Forest-water and its contributions to global water security

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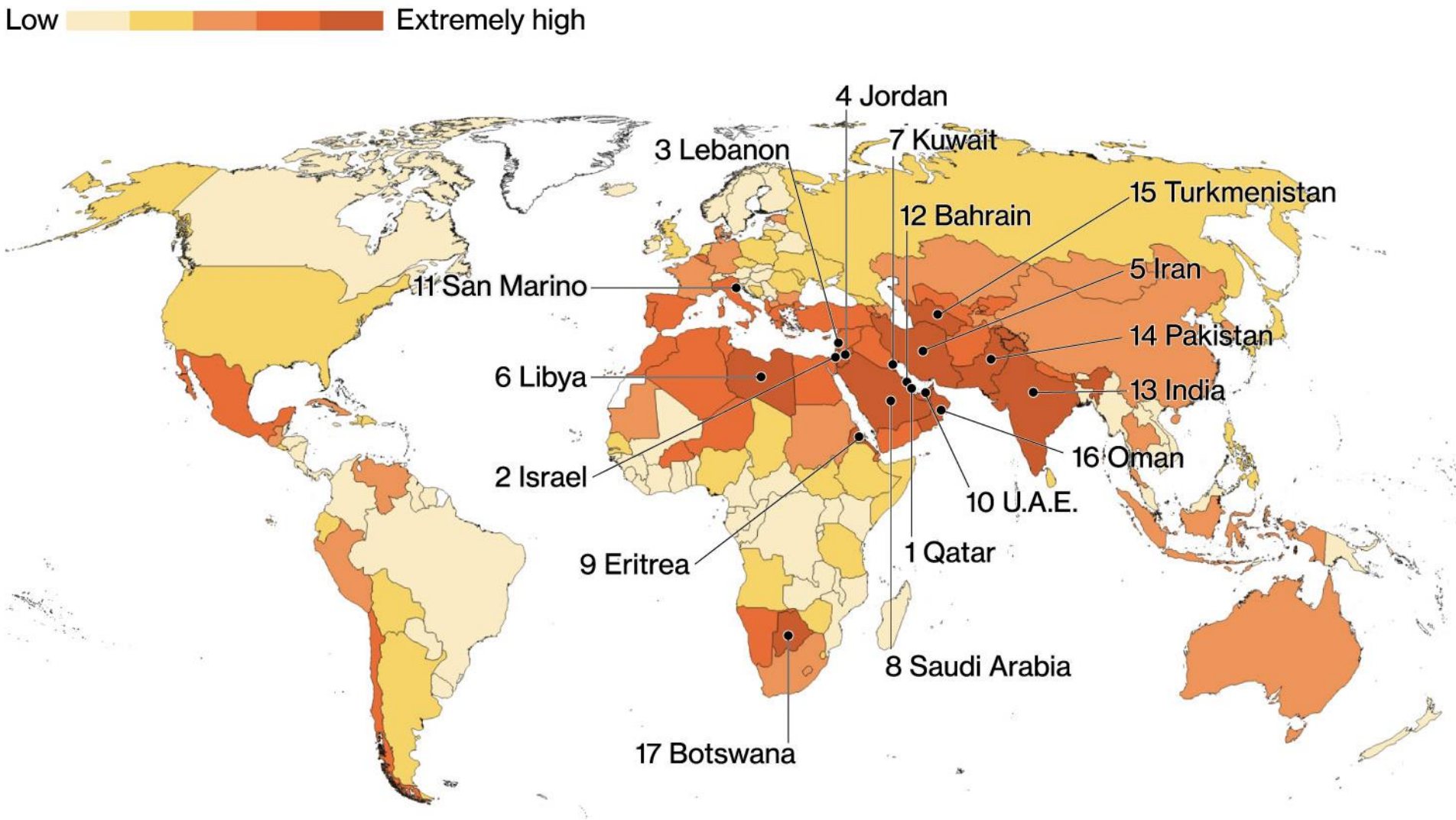
ALL-IUFRO CONFERENCE: Forests in a Volatile World. September 21-23, 2022. Vienna, Austria.

Tension over freshwater supplies is rising, especially in transboundary water systems in water-scarce regions of the planet.

Nearly 1.8 billion people in 17 countries are veering towards a water crisis in the next few years.

