

# FRESHWATER HEALTH INDEX

PROVIDING A “HEALTH CHECK” AND TRADEOFF VISUALIZATION FOR HYDROLOGIC BASINS

Maíra Bezerra, Ph.D., Moore Center for Science, Freshwater team

ISAT/CIC workshop, November 16<sup>th</sup>, 2022

CONSERVATION  
INTERNATIONAL



# IN A NUTSHELL...

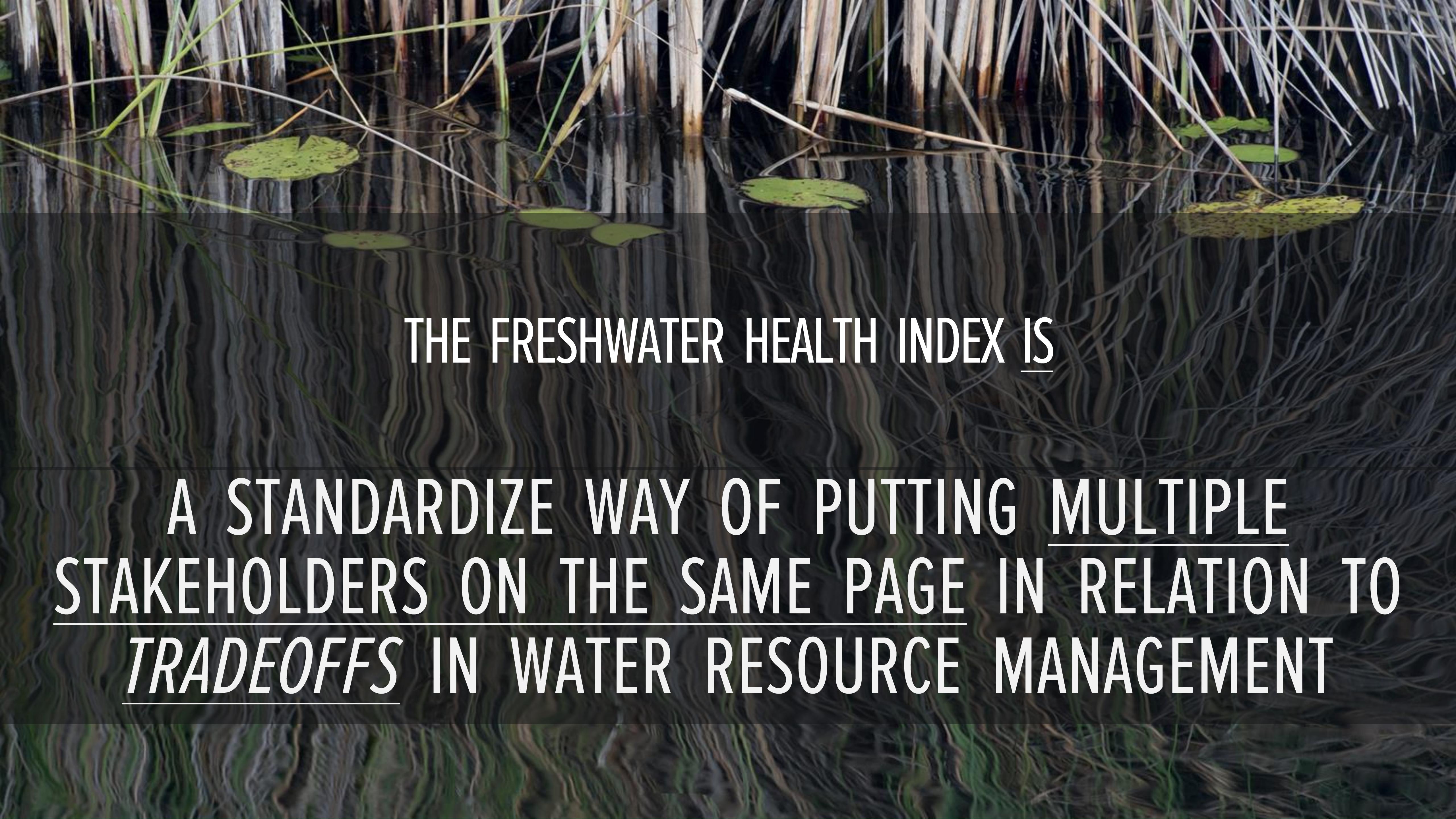
- The Freshwater Health Index (FHI) is a framework for sustainable watershed management
- Experience in Southeast Asia (3S) and Southern Africa (Cubango-Okavango) has demonstrated its utility in transboundary water dialogues
- CI would like to find ways to support CIC projects in incorporating the FHI into your work

**PLEASE, OPEN THE FOLLOWING LINK**



<https://webtools.freshwaterhealthindex.org/en.php>

Session code: 769005  
Country: **your country**



**THE FRESHWATER HEALTH INDEX IS**  
**A STANDARDIZED WAY OF PUTTING MULTIPLE**  
**STAKEHOLDERS ON THE SAME PAGE IN RELATION TO**  
**TRADEOFFS IN WATER RESOURCE MANAGEMENT**

