The University of Vermont

UN CLIMATE CHANGE CONFERENCE UK 2021

IN PARTNERSHIP WITH ITALY

Highlands to Oceans (H2O):

Anticipatory Governance of Hydroclimatic Regime Shifts in the Transboundary River Basins

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IEDS

TWIN

Transboundary Water In-Cooperation Network

GLOBAL WATER STRESS HOTSPOTS

- **In 2018, 2.3 billion people were living in countries under water stress and 3.6 billion people faced inadequate access to water at least one month per year.**
- **By 2050, the latter is expected to be more than five billion.**

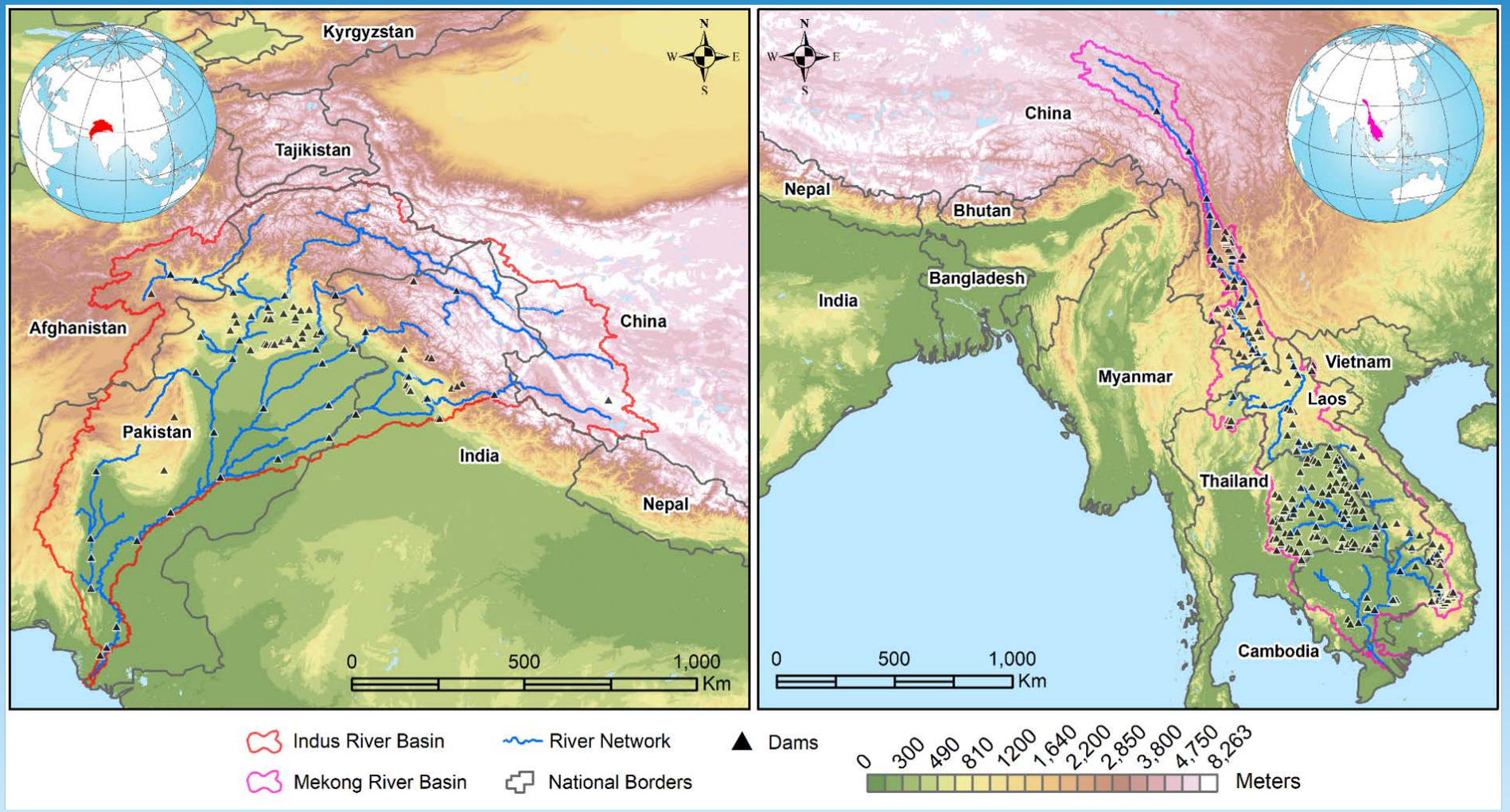
Source WMO (2021)