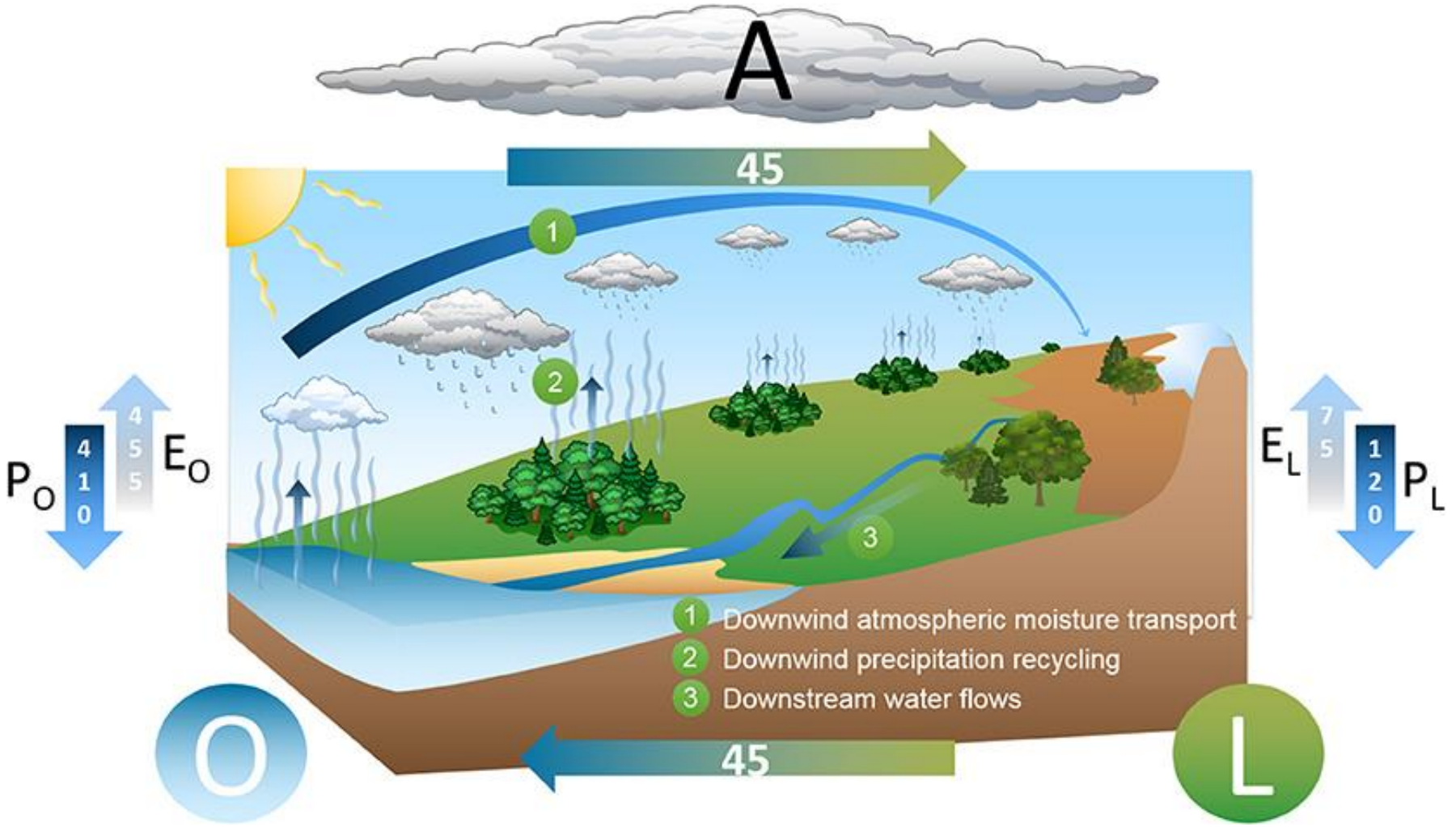


OVERALL WATER RISK

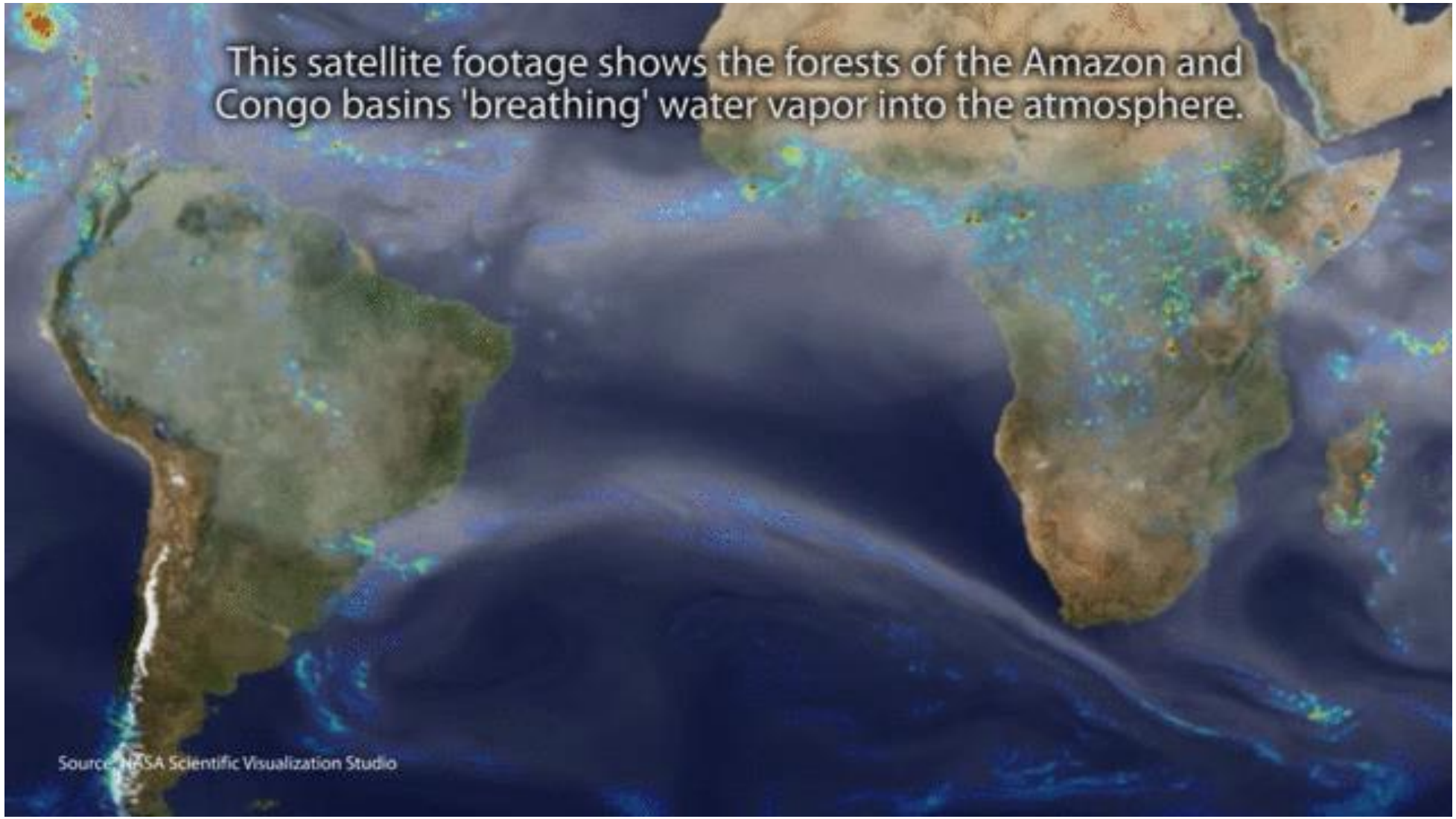
Description: Overall water risk measures all water-related risks, by aggregating all selected indicators from the Physical Quantity, Quality and Regulatory & Reputational Risk categories. Higher values indicate higher water risk. Source:WRI Aqueduct 2019

Forests are key to the provision of the world's freshwater resources.

Forests influence both "downstream" and "downwind" freshwater supplies.



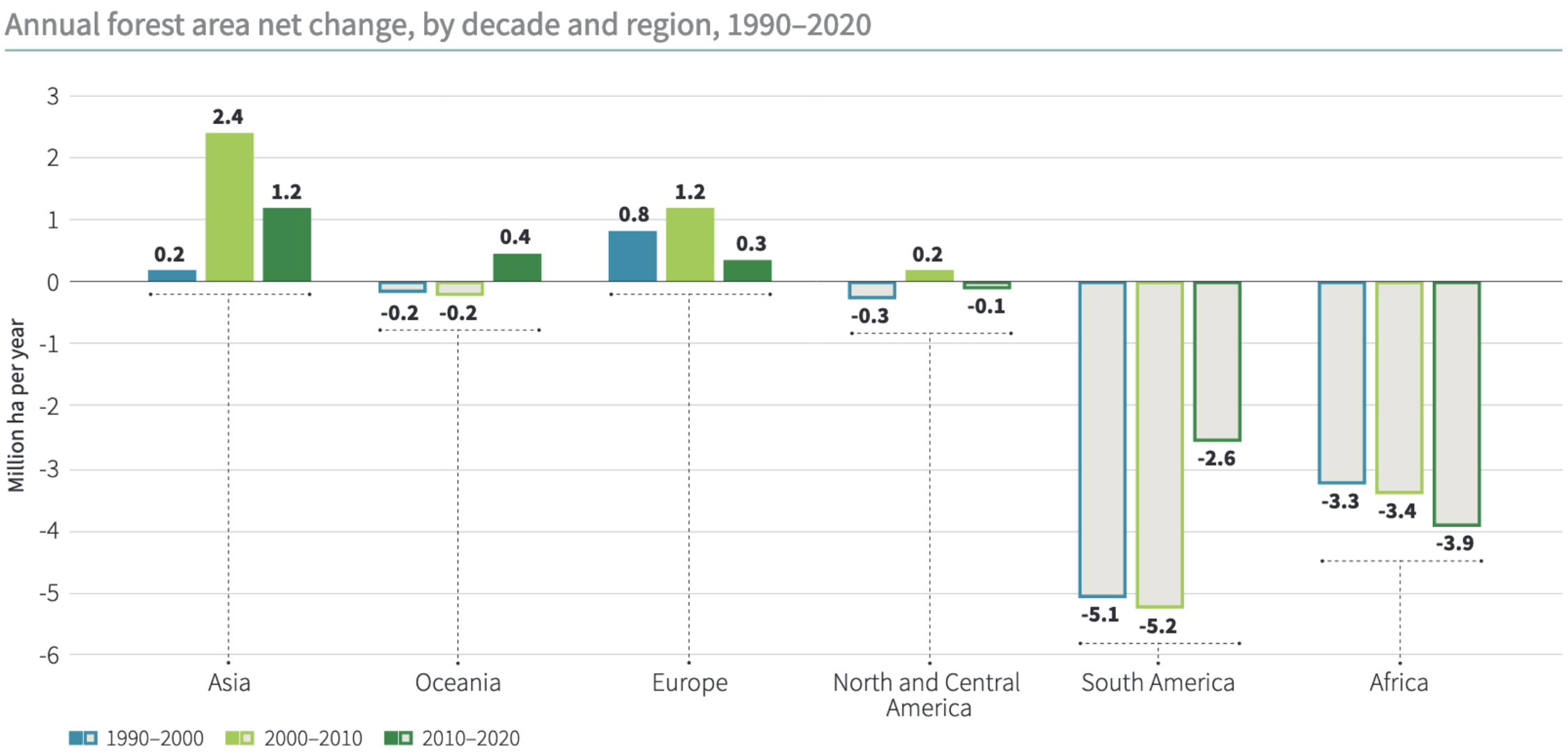
Source: Creed et al. 2019. Managing forests for downstream and downwind water. Frontiers in Forests and Global Change 2:64.



Data Source: Hansen/UMD/Google/USGS/NASA; WRI Aqueduct Global Maps 2.1 Data; NASA Water Vapor Project (NVAP); H.C. Herreshoff

Large-scale forestation efforts
are altering the global water cycle,
and these alterations are
exacerbating or alleviating pressures
on freshwater supplies.

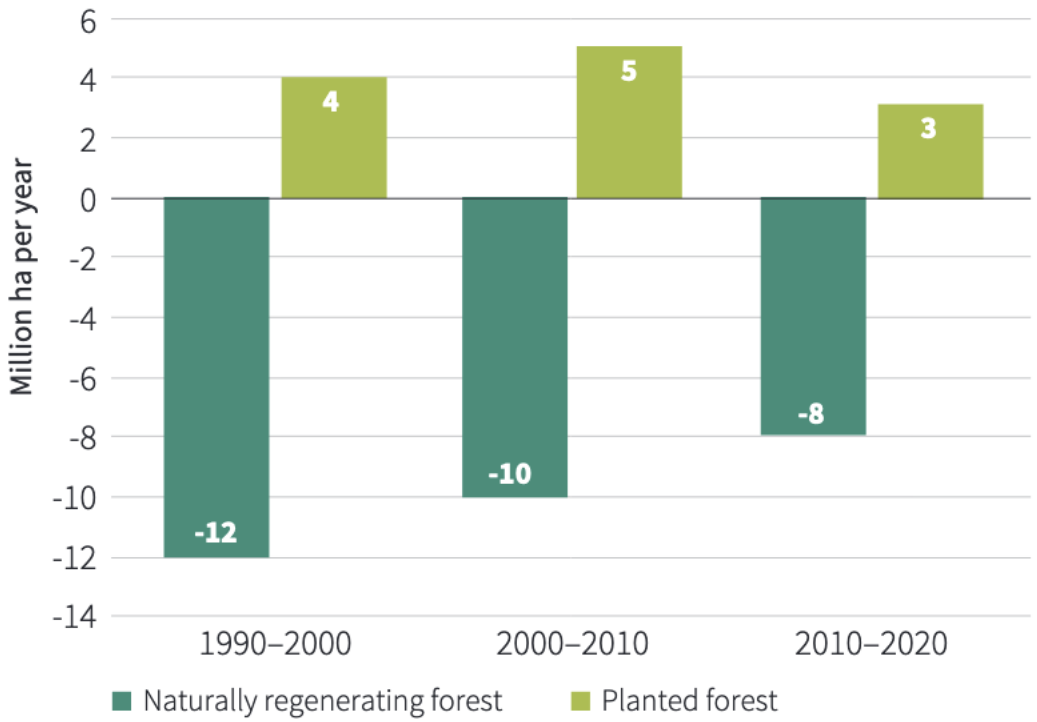
Forestation efforts are redistributing the **abundance** of forests ...