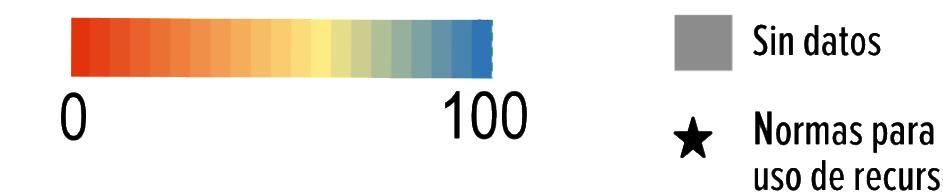
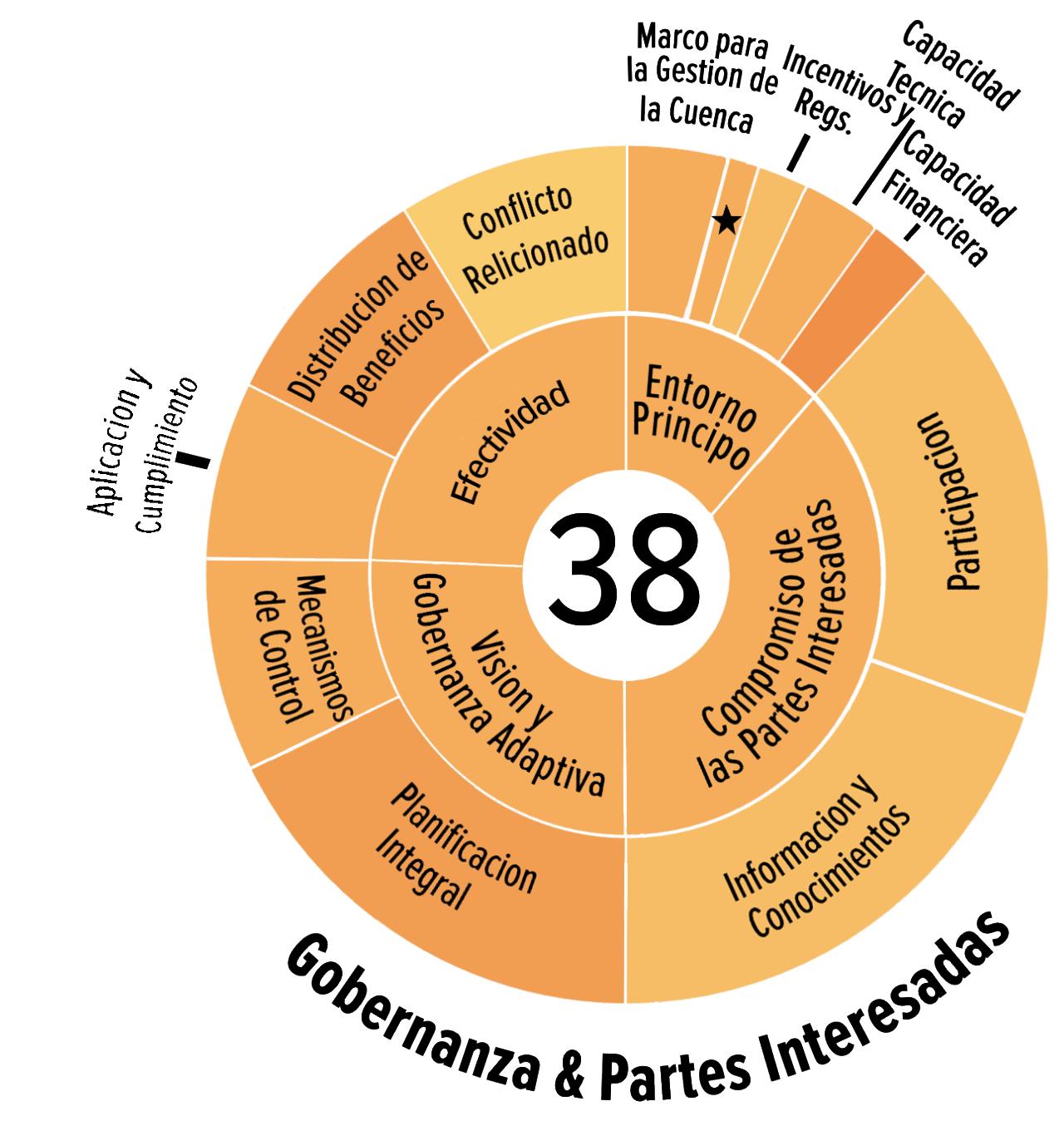
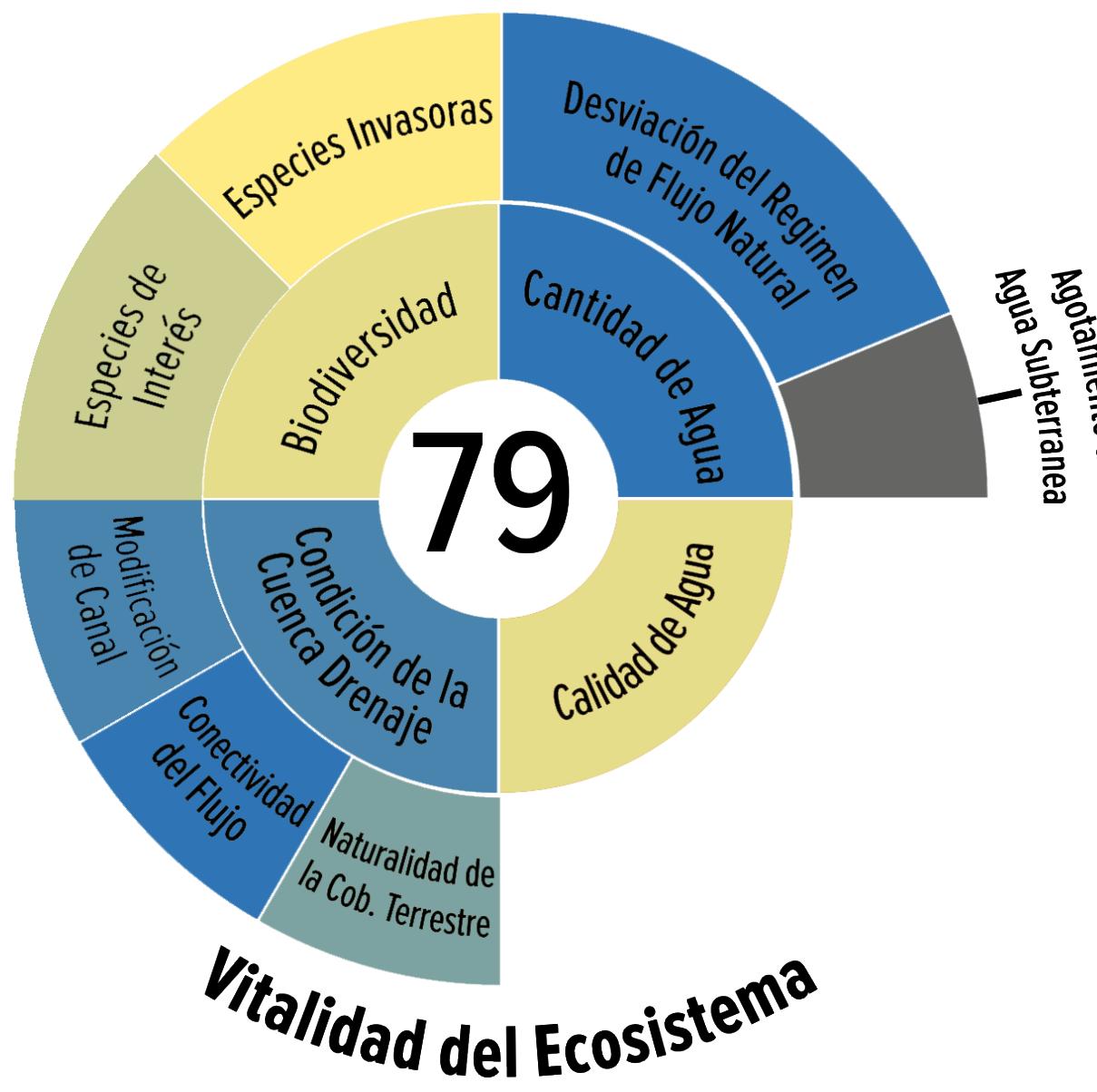