WMO (2021) Recommendations to improve the implementation and effectiveness of climate services for water worldwide

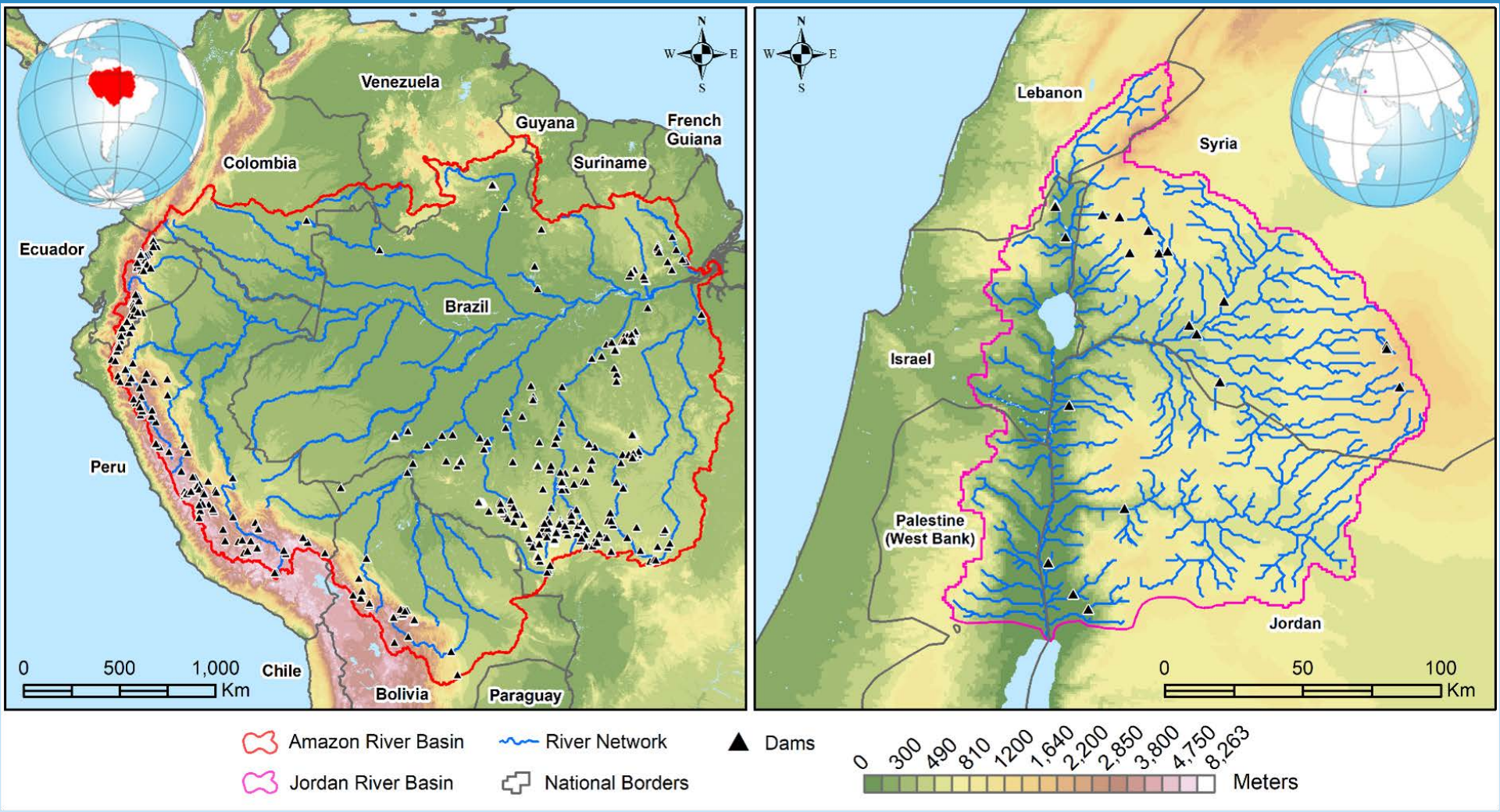
1. Invest in Integrated Resources Water Management as a solution to better manage water stress
2. Invest in end-to-end drought and flood early warning systems
3. Fill the capacity gap in collecting data for basic hydrological variables which underpin climate services and early warning systems;
4. Improve the interaction among national level stakeholders to co-develop and operationalize climate services with information users to better support adaptation in the water sector.

