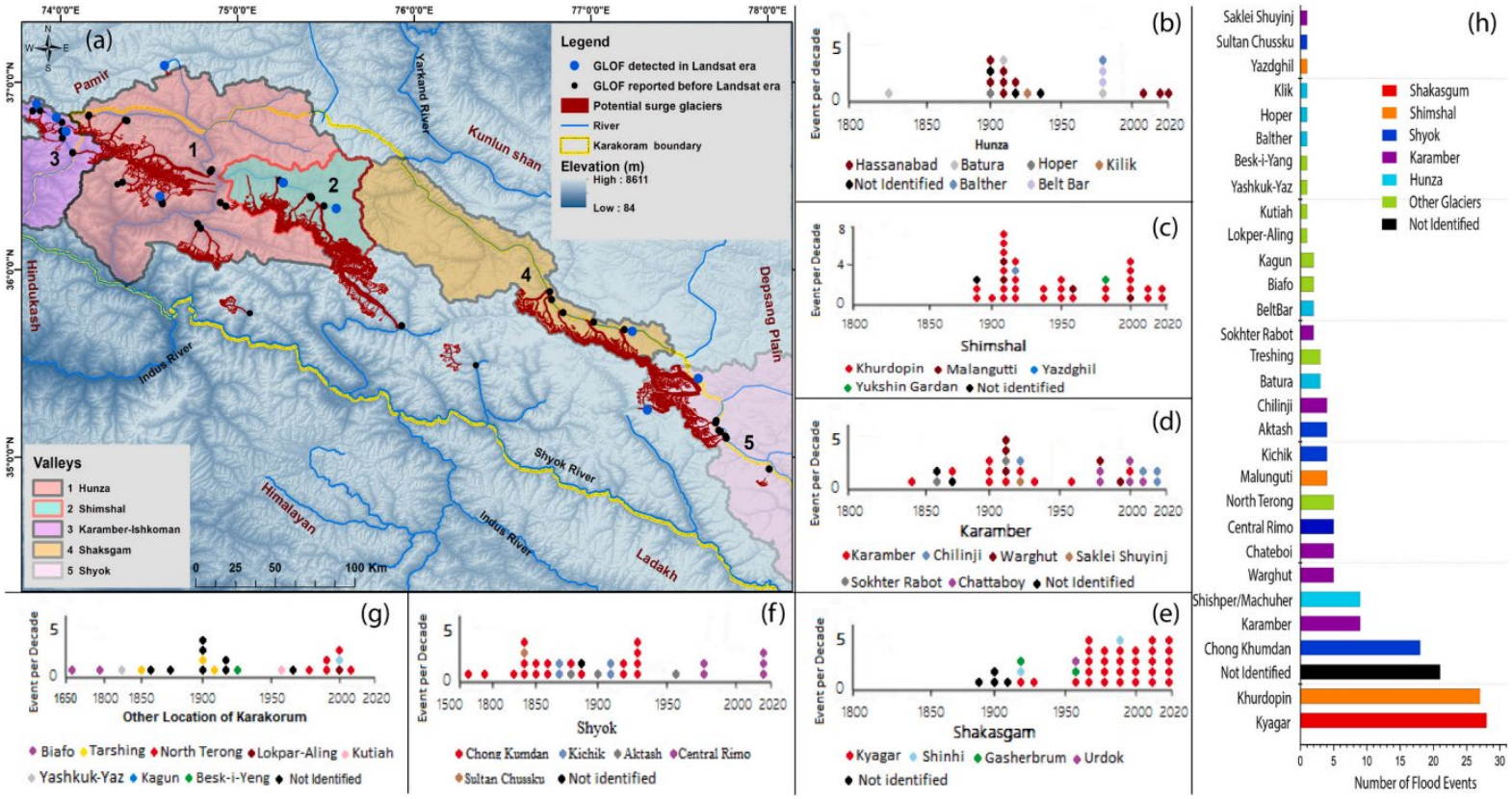
Simulated and constrained projections of wet-season runoff change at different warming levels.(*Wang et al., 2021 ,NCC.*)



TWS over the UIB.(*Zhu et al., 2021 ,STOTEN.*)