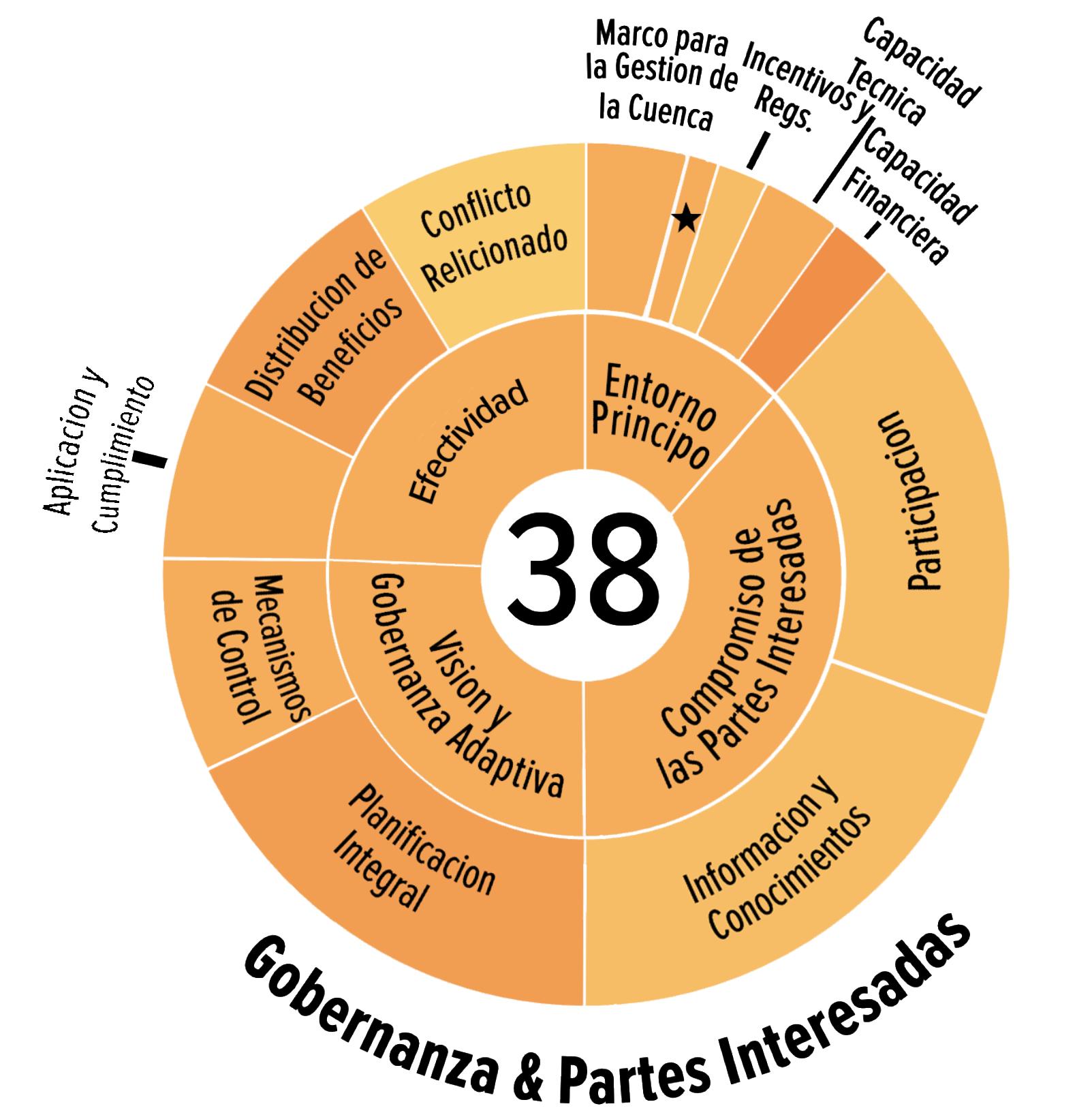
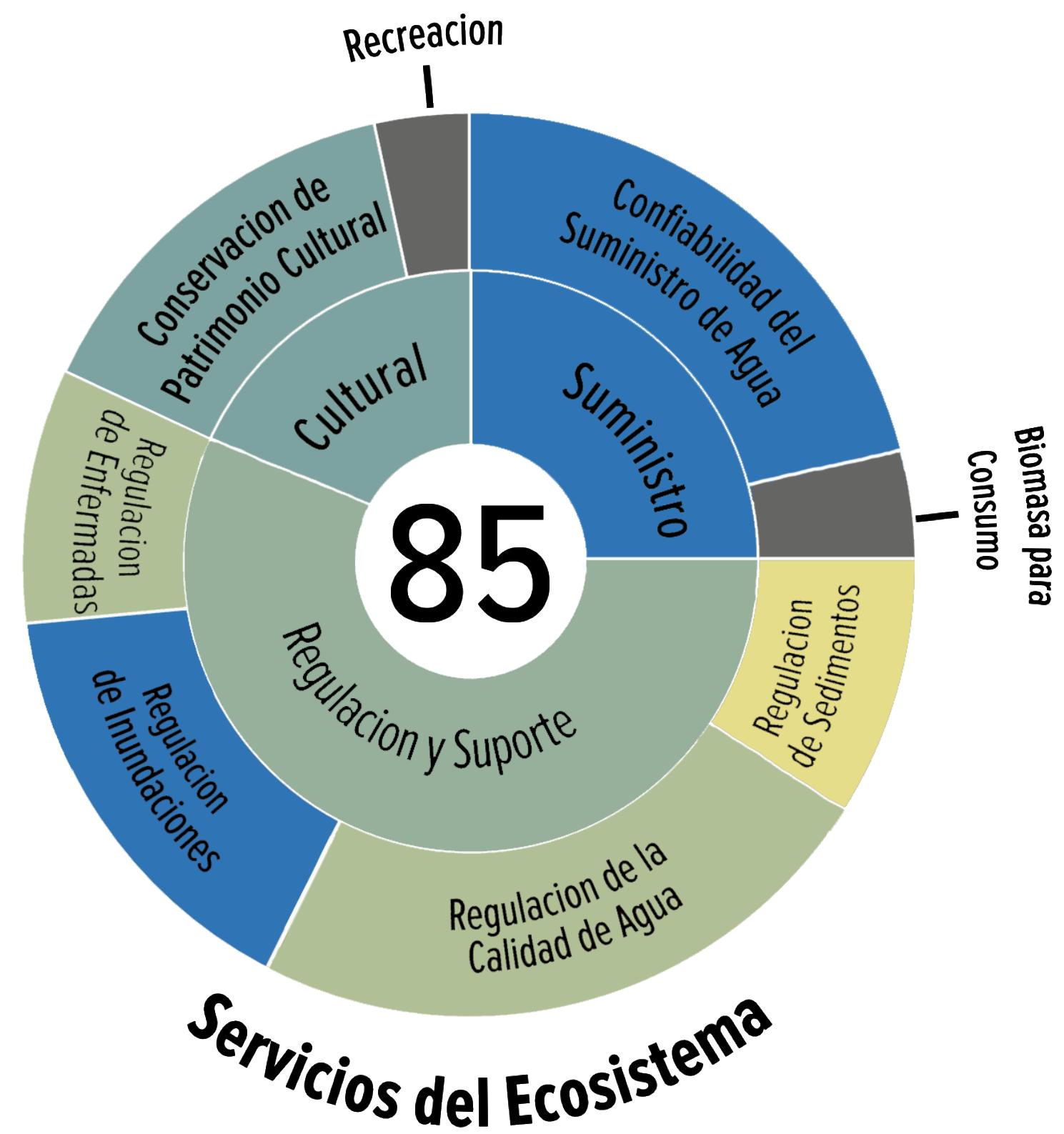
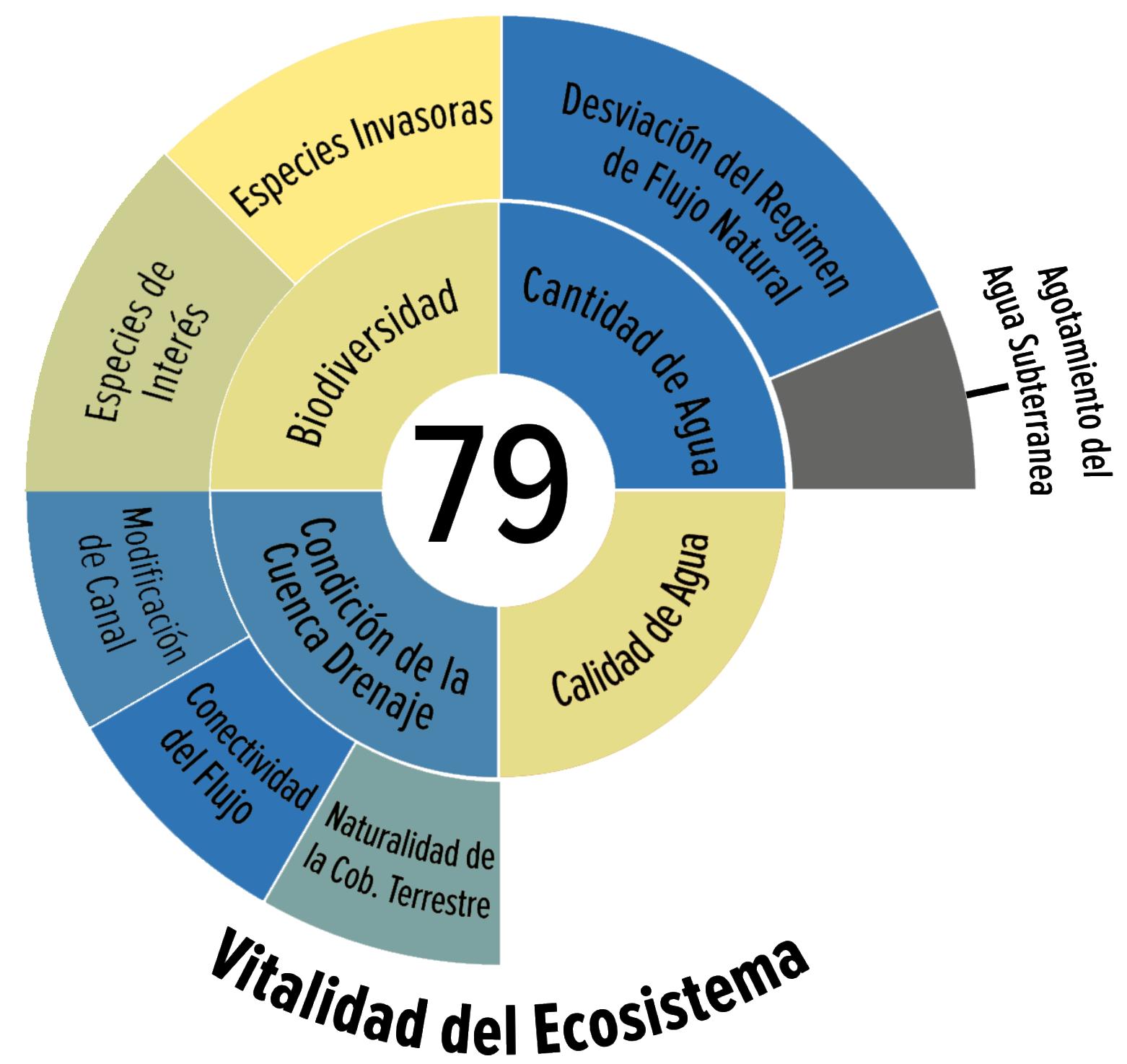
**HOW DOES THAT MATERIALIZE?**

**BY USING A COMPOSITE INDICATOR SYSTEM AS THE BASIS  
TO CONVENE AND DISCUSS PRIORITIES FOR WATER  
MANAGEMENT IN A PARTICULAR BASIN**

# COMPOSITE INDICATOR SYSTEM

- Freshwater ecosystems at the center – assessment for water security
- Focus on ecosystem services – identifies trade-offs
- Assesses governance – addresses underlying root causes of challenges
- Stakeholder engagement – involves decision makers from all sectors