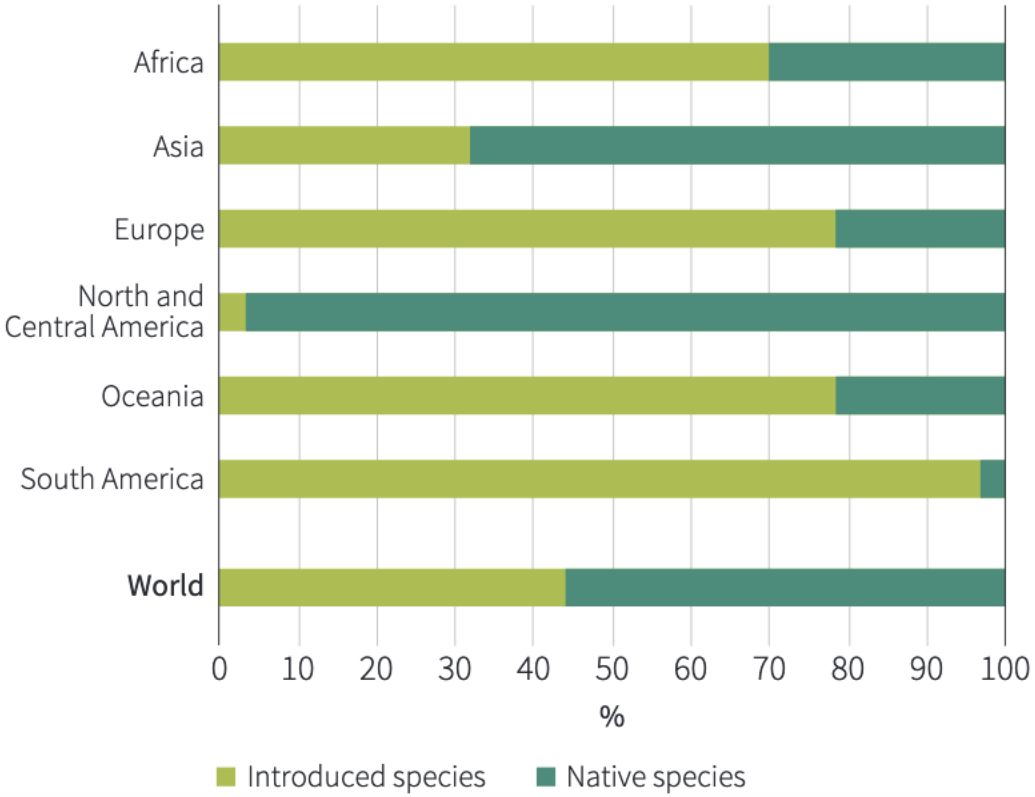
Source: FAO. 2020. Global Forest Resources Assessment 2020: Main report. Rome.

… and the **type** of forests.

Annual net change in area of naturally regenerating and planted forest, by decade, 1990–2020

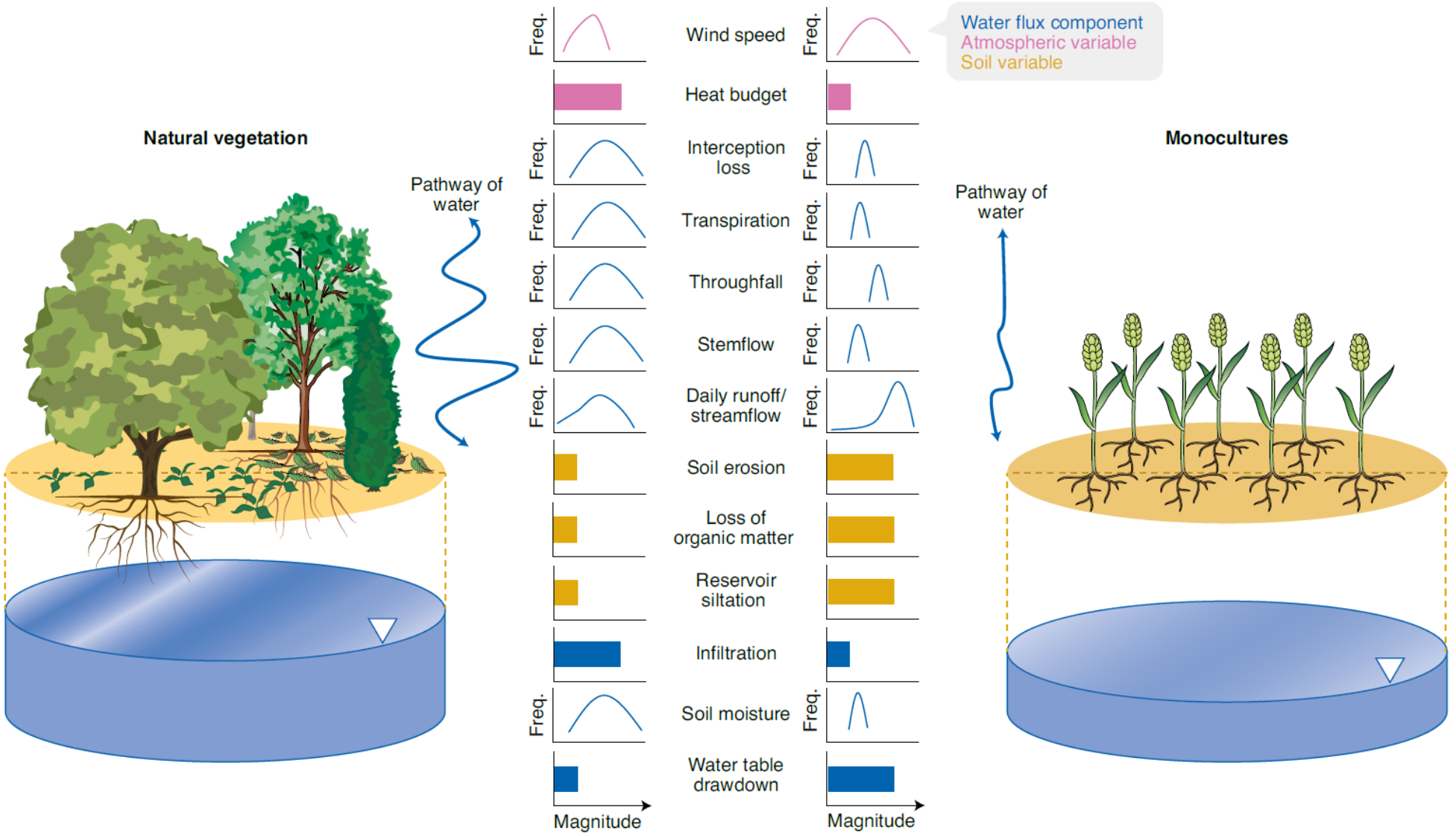


Proportion of introduced and native species in plantation forest, by region, 2020



Source: FAO. 2020. Global Forest Resources Assessment 2020: Main report. Rome.

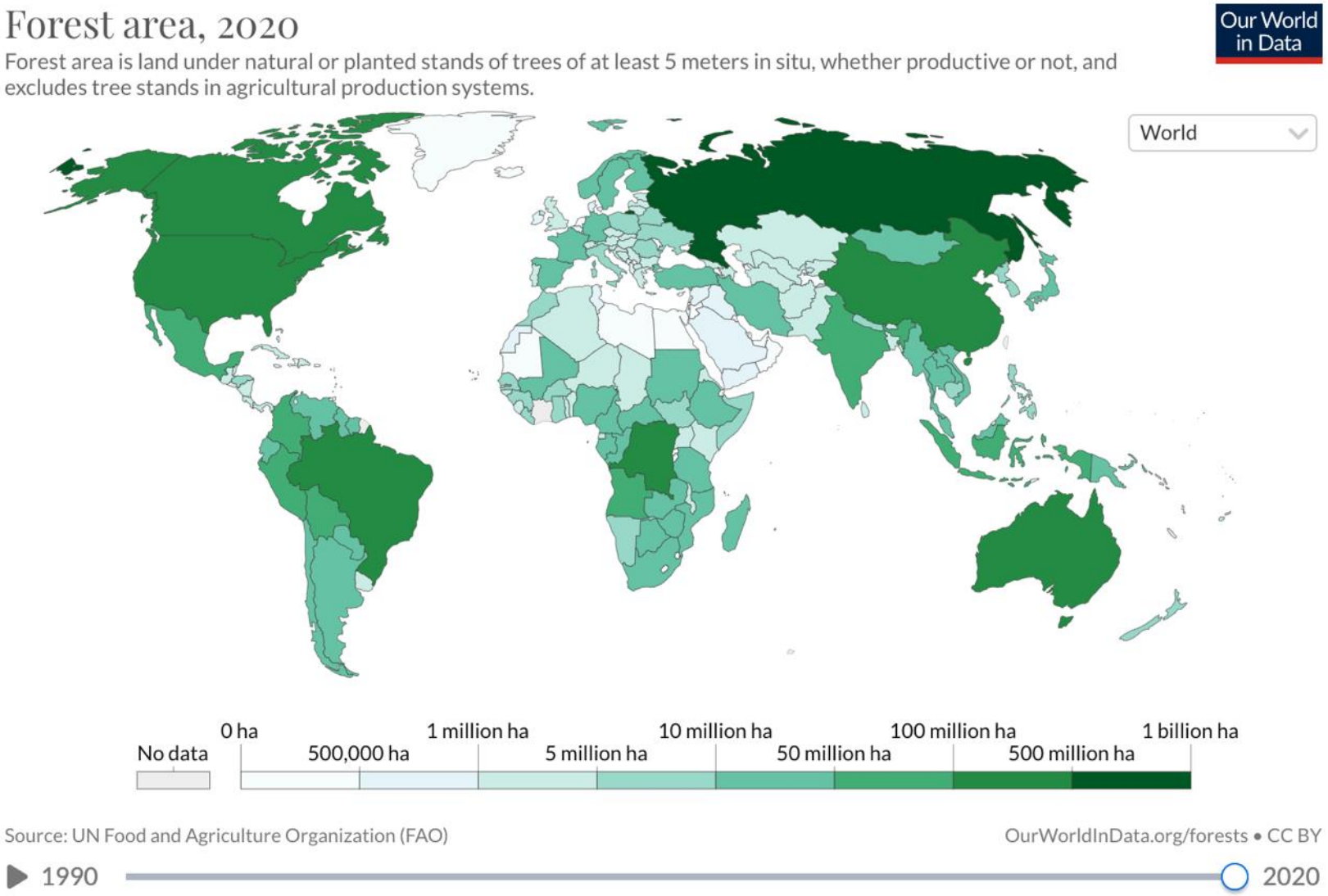
The result is often a shift from complex to simple forests and the homogenization of water fluxes.