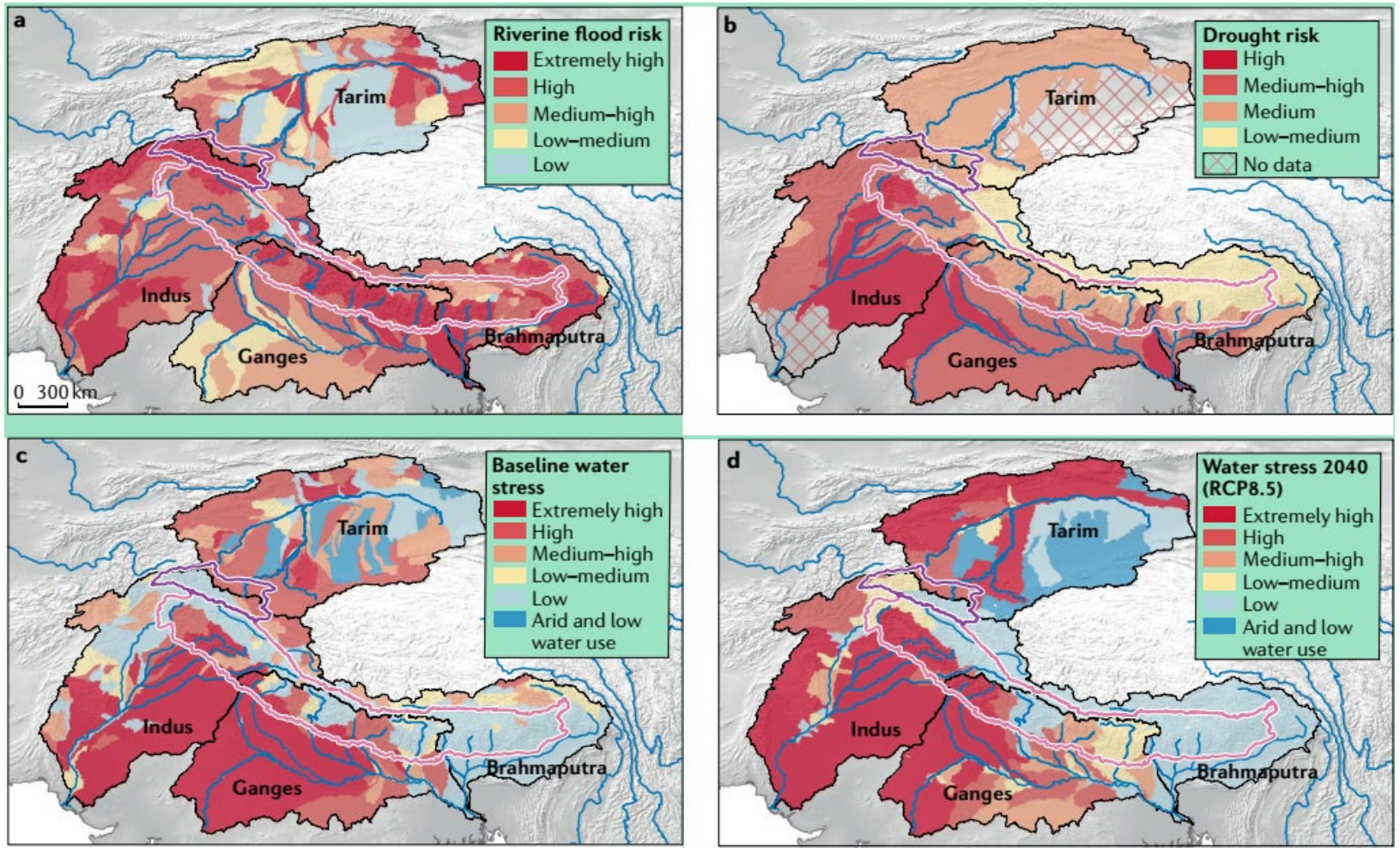
The natural hazards

- Increasing glacial lake outburst flood hazard in response to surge glaciers in the Karakoram. (Bazai, N. A. et al. 2021. ESR)



Glacier lake outburst floods (GLOFs) in the Karakoram. (Bazai, N. A. et al. 2021.)

- Run-off flooding is mainly extreme-rainfall-induced or from temperature-induced melt (of seasonal snow and glacier ice). Flooding disasters mainly occur during June–September, controlled by summer monsoon rainfall, whereas meltwater-induced floods occur during May–September.
- The magnitude and frequency of floods within the H-K basins are projected to increase by the EOC as a consequence primarily of increasing precipitation and precipitation extremes, plus a further increase in ice Melt. (Nie et al. 2021. Nature reviews earth & environment)



Hydrological risks and water stress in the himalaya and Karakoram basins. (Nie et al. 2021. Nature reviews earth & environment)

Progress based on intermediate results of UIBN-CN

1. **Regional and transboundary collaborative projects on science and capacity building**

   ANSO（Alliance of International Science Organizations）-CAS Collaborative Research

   (part related to UIBN)

   1）Multi-model-Integrated Subseasonal-to-Seasonal Prediction and Application in Disaster Risk Reduction
   2）Collaborative Research on Feasible Technologies and Strategies for Safe Drinking
   3）Water in Southeast and South Asian “Belt and Road” Countries
   4）ANSO Atmosphere Observation Network Serves for Belt and Road Initiative
   5）Research on rapid acquisition of remote sensing image and its application technology in commercial aerospace
   6）Research collaboration on Thailand new synchrotron light source facility (SPS-II)

2. **ANSO fellowships (some for UIBN country students)**

   Scholarships for 200 MSc and 300 PhD students study in CAS institutes each year

Future plans for the country chapter

1. What are the key plans for the country chapter? (In line with the intermediate results in slide 3)
2. How is the country chapter thinking of sustainability? (its integration with existing institutional mechanisms fundraising , applying for grants)

   NSFC collaborative projects

   MOST for international collaboration
3. What are proposed country chapter meeting dates for 2021 (dates, venues/virtual)

   Possible to hold a workshop on issues in UIB together for the UIBN-CN meeting in August with the support from ICIMOD


Thank you