Future upstream water consumption and its impact on downstream availability in the transboundary Indus basin

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10 questions to be addressed by the UIBN

 What were the climatic trends and variability in the basin in the past, and how will they be in the future?
What is the state of various cryosphere components (glacier, snow, permatrost), how are they are changing with time, and how will they change in the future under climate change?

3) How can the present observation system be strengthened to support previous questions?

4) How to enhance the effectiveness of data collection, quality control and dissemination at national and regional levels?

5) How will climate change and cryosphere dynamics impact the water availability in the future?

6) What will be the water demand scenario of the future?

(7) How can the supply-demand gaps be addressed?

8) What are the most suitable and sustainable development options for the upstream part of the basin?

9) What are the natural hazard hotspots and how is the vulnerability changing?

10) What could be the impact of cryospheric changes on ecosystem?

Upstream-downstream water accounting

Combined downscaled climate change and socioeconomic projections

Cryospheric-hydrological and crophydrological model output

7 upper Indus sub-basins

18 lower Indus sub-basins that receive mountain water resources from a unique combination of upper Indus sub-basins







Heterogenous impact through space and time in the lower Indus basin

Low local per capita water availability (high population density) aggravates impact. Urbanisation compounds this effect by concentrating population



0	-2	-4	-6	-8	-10	-12	-14	-16	-18	-20	-25→

Climate change increases water availability

Population growth greatly decreases water availability

Upstream consumption compounds the negative effect of population growth in the dry season

Total per capita water availability decreases





Socio-economic development increases water stress in the several upper Indus sub-basins and may cause water scarcity during the dry season



Upstream consumption causes hotspots through space and time where it compounds an already decreasing trend in lower Indus water availability



Indus basin upstream-downstream dependency increase further, and water use activities in the upper Indus become increasingly relevant



Future hydrological and adaptation studies for the Indus basin must explicitly account for this changing upstream-downstream dynamic



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THANK YOU!