Source: Levia, Creed, et al. 2020. Homogenization of the terrestrial water cycle. Nature Geoscience 13: 656-660.

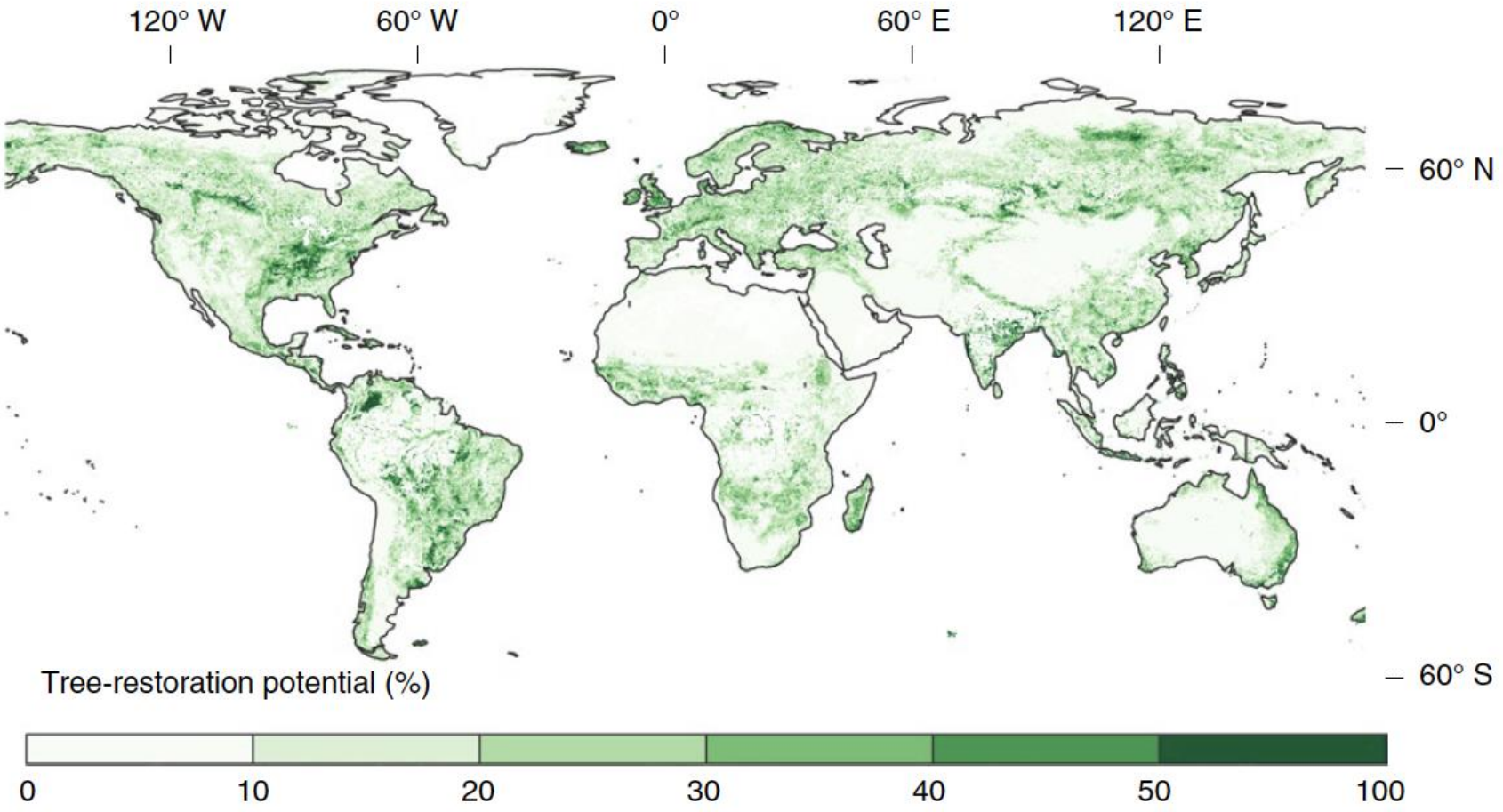
Worldwide, policies are being designed to increase the land's ability to sequester carbon.

Forests cover 31% of the planet's land surface, with more than 50% in only five countries.



Source: FAO. 2020. Global Forest Resources Assessment 2020: Main report. Rome.

But the planet's land surface can naturally support 4.4 billion hectares of forest, meaning there is an additional 0.9 billion hectares where new forests could grow.



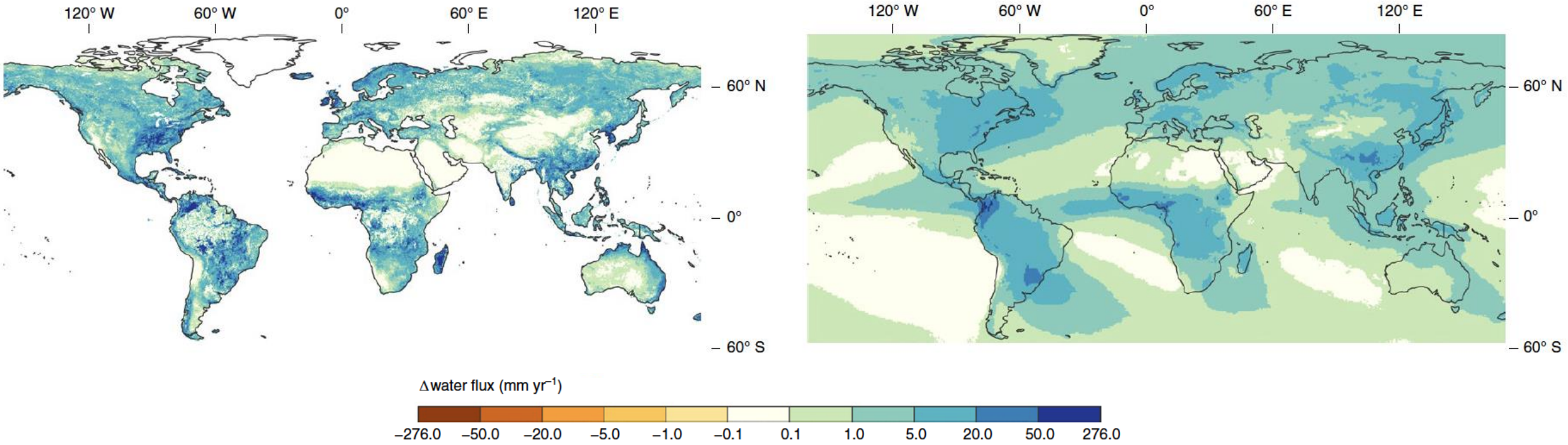
Source: Hoek van Dijke et al. 2022. Shifts in regional water availability due to global tree restoration. Nature Geoscience 15:363.

These new forests could pull 206 GtC of CO_2 out of the atmosphere.

But these new forests could also affect the global water cycle.

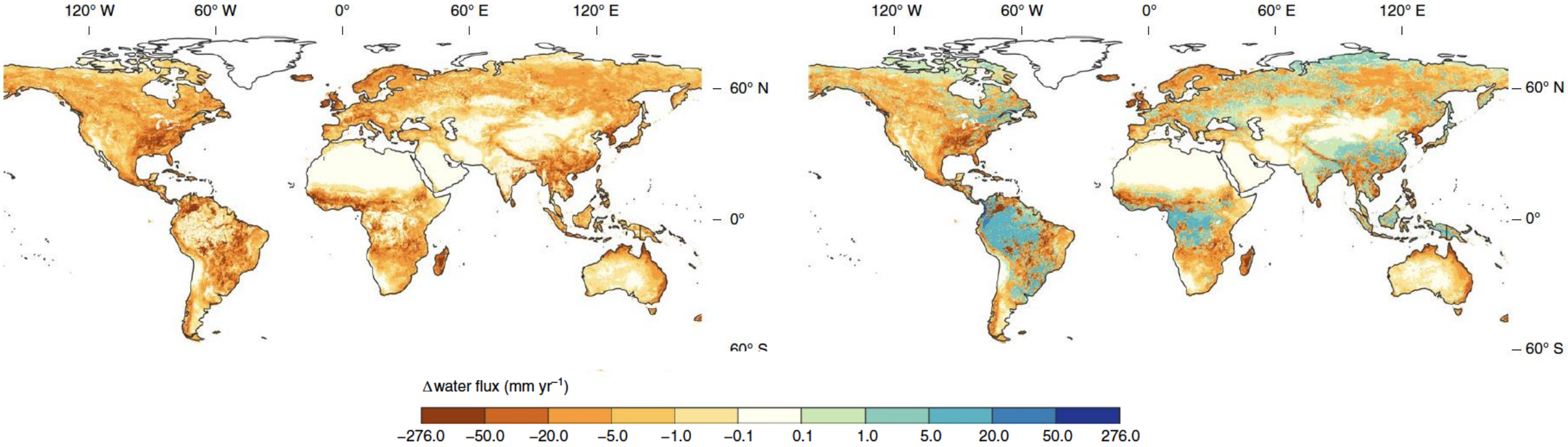
Source: Bastin et al. The global tree restoration potential. Science 365:76.