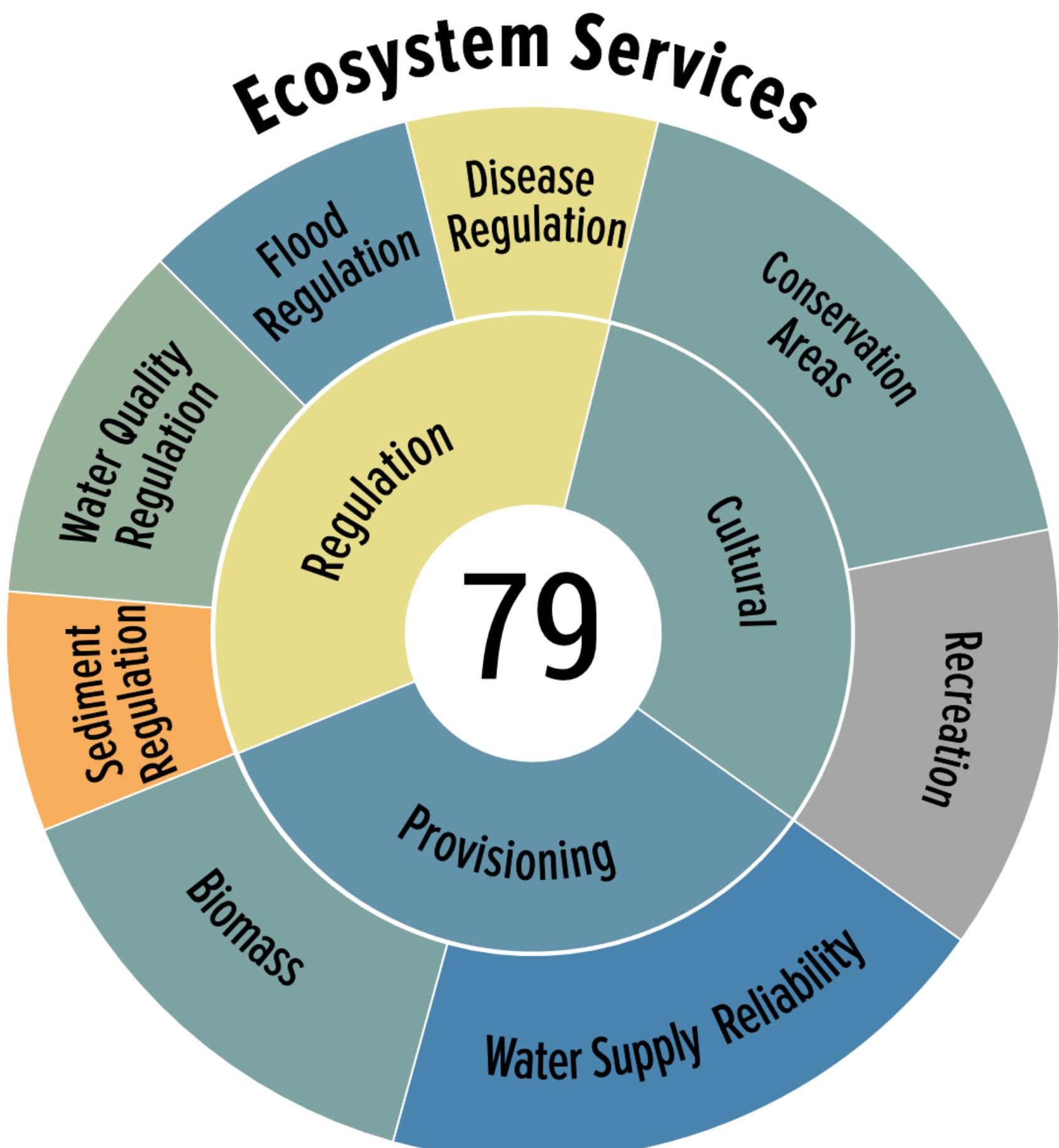
*Strengthening the cooperation capacity for the IWRM Monitoring framework  
Better communication among riparian stakeholders – same language*

Links with La Plata SAP

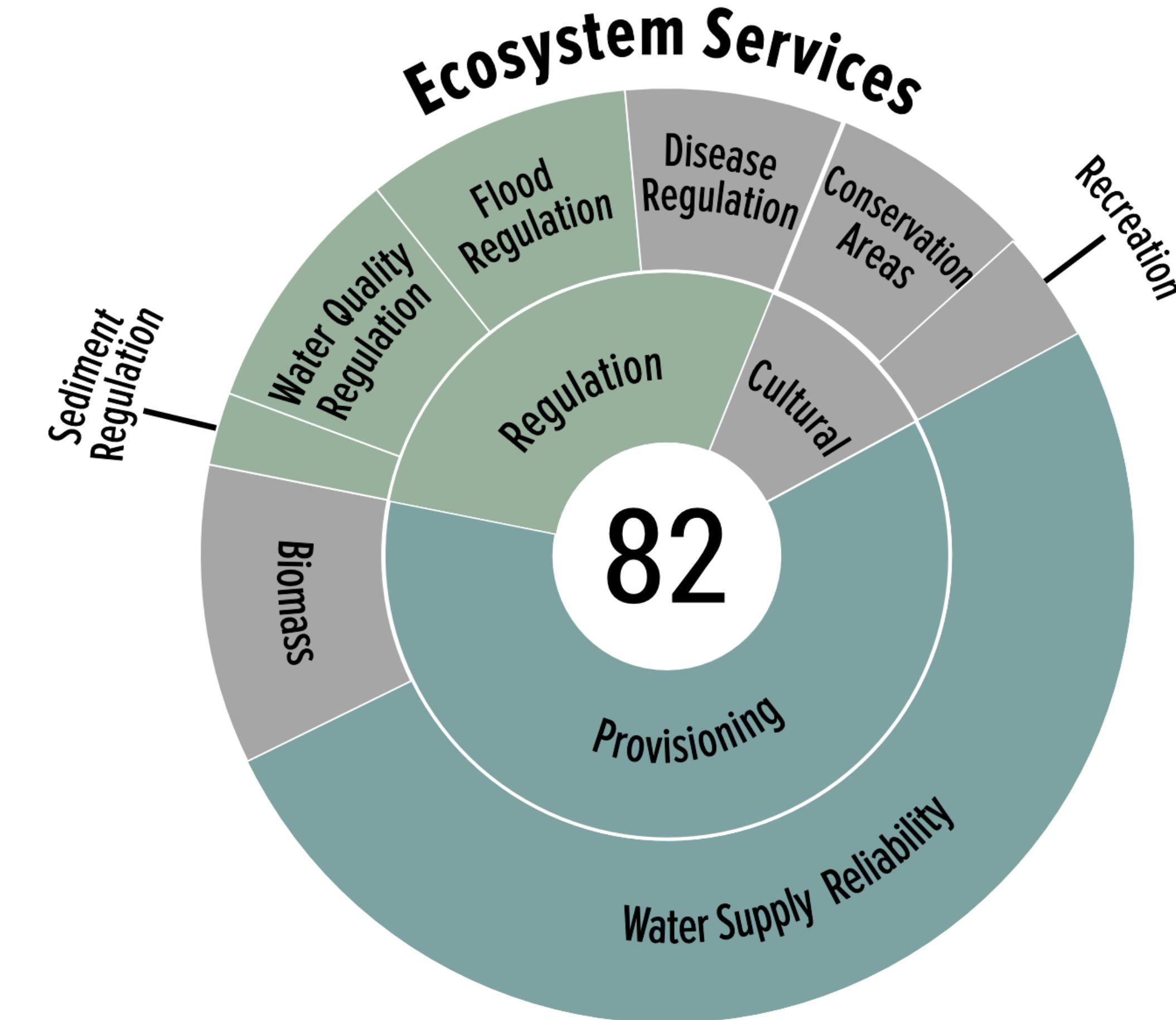
- IWRM – water balance, water quality, groundwater, biodiversity (aquatic systems)
- La Plata Critical themes: Extreme hydrologic events, sedimentation, loss of water quality, water use conflicts

# RESULTS FROM WEIGHT EXERCISE

# WEIGHTS VARY BY STAKEHOLDER PREFERENCES & THIS INFORMATION IS USED DIRECTLY IN THE ASSESSMENT



LOWER MEKONG  
(LAO PDR, VIETNAM, CAMBODIA)



DONGJIANG  
(CHINA)

# ASSESSING PERCEPTION OF WATER GOVERNANCE

## Nivel general de monitoreo de la cantidad de agua

Los ejemplos incluyen, pero no se limitan a: caudal de riachuelo que se mide regularmente, estimada o modelada en la cuenca

Clasificación	Criterios
1	Existen restricciones en los recursos, los datos se controlan y aplican de forma muy deficiente
2	Existen restricciones en los recursos, los datos se controlan y aplican de forma deficiente
3	Existen restricciones en los recursos, pero los datos se controlan y aplican de forma regular
4	Existen restricciones en los recursos, pero los datos se controlan y se aplican bien
5	Existen restricciones en los recursos, pero los datos se controlan y aplican muy bien