- **Great recommendations but WMO 2021 report assumes that riparian countries in transboundary river basins are willing to cooperate and coordinate their efforts.**

- **These recommendations ignore the imminent reality of ”water wars” within and across riparian countries due to climate change.**



Transboundary Indus and Mekong river basin boundaries spanning highlands of Tibetan Plateau across 9 riparian countries' lowlands and oceans. Locations of major dams are shown.



Transboundary Amazon and Jordan river basin boundaries spanning highlands to oceans across riparian countries. Locations of major dams are shown.

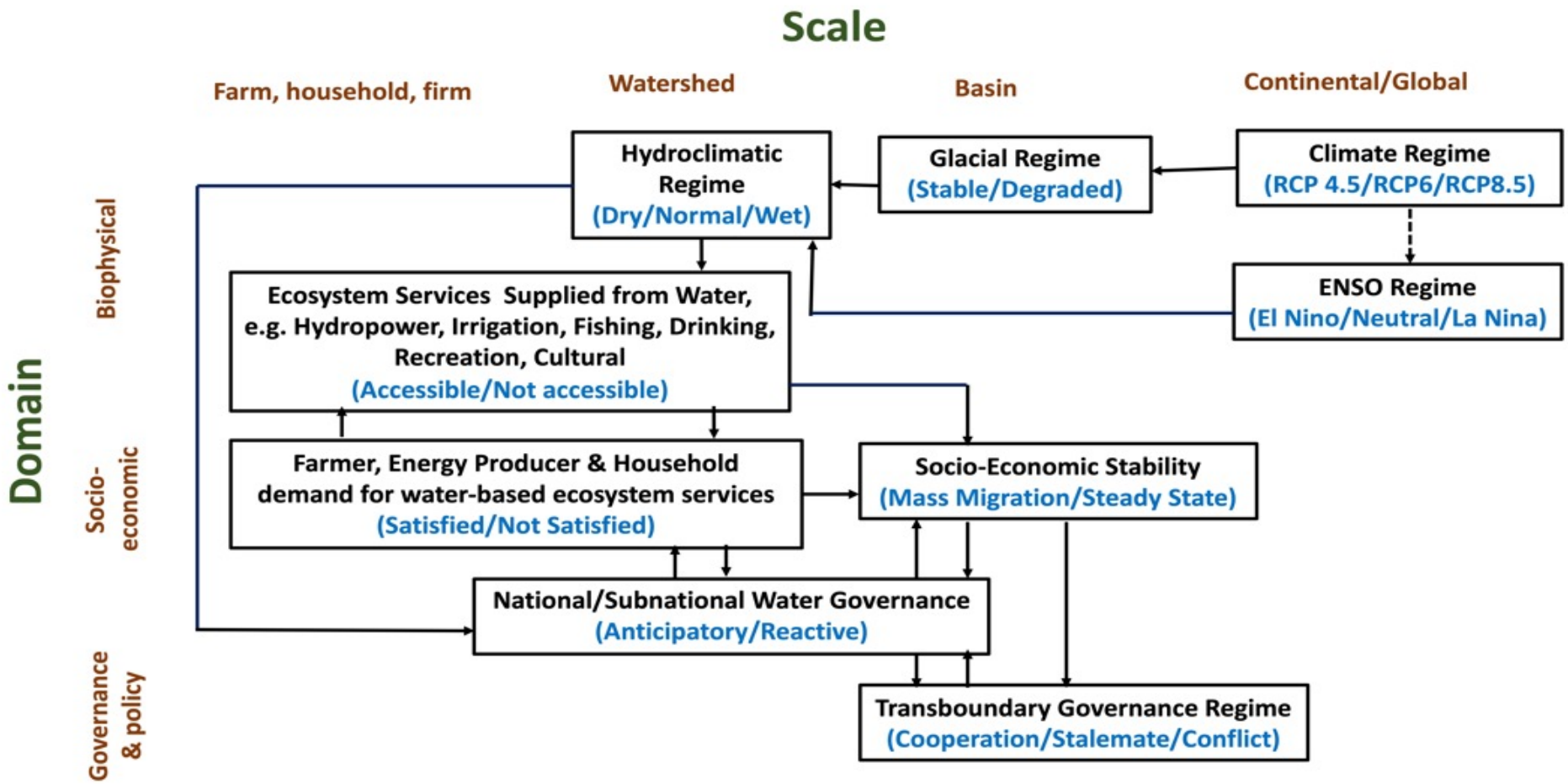


Figure 1: A Thresholds Matrix Showing the Dynamics of Cascading Regime Shifts Across Multiple Scales and Domains in the Integrated Socio-Environmental System of Transboundary River Basins

Q1: How do shifts in global climate change and ENSO regimes affect the dynamics of regime shifts in highlands (e.g. glaciers), highlands to lowlands (e.g. hydroclimatic regimes) and the provision of aquatic ecosystem services (ES) (e.g. hydropower, irrigation, fishing, drinking, recreation and cultural)?