We know forests transmit water to the atmosphere as vapour (top), and then to the land surface as precipitation (bottom).



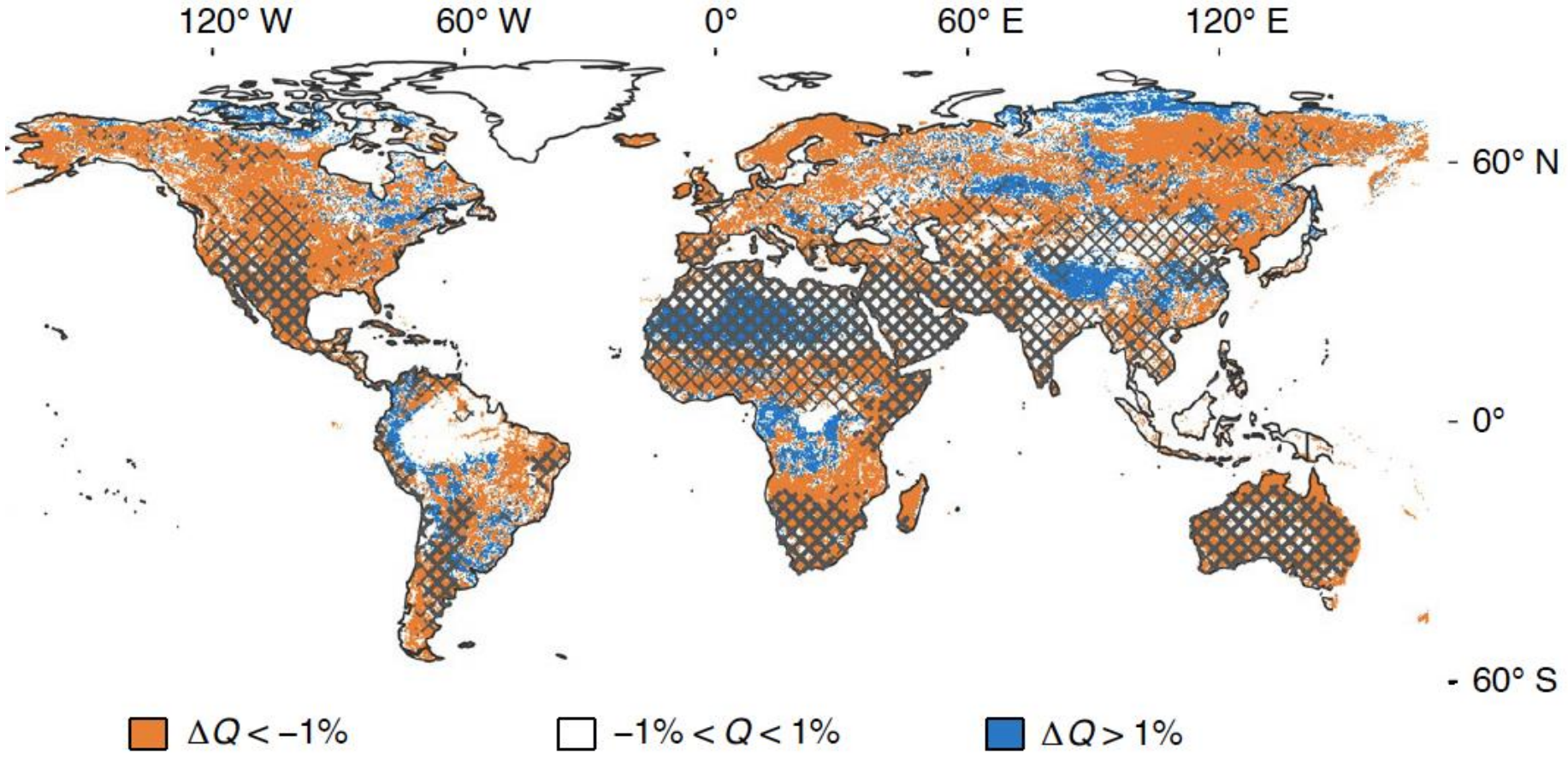
Source: Hoek van Dijke et al. 2022. Shifts in regional water availability due to global tree restoration. Nature Geoscience 15:363.

We can now estimate the effects of restored forests' recycled evaporation on freshwater availability.



Source: Hoek van Dijke et al. 2022. Shifts in regional water availability due to global tree restoration. Nature Geoscience 15:363.

Restored forests can alleviate water scarcity in some areas but make amplify water scarcity in other areas.



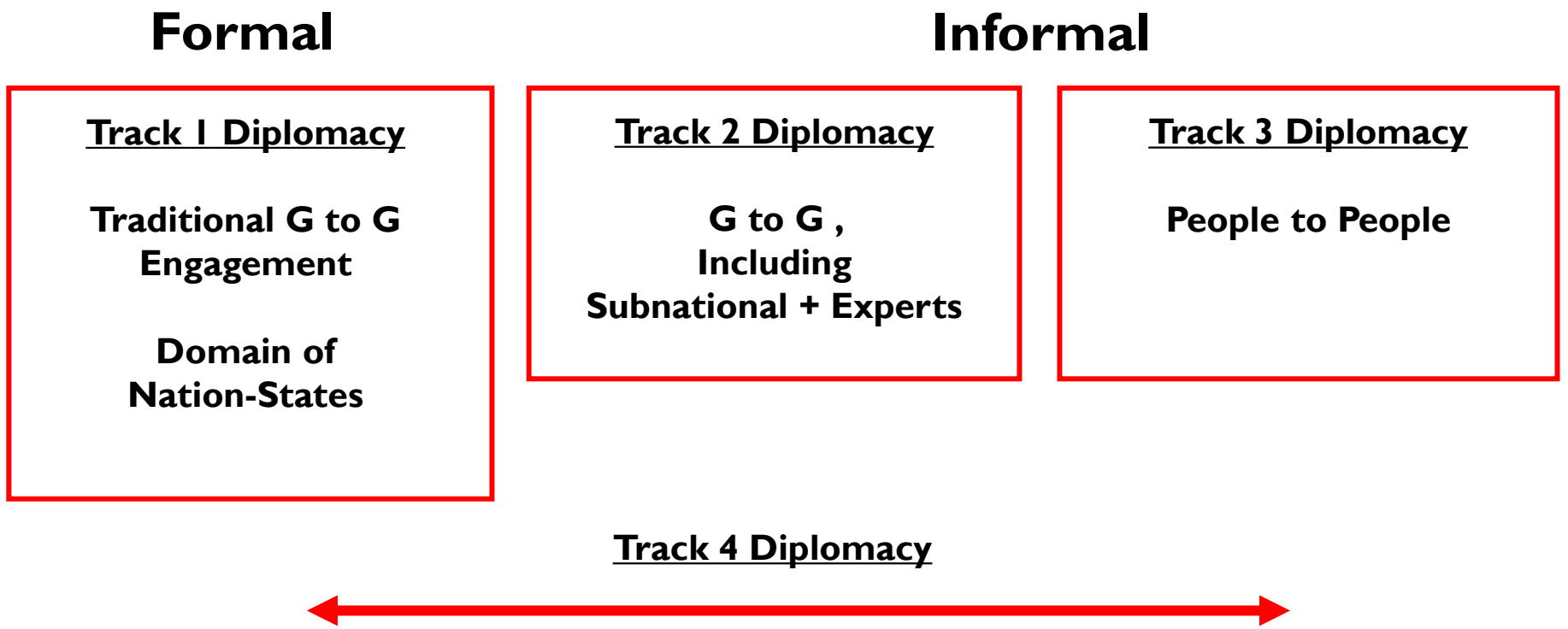
Bold hatched areas
= regions facing freshwater water scarcity for at least 9 months/ year

Source: Hoek van Dijke et al. 2022. Shifts in regional water availability due to global tree restoration. Nature Geoscience 15:363.

Water science informs actions.
Water intelligence informs actors.