**Muy Bajo**

**Aceptable**

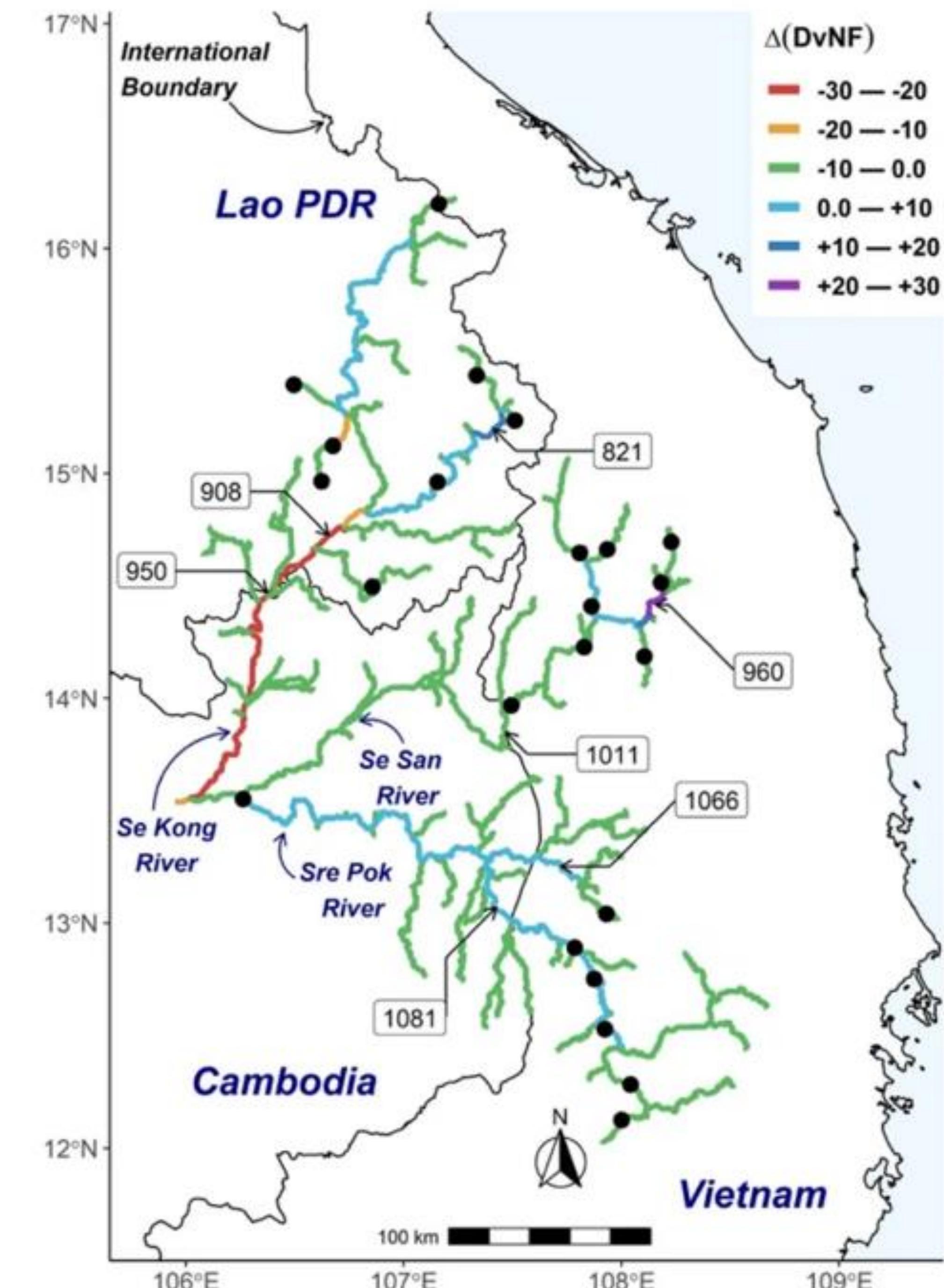
**Muy Alto**

# FINE SCALE ASSESSMENT

Prioritizing local data to:

- 1) Ensure legitimacy
- 2) Help pinpoint areas of concern and establish agreed-upon baselines for monitoring
- 3) Target recommendations where green and grey actions are needed

Satellite/remote sensing and modeled datasets *can be used*, but require further discussion with decision makers



# SCENARIO ANALYSIS

3S, Lower Mekong  
FLOW CONNECTIVITY AND DAM DEVELOPMENT



EXISTING



+LOWER SESAN

## Modeling with Partners--NASA

- Future scenarios – for climate change, land-use change and dam development – are the most important way that we can influence decisions around investing in natural capital in a basin.
- Scenarios reveal areas that may be threatened in the future (e.g., where dams could impact fisheries) and where ecosystem restoration could have downstream benefits.

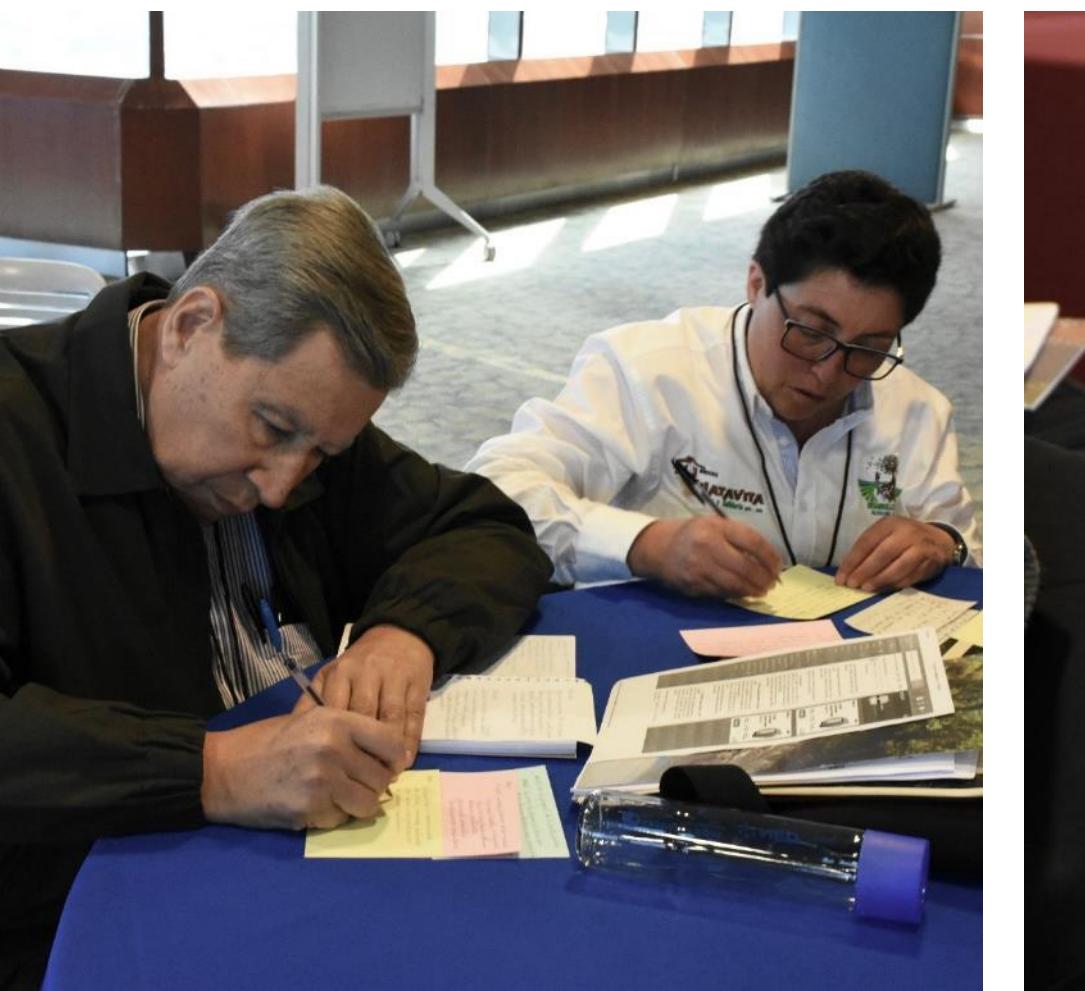
OPEN

Mohammed et al. 2022  
*Scientific Reports*

# Diagnosing challenges and setting priorities for sustainable water resource management under climate change

Ibrahim Nourein Mohammed<sup>1</sup>✉, John D. Bolten<sup>2</sup>, Nicholas J. Souter<sup>3</sup>, Kashif Shaad<sup>4</sup> & Derek Vollmer<sup>4</sup>

- Transboundary basin management – balancing tradeoffs
- Socio-ecological integrated approach – combining remote and in-situ obs., hydrologic and climate models, social surveys
- How climate change and dam development impact 3S – Mekong basin
- Climate change will lead to increased precipitation, necessitating a shift in dam operations, from maintaining low flows to reducing flood hazards
- Water governance systems in Laos, Vietnam, and Cambodia are ill-prepared to address the problem