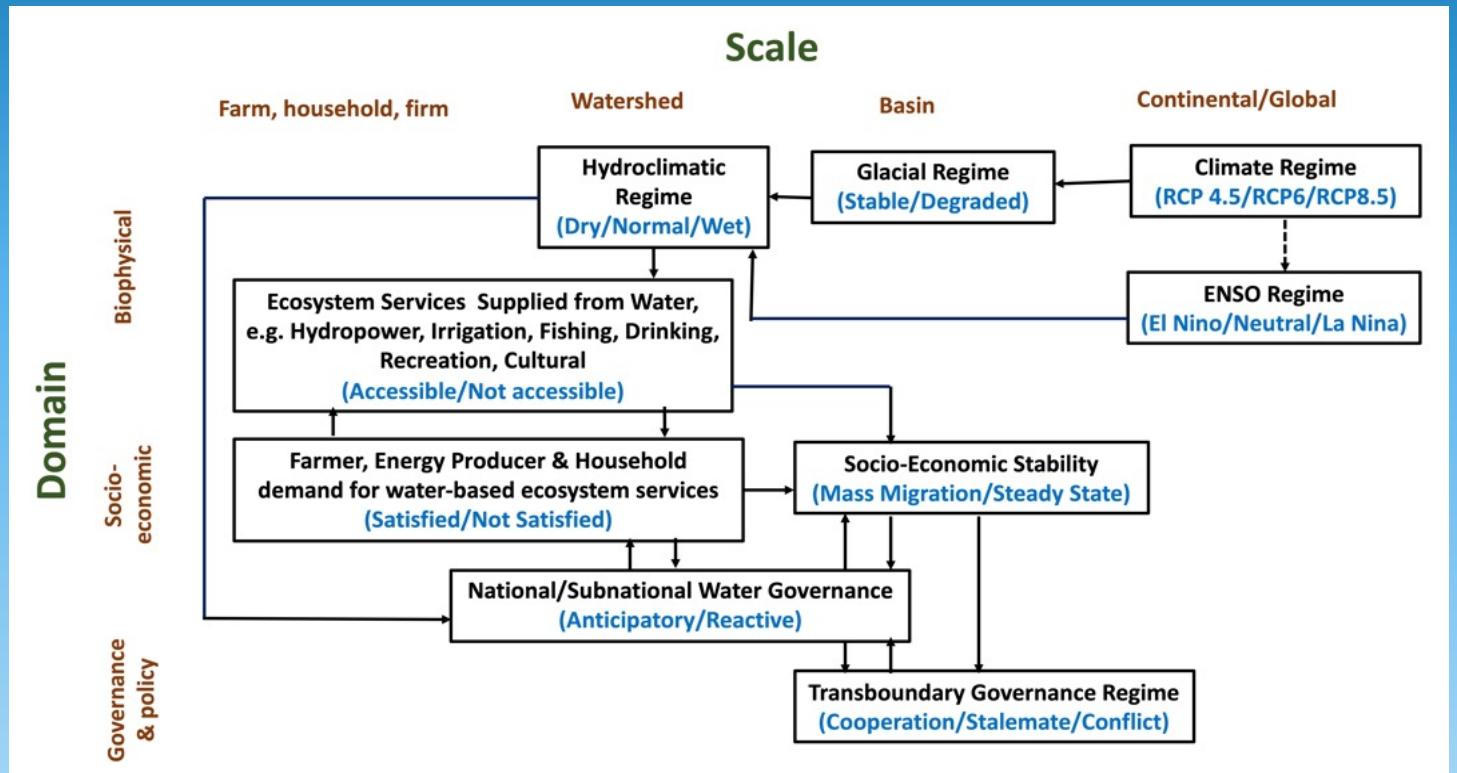