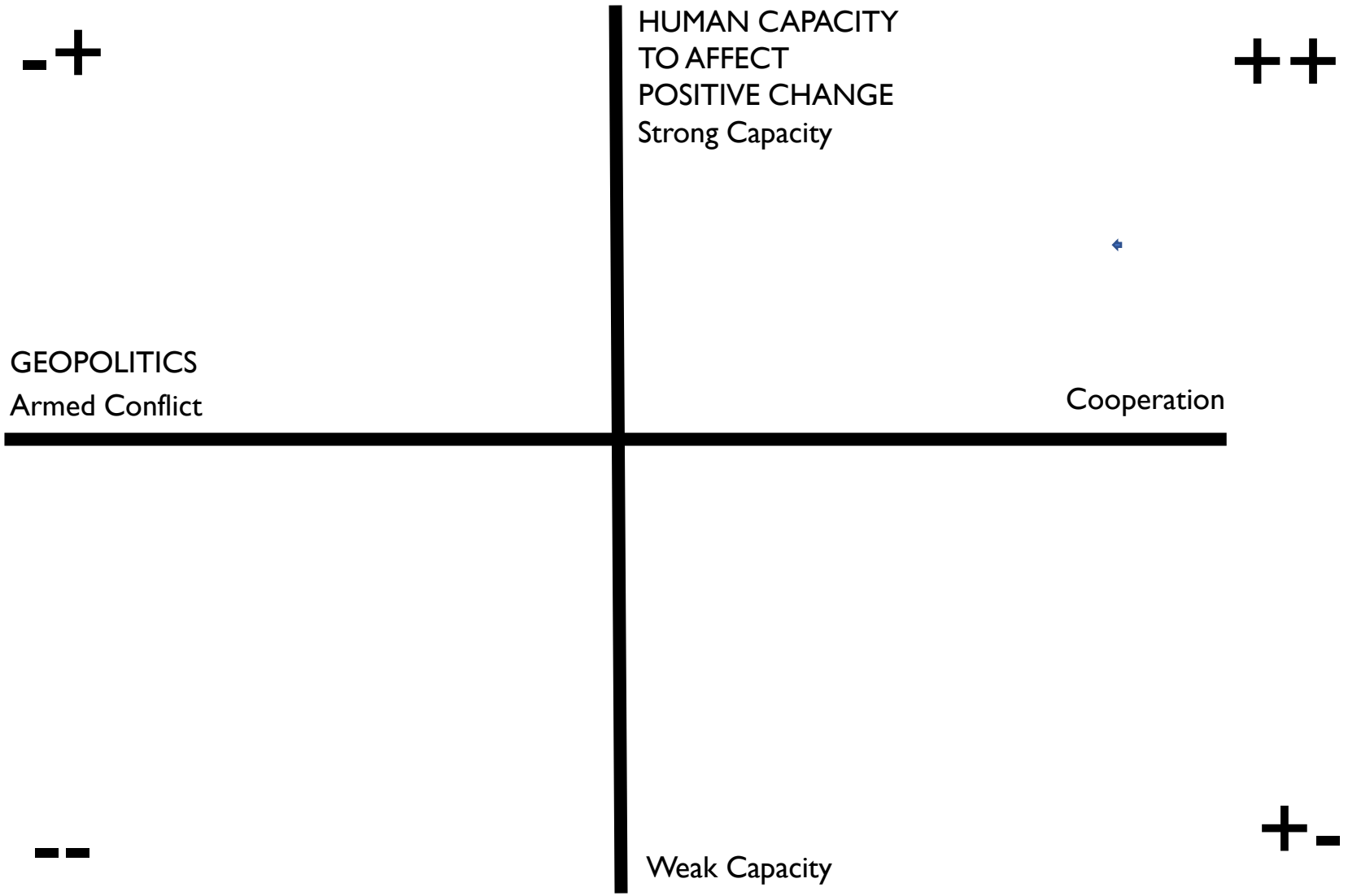
"**Water intelligence**"
on the importance of forests in water supplies
needs to be shared among diplomats.

What are the diplomatic entry points to address transboundary water conflicts?



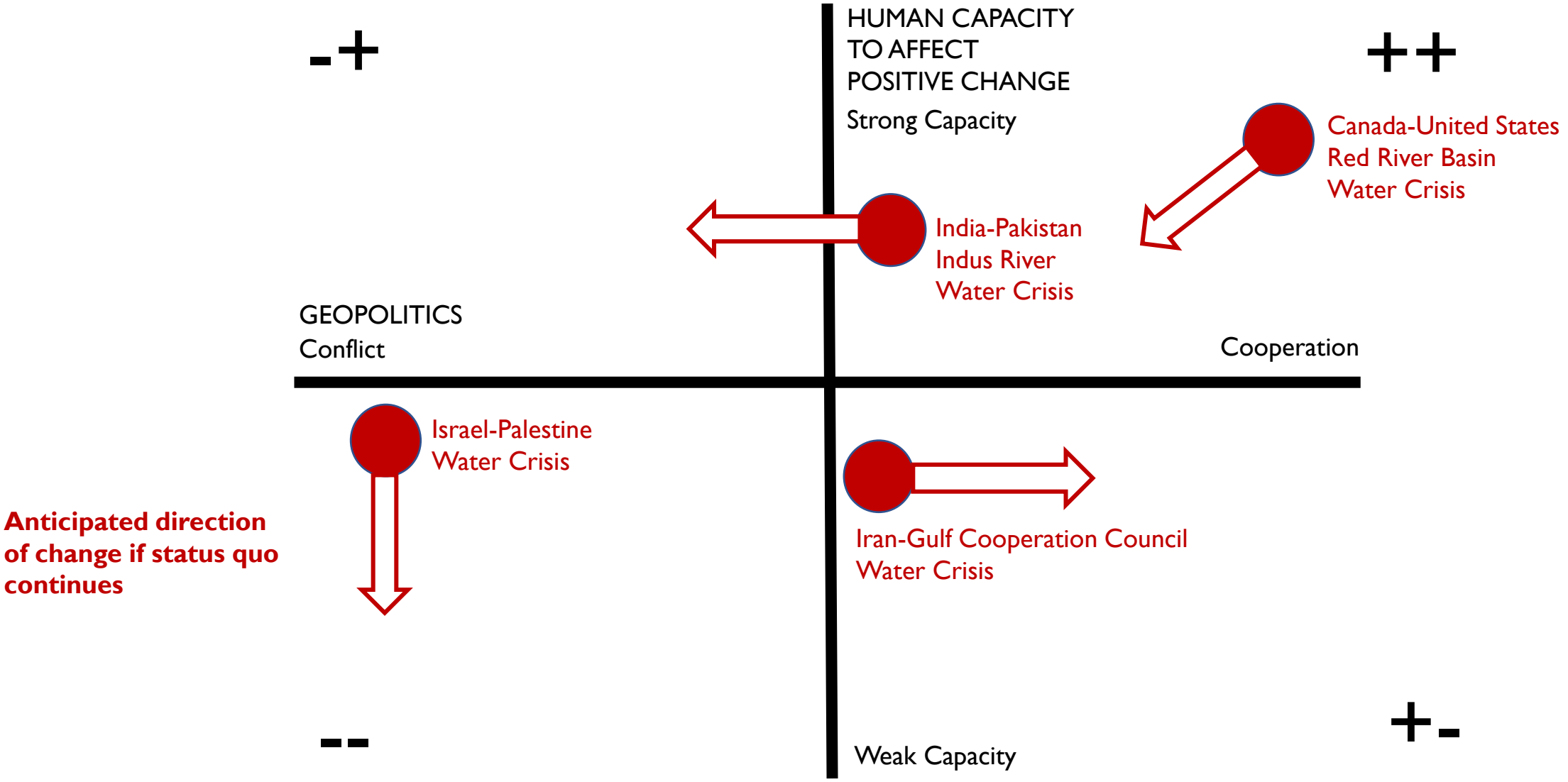
Source: Global Water Diplomacy Lab 4.0, Berlin, Germany.

Two drivers of water conflicts of high importance and high uncertainty



Source: Global Water Diplomacy Lab 4.0, Berlin, Germany.

Each conflict is a conflict for its own reasons



Source: Global Water Diplomacy Lab 4.0, Berlin, Germany.

Israel and the Palestinian Territories

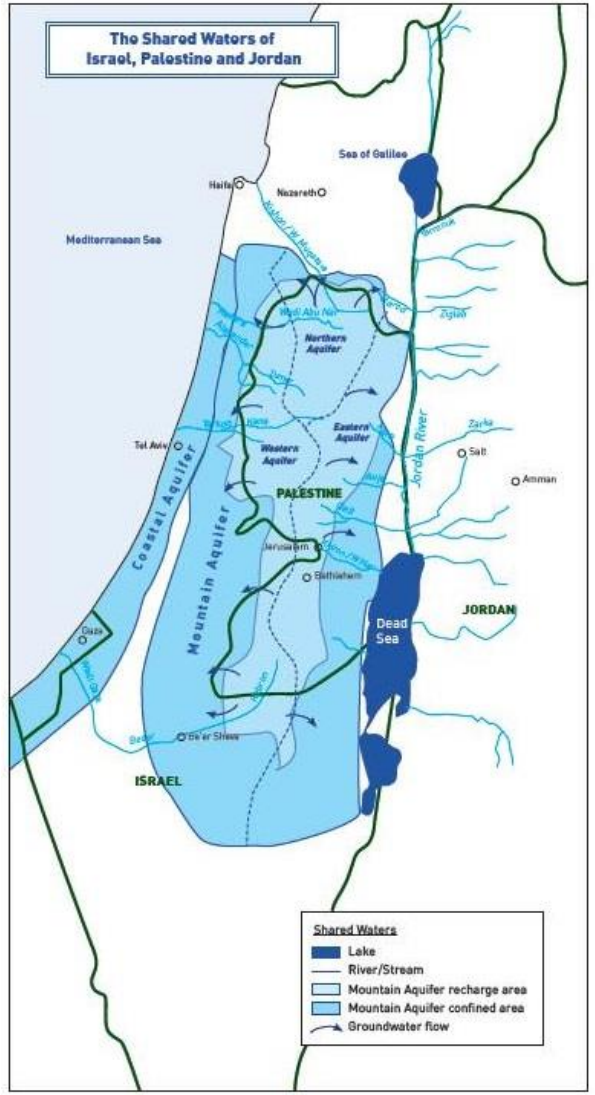
Mountain Aquifer

WATER ISSUE:
Freshwater scarcity; Israel controls access to majority of water resources

HUMAN CAPACITY TO AFFECT POSITIVE CHANGE:
Moderately weak: Gridlocked conflict, but strong science and technology

INTERGOVERNMENTAL INTERACTION:
Conflictual

PROPOSED DIPLOMATIC TOOLS:
Track 1: Joint Water Committee (1995), that is malfunctioning due to asymmetry of power, interests, information, and capacity



Source: Global Water Diplomacy Lab 4.0, Berlin, Germany.