## PEOPLE DEPENDENT ON FRESHWATER BASINS WHERE WE WORK:

BOGOTA CONSERVATION CORRIDOR, COLOMBIA:  
10,000,000

ALTO MAYO BASIN, PERU:  
280,000

OKAVANGO BASIN, ANGOLA,  
BOTSWANA, NAMIBIA:  
1,000,000

GUANDU BASIN, BRAZIL:  
10,000,000

UMZIMBUVU, SOUTH AFRICA:  
4,500,000

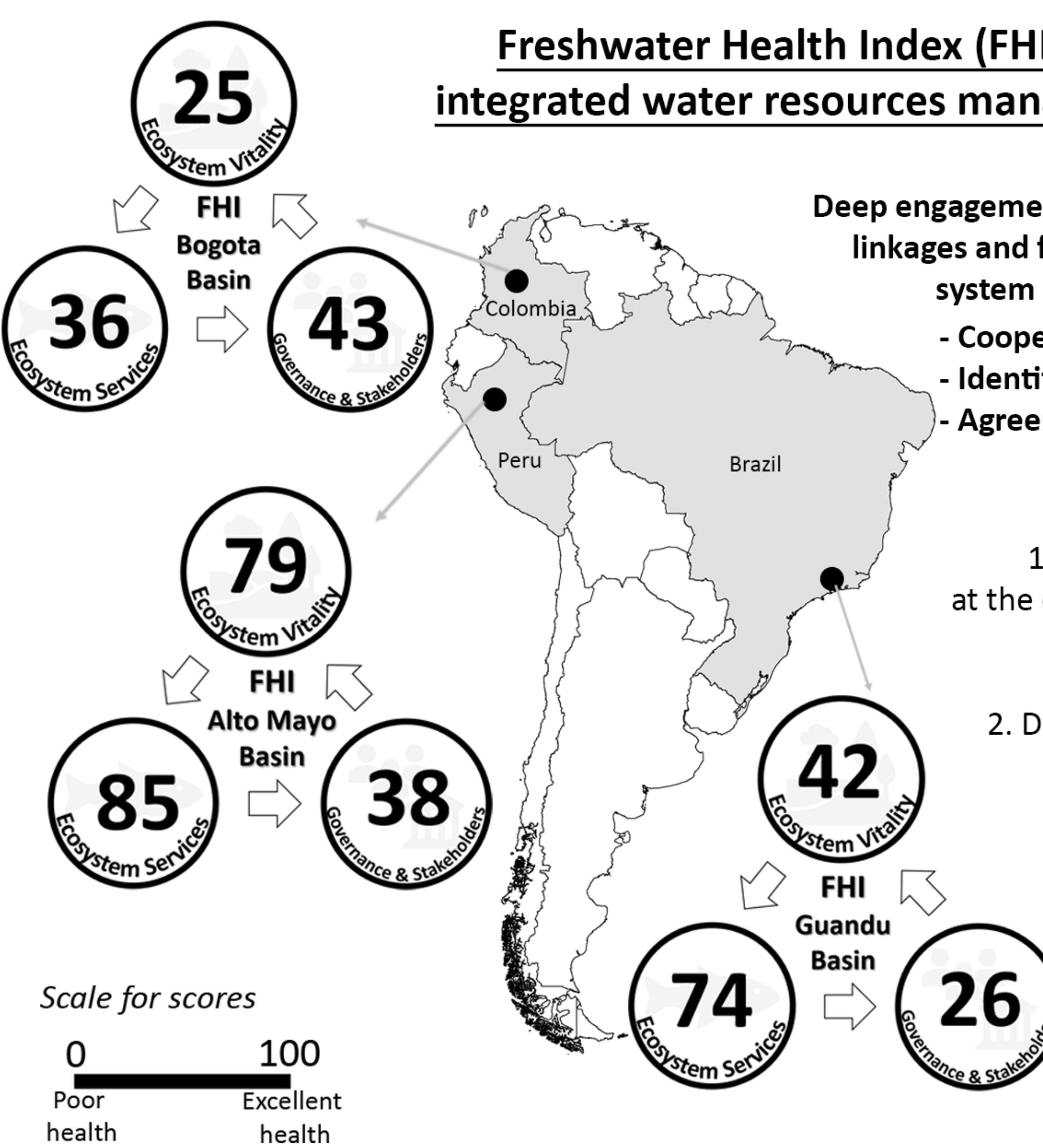
LANCANG, CHINA:  
1,200,000

DONGJIANG BASIN, CHINA:  
53,300,000

SEKONG, SREPOK & SESAN  
(3S) BASIN, LOWER MEKONG  
(CAMBODIA, LAOS AND VIETNAM):  
3,400,000

TONLE SAP BASIN, CAMBODIA:  
4,500,000

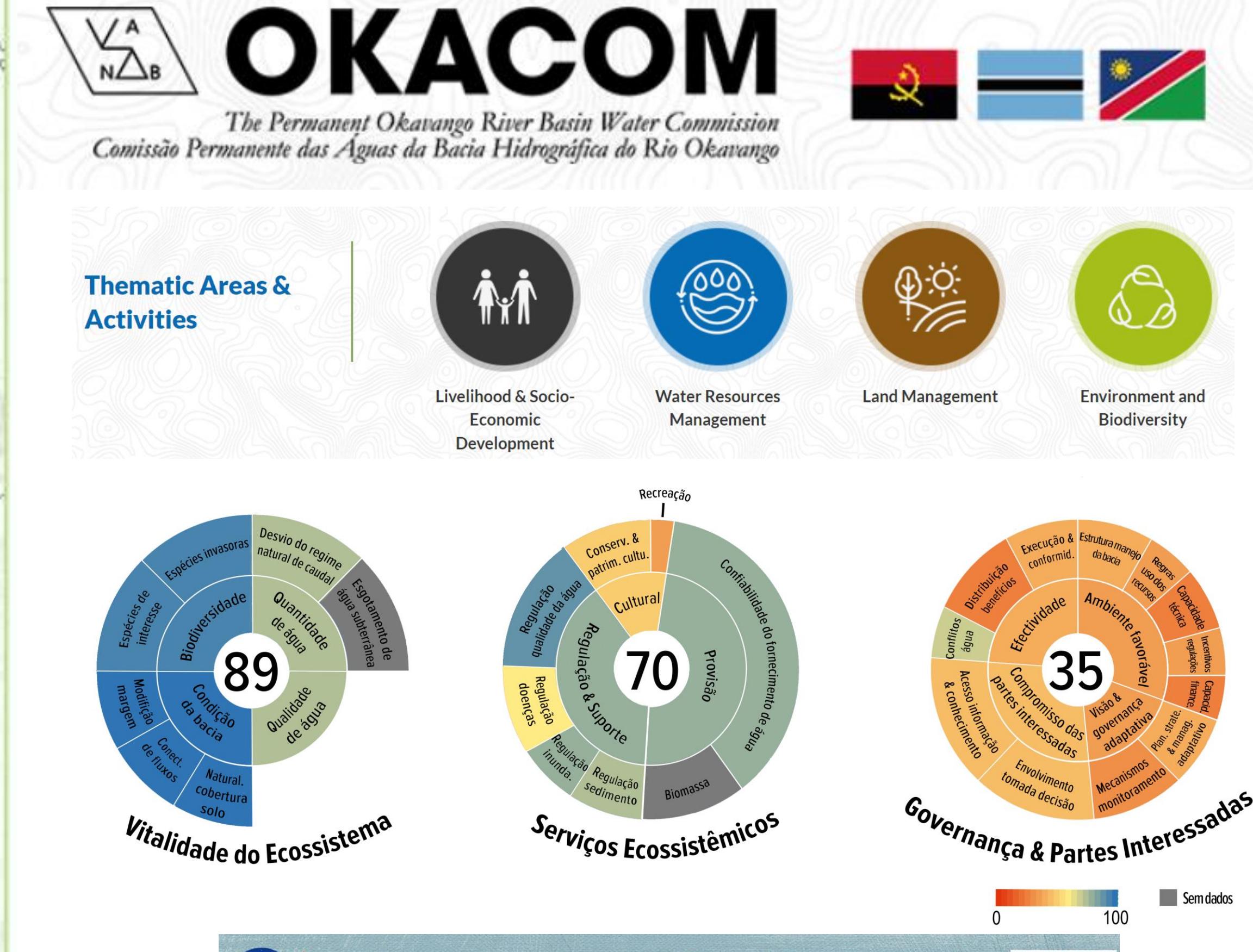
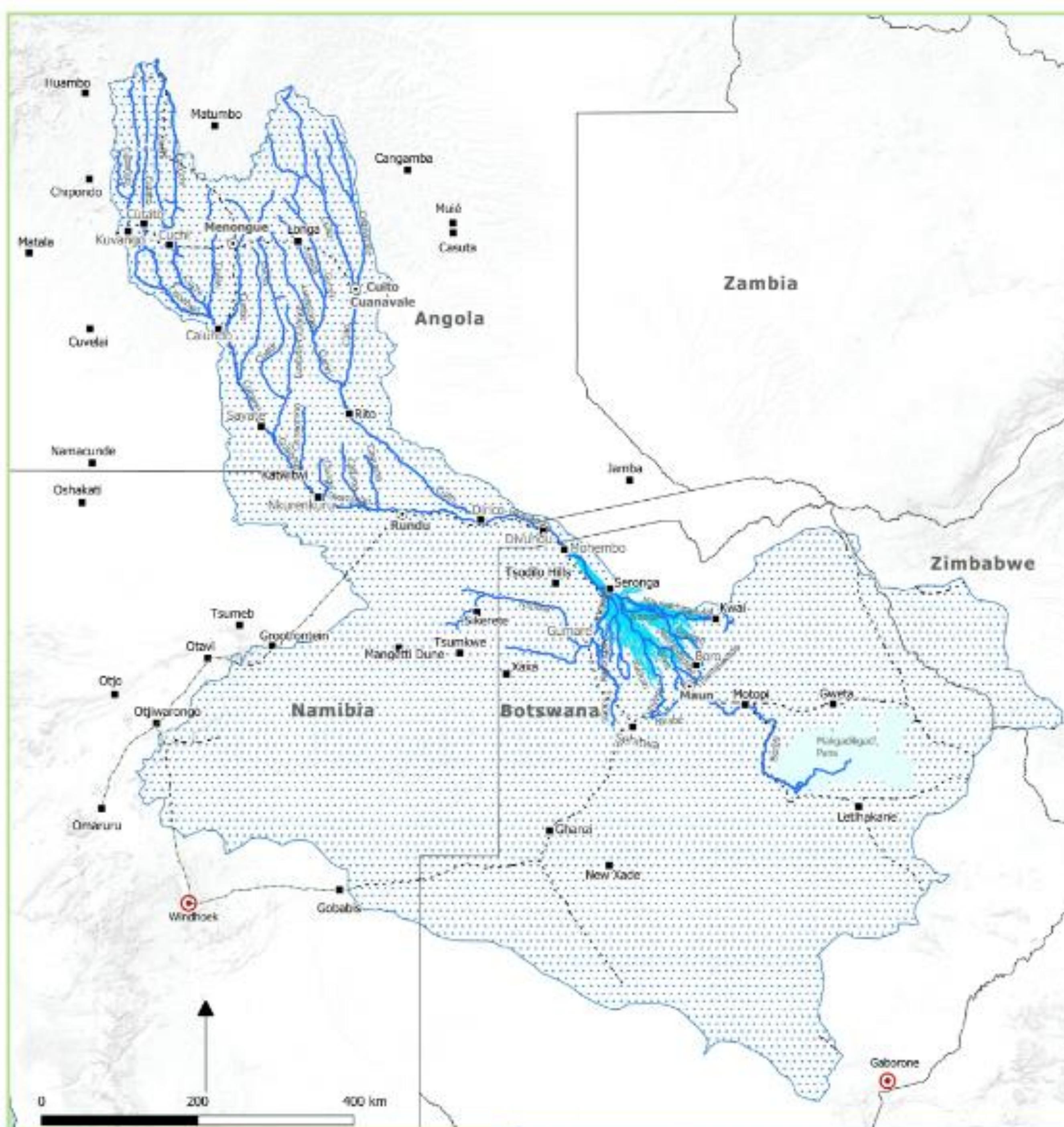
# Freshwater Health Index (FHI) contributes to effective integrated water resources management in Latin America