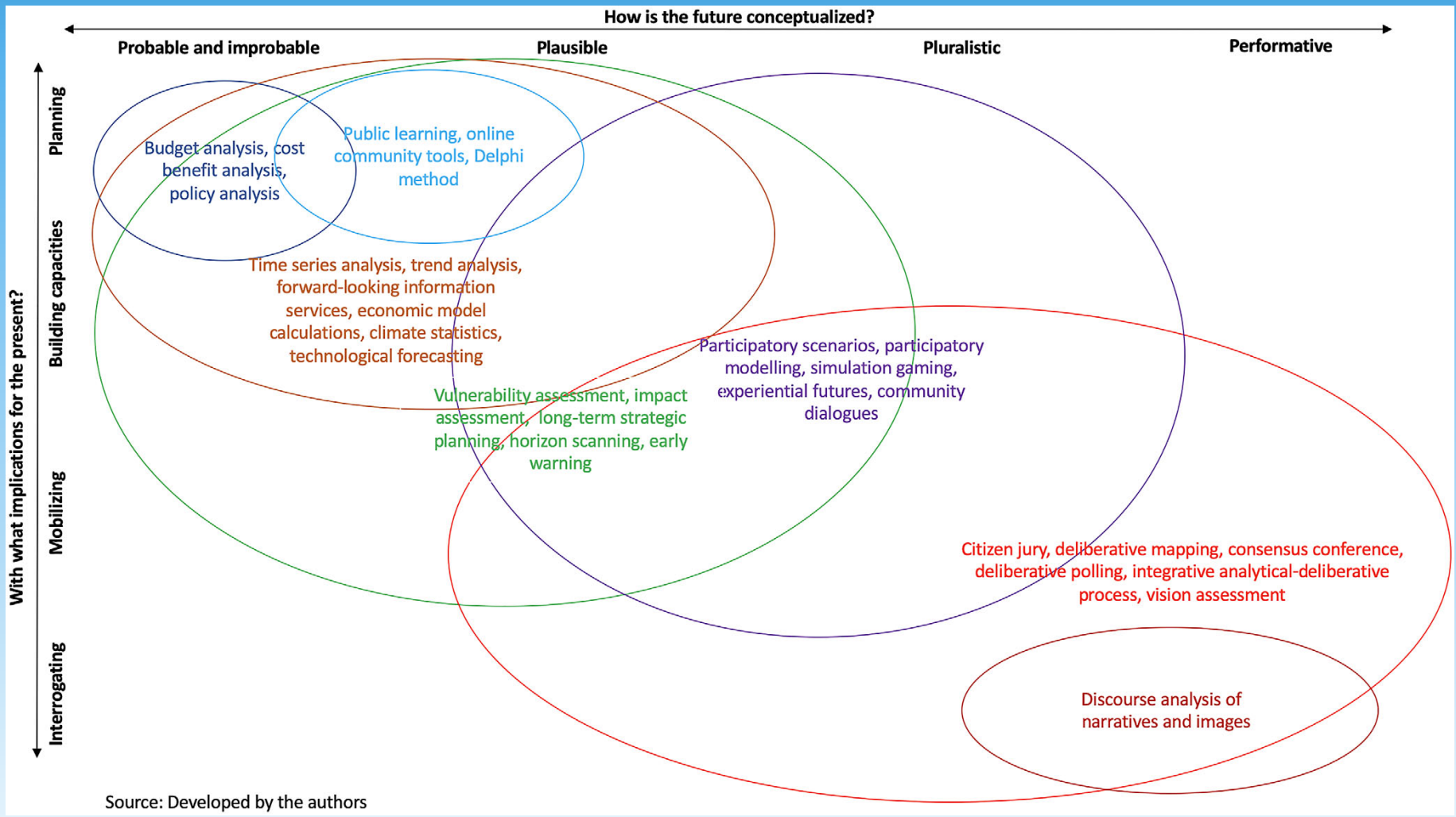