India and Pakistan

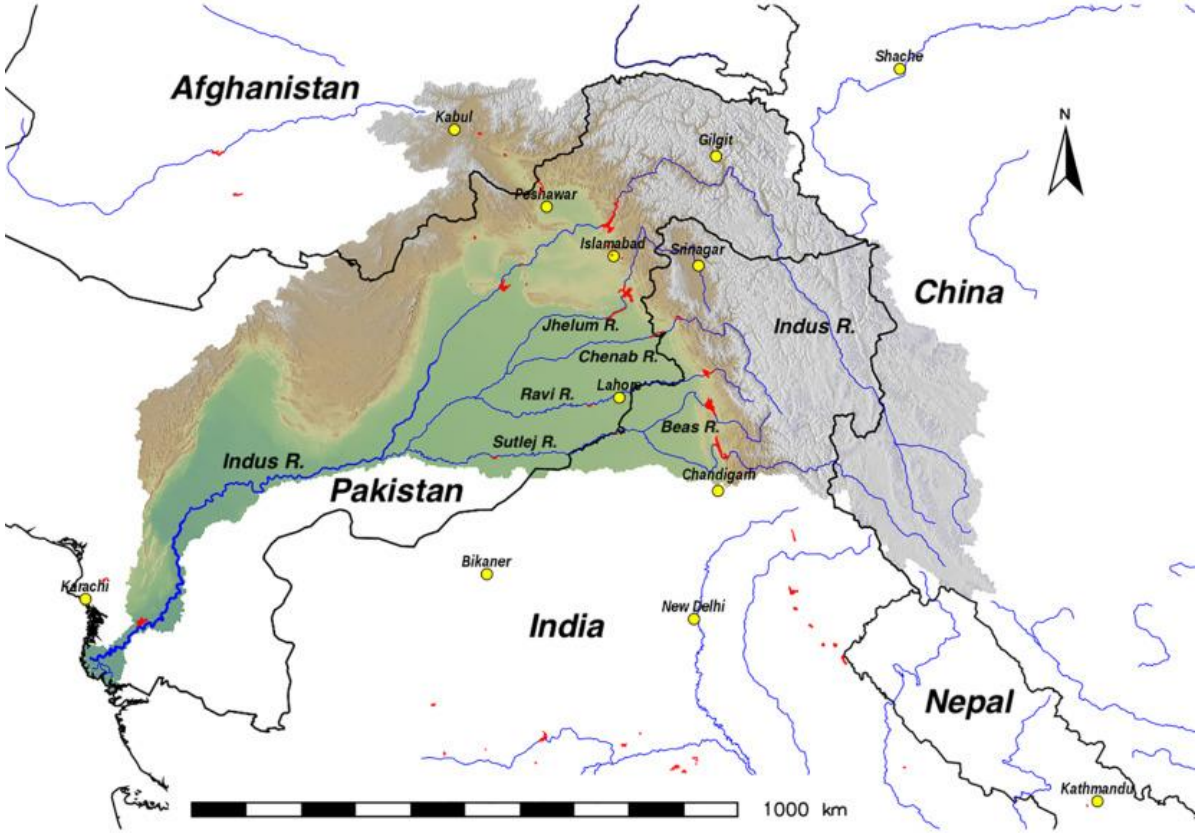
Indus River Basin

WATER ISSUE:
Droughts and floods

HUMAN CAPACITY TO AFFECT POSITIVE CHANGE:
Moderately strong: Many informal, small-scale interactions

INTERGOVERNMENTAL INTERACTION:
Moderately cooperative: Politically conflictual, but cooperative on Indus River Basin

DIPLOMATIC TOOLS:
Track 1: Politically based Indus Water Treaty (1960)



Source: Global Water Diplomacy Lab 4.0, Berlin, Germany.

Iran and the Gulf Cooperation Council

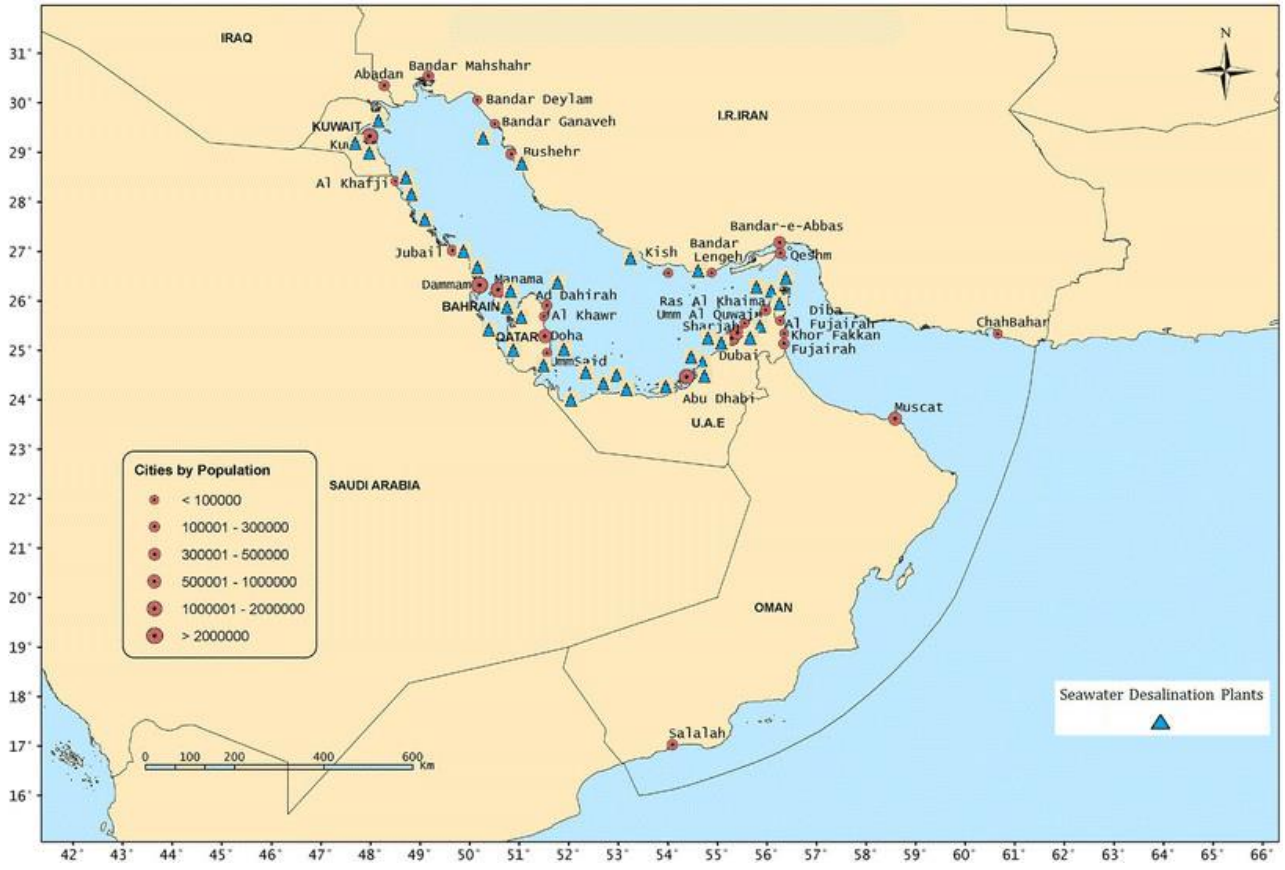
Persian Gulf

WATER ISSUE:
Reliance on desalinization of seawater

HUMAN CAPACITY TO AFFECT POSITIVE CHANGE:
Moderately weak: Strong science and technology, but weak civil society

INTERGOVERNMENTAL INTERACTION:
Moderately cooperative: Multinational agreements when addressing shared problems (e.g., sandstorms)

PROPOSED DIPLOMATIC TOOLS:
Track 1: Science based Gulf Cooperation Council (1981)



Source: Global Water Diplomacy Lab 4.0, Berlin, Germany.