Deep engagement with stakeholders to clarify the linkages and feedback between the biophysical system and ecosystem services facilitates:

- Cooperation
- Identification of problems and solutions
- Agreement on common objectives

- General FHI results:**
1. Human needs met fairly well but at the expense of the ecosystem ecology in Alto Mayo and Guandu basins
  2. Demand of services met poorly and ecosystem severely degraded in the Bogota basin
  3. Governance and Stakeholder engagement needs significant improvement in all three basins



## NASA-CI Partnership Aids Sustainable Growth with Earth Observations

Ibrahim Mohammed<sup>1,\*</sup>, John Bolten<sup>1</sup>, Maira Bezerra<sup>2</sup>, Kashif Shaad<sup>2</sup>, Nicholas Souter<sup>3</sup>, Derek Vollmer<sup>2</sup>

<sup>1</sup>NASA Goddard Space Flight Center, Hydrological Sciences Laboratory, USA

<sup>2</sup>Conservation International, Betty and Gordon Moore Center for Science, USA

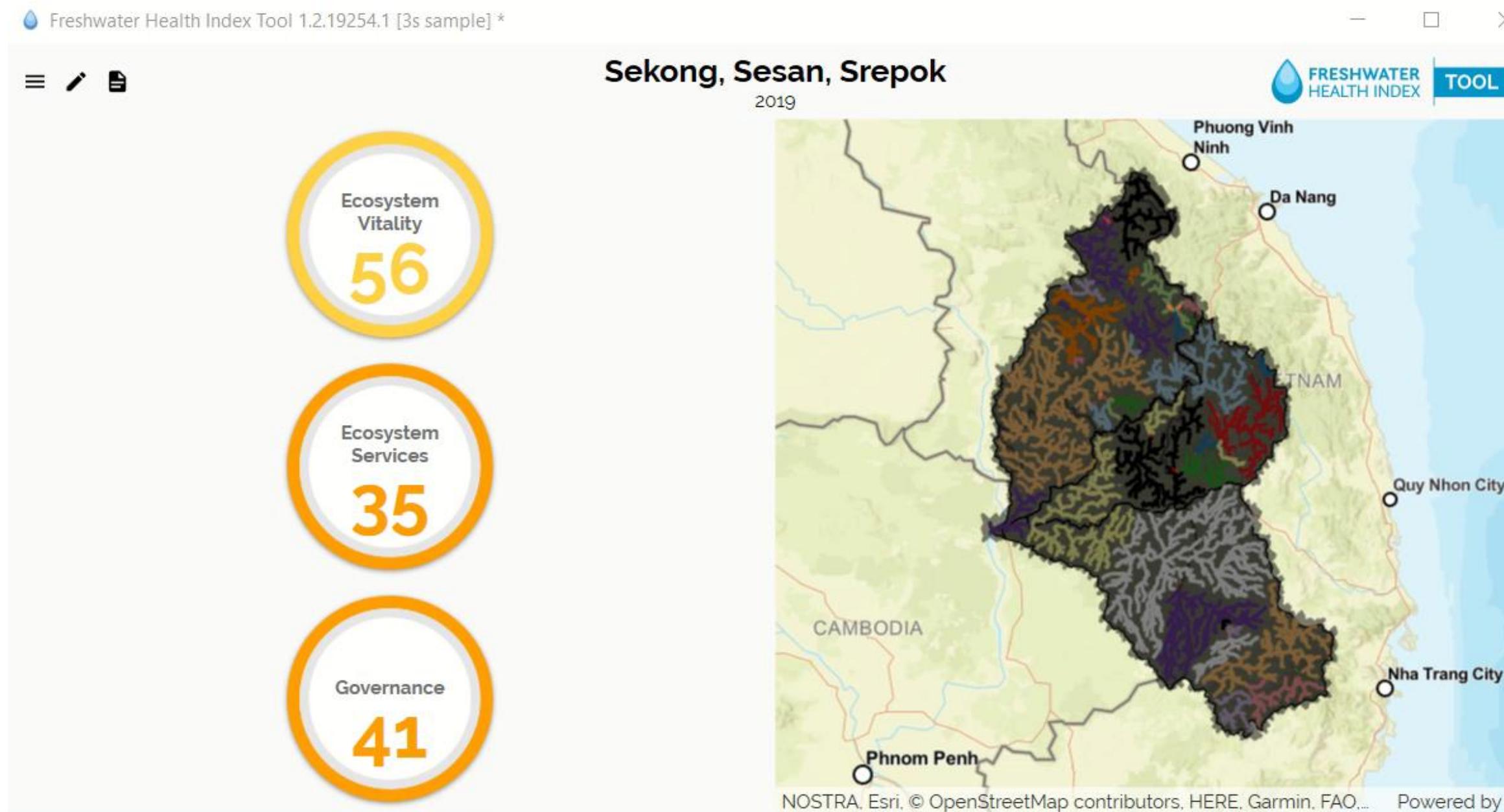
<sup>3</sup>Conservation International, Greater Mekong Program, Australia