Figure 1: A Thresholds Matrix Showing the Dynamics of Cascading Regime Shifts Across Multiple Scales and Domains in the Integrated Socio-Environmental System of Transboundary River Basins

Q2: How do transboundary governance regimes (cooperative or conflictive) and national/subnational water policies (anticipatory or reactive) affect the provision of aquatic ecosystem services to farmers, energy producers and households and prevent mass migrations under alternate climate change and ENSO regimes?

Q3: Can integrative modeling of multi-scalar cascading regime shifts in transboundary river basins spanning Highlands to Oceans (H2O), provide foresight about designing sustainable solutions to watershed management problems, such as benefit-transfer mechanisms from lowlands to highlands and international treaties?

Diverse Tools and Methods of Anticipatory Governance: Engaging with the Future, Acting in the Present



Source: Muiderman, K., Gupta, A., Vervoort, J. and Biermann, F., 2020. Four approaches to anticipatory climate governance: Different conceptions of the future and implications for the present. *Wiley Interdisciplinary Reviews: Climate Change*, *11*(6), p.e673.

Calibration, Validation, & Scenario Testing of H2O Integrated Models Requires Science Cooperation and Data Sharing Among All Riparian Partners of a River Basin!

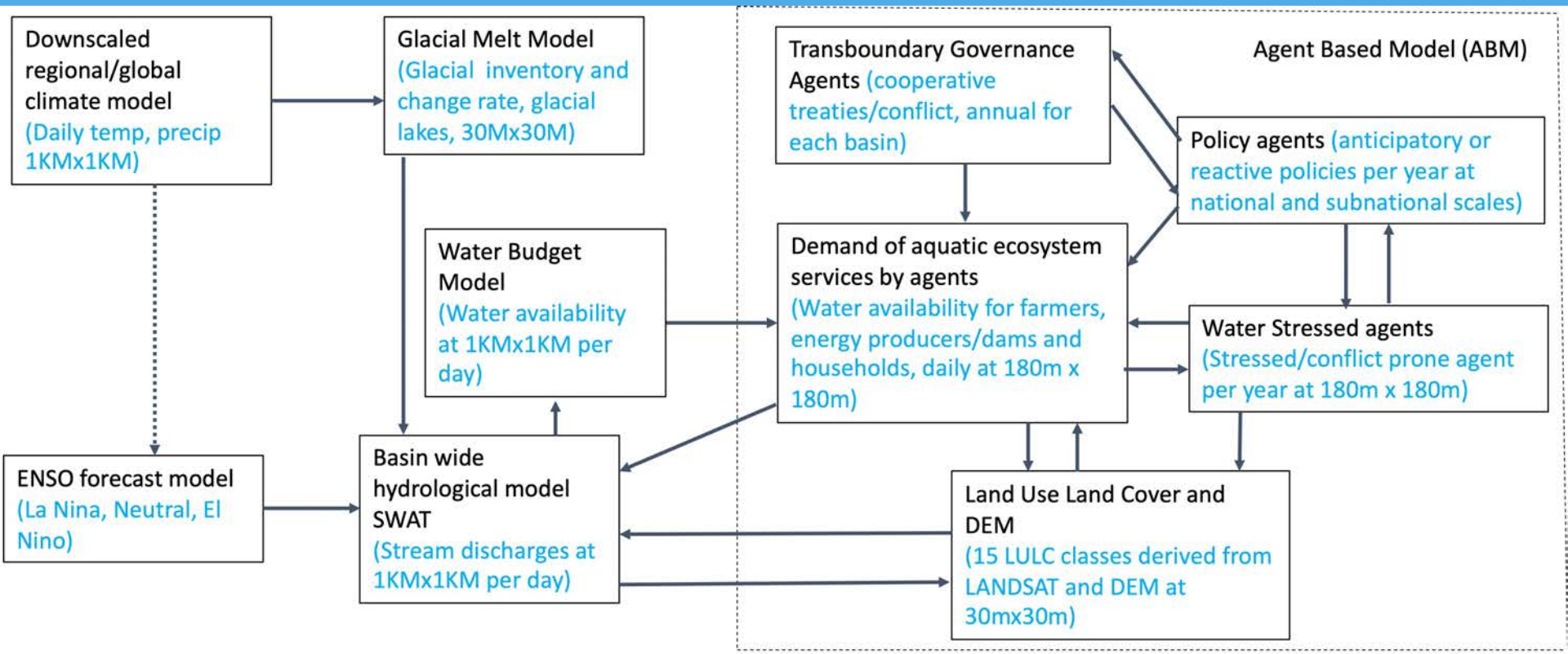


Figure 7: Computational Structure of a novel Highlands to Oceans (H2O) Integrated Regime Shift Assessment Model (H2O-IRSAM)

Securing clean water in transboundary river basins through science and environmental diplomacy

1. Set up a network of networks ”Transboundary Water In-Cooperation Network” (TWIN) www.transboundarywater.org

2. Identifying the gaps in transboundary watershed monitoring and water security early warning early action systems (e.g. flood, drought, famine, water quality early warnings)?

3. Promoting scientist to scientist (track-2) and community to community (track-3) cooperation within and across transboundary river basins

4. Integrating indigenous knowledge and wisdom with scientific knowledge to secure clean water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TWIN
Transboundary Water In-Cooperation Network
SEGS Lab
social ecological gaming and simulation
Harnessing complexity to solve problems.
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