United States and Canada

Red River Basin

WATER ISSUE:
Droughts and floods

HUMAN CAPACITY TO AFFECT POSITIVE CHANGE:
Strong

INTERGOVERNMENTAL INTERACTION:
Cooperative

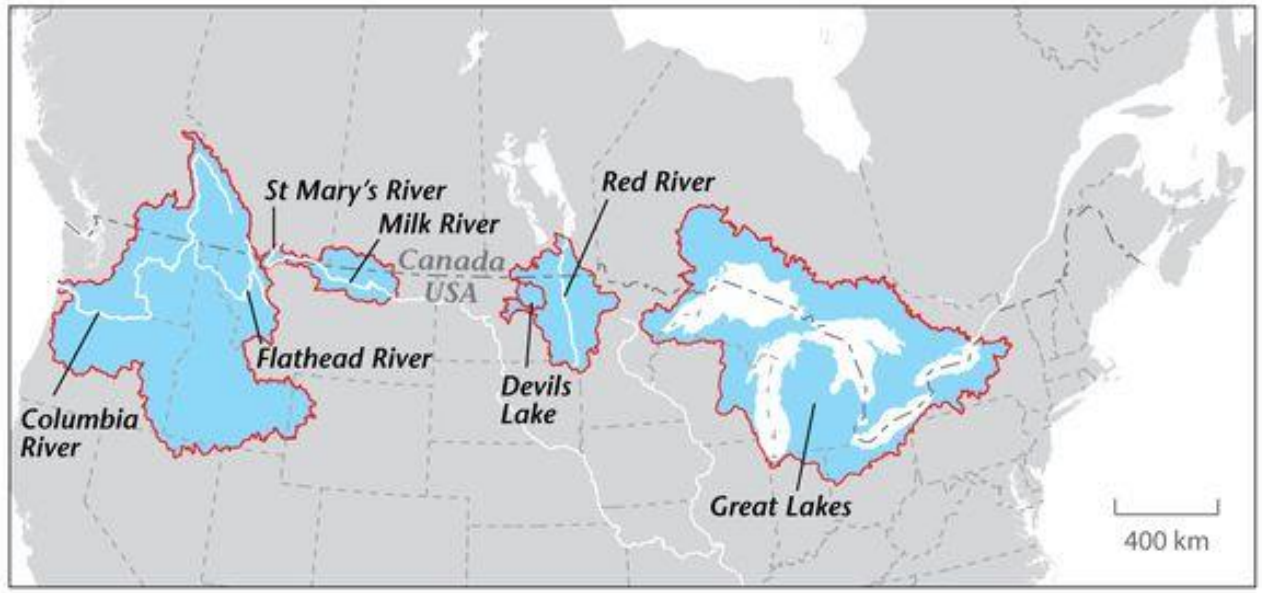
DIPLOMATIC TOOLS:

Track 1: Science diplomacy used as a guiding principle

Track 2: Top-down cooperation with local stakeholders

Track 3: Bottom-up engagement of local stakeholder engagement

Track 4: Weak. Local stakeholders need a stronger seat at the decision-making table (i.e., not just providing feedback)



https://www.greatlakeslaw.org/blog/2013/09/water-without-borders-canada-the-united-states-shared-waters-new-book-and-online-resources.html

Source: Global Water Diplomacy Lab 4.0, Berlin, Germany.

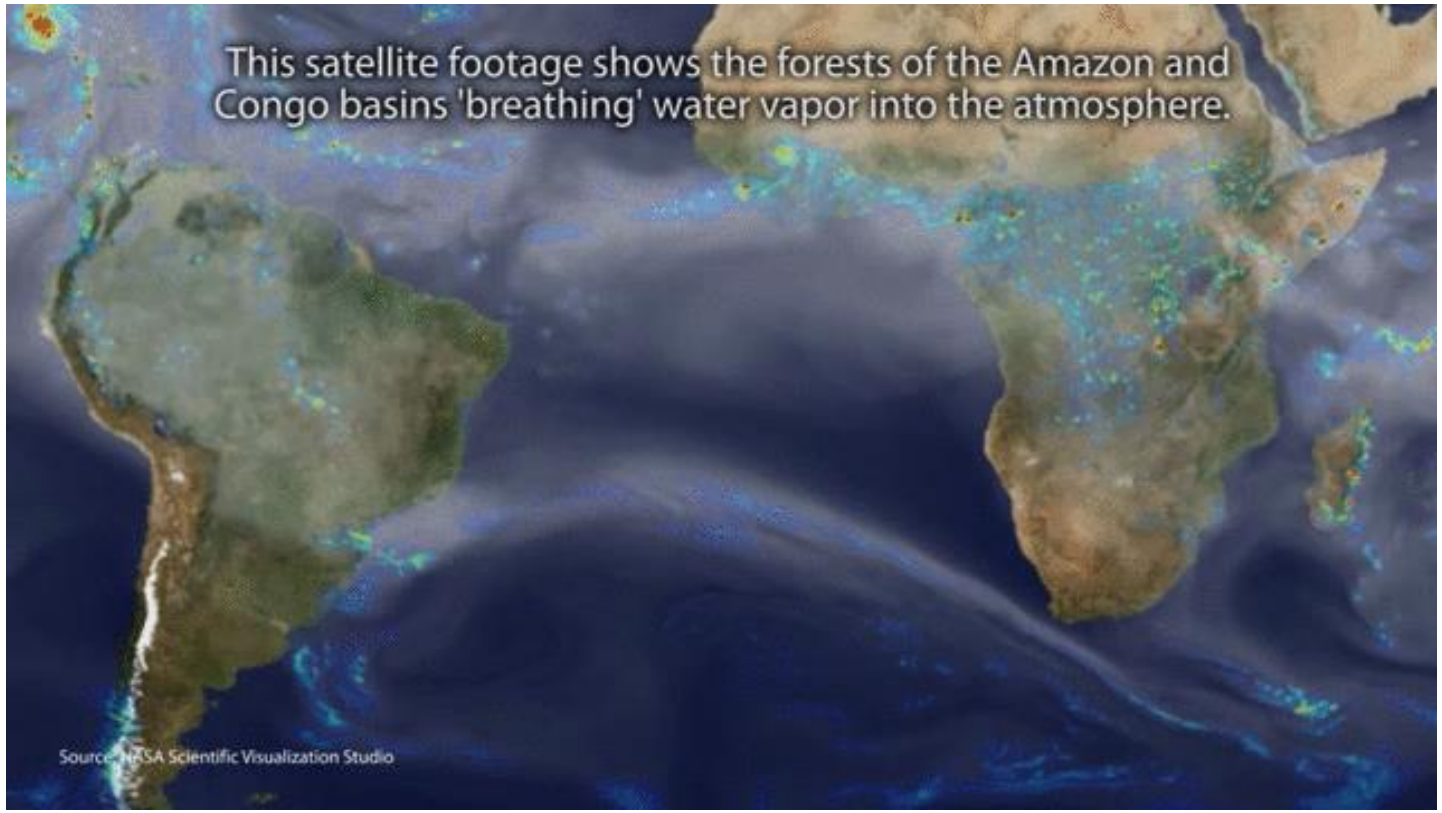
Changes in forest-water flows can exacerbate or alleviate water conflicts

But currently, there is:

No intergovernmental interaction.

No human capacity to affect positive change.

Due to a lack of "water intelligence" within diplomatic circles.



Source: Global Water Diplomacy Lab 4.0, Berlin, Germany.

A call-to-action.

- A multilateral institution (Track 1) that engages in science diplomacy and advises national governments.
- This institution would work closely with decentralized regional water agencies (Track 2) that track changes to forest-water flows both from and to the region, and engage local stakeholders to develop a shared understanding of forest-water (Track 3).
- These regional water agencies could then report back to the centralized multilateral institution that synthesizes the data and engages in top-down water diplomacy on an inter-national level to affect positive change (Track 4).

Statement from the 2022 Bled Strategic Forum and Interpeace on the importance of addressing the nexus of Water and Peace

"We therefore call upon the Kingdom of the Netherlands, Republic of Tajikistan, and the United Nations as co-hosts of the UN Water Conference in particular to:

- Acknowledge the interconnections and inter-dependencies of the global water system, and the fact that actions in one place will have consequences in another;
- Acknowledge the potential of water cooperation as a catalyst for peace, and of peacebuilding actions in advancing SDG 6 on access to safe, clean water;
- Reflect the convergence of water and peace as a thematic priority at the 2023 UN Water Conference; and
- Involve stakeholders in interdisciplinary discussions about the interlinkages between peace and water in the lead up to the Conference."

- Dear all presenters,
- Many thanks to you for agreeing to provide presentations at the All-IUFRO conference. Our forest and water session will be from 2:30pm to 4:15pm (1 hr and 45 min) on Sept 23. I attached the program for your convenience; more information can be found on the IUFRO website). Here is our tentative plan: for panel presentations (Irena, Lulu, Lars and Silvio), the presentation time is 15 minutes each, and for the rest flash talks, it is 5 minutes each. In addition, there will be 10 minutes panel discussion after all panel presentations.

- I need you to provide the following information by August 13:
- Your title and organization
- Your short bio (max. 100 words)
- Your photo (600x600 min resolution)

#1 Forests are key to the provision of the world's freshwater resources. About 30% of the planet's land area is covered with forests, which influence both downstream and downwind waters. #2 Tension over freshwater supplies is rising, especially in transboundary water systems in water-scarce regions of the planet, such as the Middle East. At the same time, the risk of severe floods and drought affecting transboundary water systems is increasing globally, impacting human security in densely populated regions such as the Indus River Basin in South Asia. #3 Large-scale forestation (reforestation, afforestation) efforts that focus on forests as nature-based climate solutions for storing carbon are altering how forests transmit water downstream and downwind. #4 These large-scale efforts are "replumbing" the water cycle, and this replumbing of the water cycle may exacerbate or alleviate pressures on freshwater supplies. #4 Water intelligence on the importance of forests in atmospheric, surface and groundwater supplies needs to be shared among scientists, policymakers, and diplomats. Further, science and technologies are urgently needed to advance understanding of the global connections between forest-water and water-scarce regions. Finally, flexible and agile governance frameworks are needed to respond to climate-driven changes in these forest-influenced water supplies. #5 For example, a new multilateral water institution could work closely with a system of distributed autonomous regional water agencies that follow a bottom-up approach of engaging relevant stakeholders of a transboundary water system and tracking changes to atmospheric water sources to the region. These regional water agencies could then report back to the centralized multilateral institution that coordinates and synthesizes the data and in turn engages in top-down water diplomacy on an interstate level. #6 A call-to-action for international agreements, regional organizations, and national governments that focus on the role of forests for water (not just forests for carbon) and that embrace inclusive (diverse stakeholders, rights-holders, elders, youth) and integrated (local to global) diplomatic tools to facilitate the incorporation of science and governments into decisions and actions is presented.