NASA-CI-Slides-OKACOM

\*Ibrahim.mohammed@nasa.gov

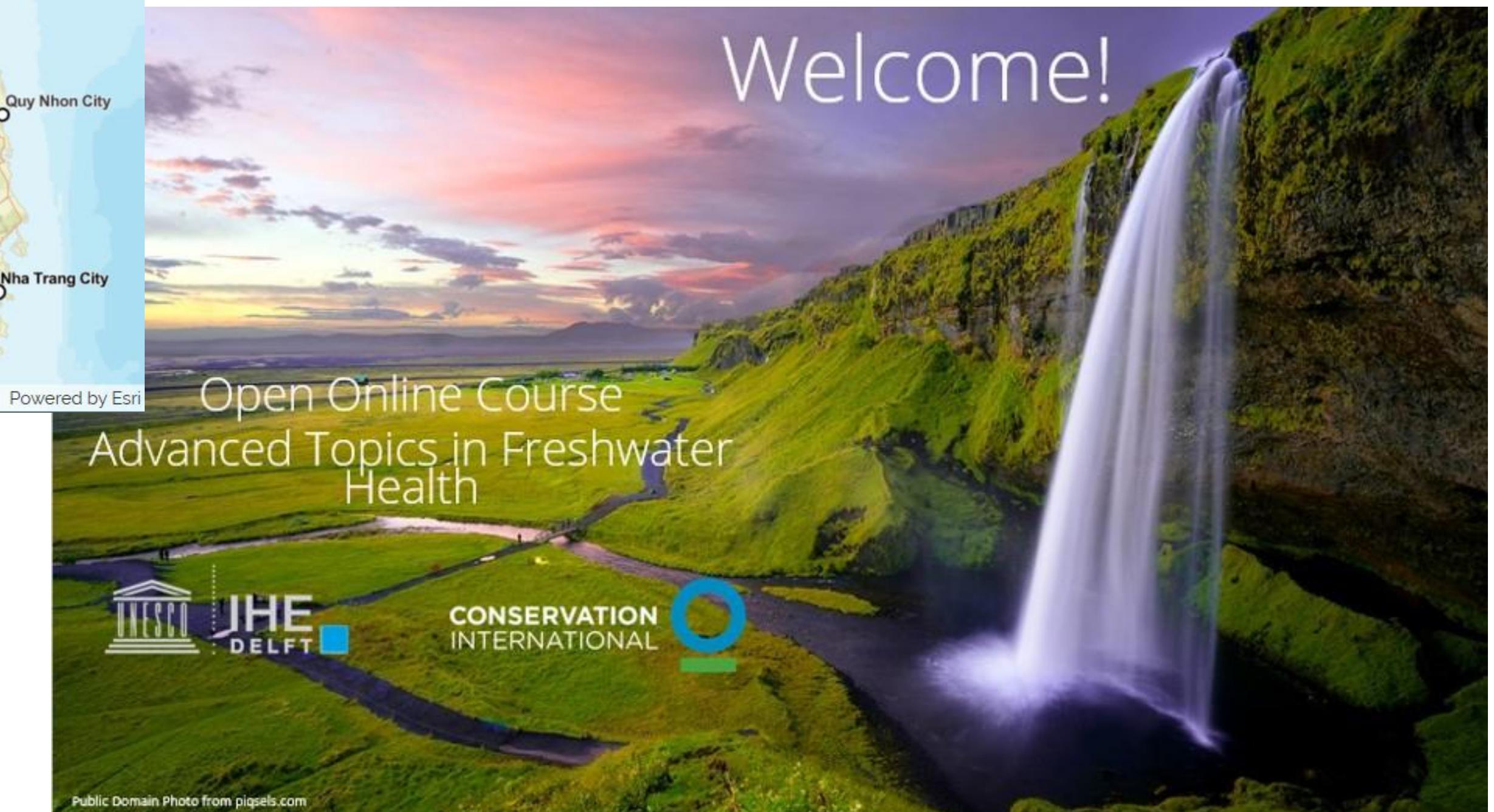
This work was supported by the National Aeronautics and Space Administration (NASA) and the nonprofit Conservation International partnership (Space Act Agreement number 27304) that is dedicated to improving natural resources assessment for conservation and sustainable management on water resources along the Mekong River in southeast Asia and land ecosystems in Africa.

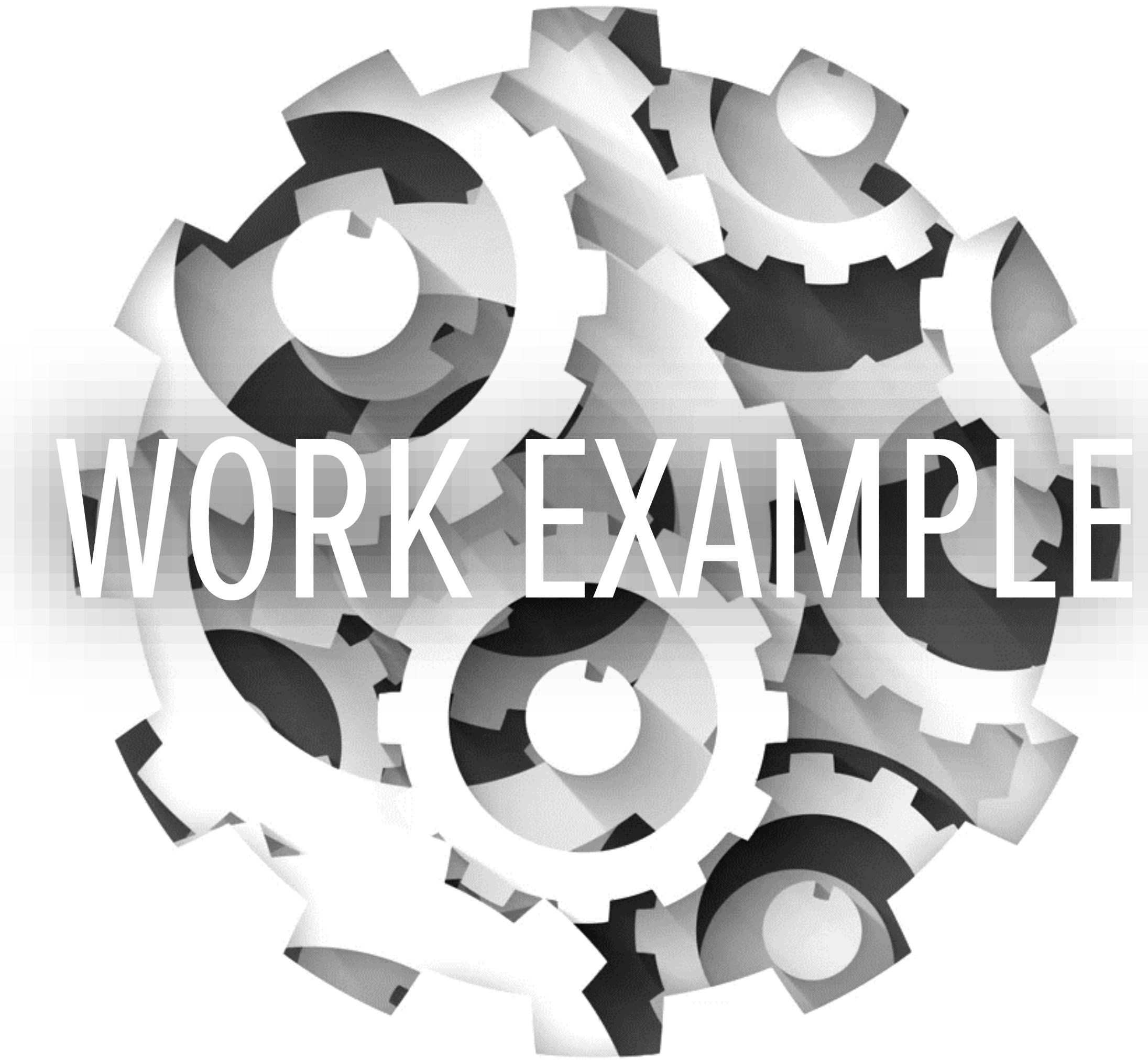
# GETTING MORE USERS TO WORK WITH THE FHI



Desktop and web-based tools available  
to collect and synthesize data

Open online courses offered  
through IHE Delft





**DEVIATION OF NATURAL FLOW REGIME**

An aerial photograph showing a network of winding, shallow, light-blue lakes and lagoons. These water bodies are surrounded by dense green vegetation and some brown, dry land. The lakes form complex, meandering patterns across the landscape.

**GRACIAS**  
**OBRIGADA**

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SALTWATER LAKES IN SOUTHERN PANTANAL, BRAZIL  
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