



# Embedding data-driven tools in transboundary water governance

## KEY POLICY MESSAGES

- **Ensure data-sharing and modeling agreements are supported from the outset by involving all decision-making tiers across transboundary, national, and local levels.**
- **Involve stakeholders before data collection and modeling to build trust and ensure long-term success.**
- **Connect science and practice by teaming experts in water diplomacy and integrated water resource management (IWRM) who understand the interplay between people, countries, and water systems, with those skilled in data collection and model development.**

■ A modeler's view of a river © Daniel Coe, Freepik

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As water does not stop at administrative boundaries, the sharing of data across boundaries is imperative for robust, informed water management. While imperative, it is not easy.

In an ideal world, data and information for transboundary water governance should be timely, targeted, relevant, sufficient, valid, and reliable. The world is not so ideal, at least not yet. Data generation and analysis depend on the technologies applied, and they are generated and applied in social and political contexts. As new methods in remote sensing and artificial intelligence become available, it is crucial to consider how these tools both influence and are shaped by cross-border cooperation, legal frameworks, and institutional dynamics. There is a broad literature on transboundary water cooperation, but few examples explore how data and models are used to support that cooperation, particularly in the face of political sensitivities. A recent special issue of Water International provides some of those examples, from all over the world, with important policy implications.

## ENGAGE ACROSS MULTIPLE LEVELS OF GOVERNANCE IN DATA-SHARING AGREEMENTS

Transboundary water management often involves multiple political and administrative layers. Agreements at the international level may not gain support at the national or local levels, especially when political interests, power imbalances, and bureaucratic fragmentation are at play at all levels.

This is especially true when agreements at the transboundary level fail to align with national or local needs.



This was the case in the Cauvery River shared by several states in southern India, where ter Horst et al. find that a remote sensing-based model failed to meet local needs because negotiations only focused on the main river and dams, ignoring the broader basin.

Similarly, in the Mara River Basin shared by Kenya and Tanzania, Zielinski et al. show that the failure to include all decision-making levels in data-sharing agreements from the outset left national and local actors feeling disconnected from transboundary efforts.

From the top:

■ Banks of River Cauvery © Ashwin Kumar, 2012

■ Mara River Aerial © Colin Jackson, 2008





■ © NASA, Earth observations taken by Expedition 44 crew member ISS044E022791, 2015

## INTEGRATE OFF-SITE AND GROUND-BASED INFORMATION EXCHANGE

Remote sensing can reduce dependency on on-site data sharing but cannot fully replace ground-measured data. For effective data-driven decision-making, it is essential to combine remote sensing tools with ground-based data exchanges.

In Ethiopia, Hassan et al. recount how a remote sensing-based analysis had to be developed to forecast critical water supplies to Sudan during the filling of the Grand Ethiopian Renaissance Dam, in order to overcome a lack of information exchange between the two countries. Despite this innovation, it cannot replace ground-measured data and transparent information exchange between the countries in assessing the risks and benefits of the incoming water flows and to operate the Sudanese infrastructure accordingly.

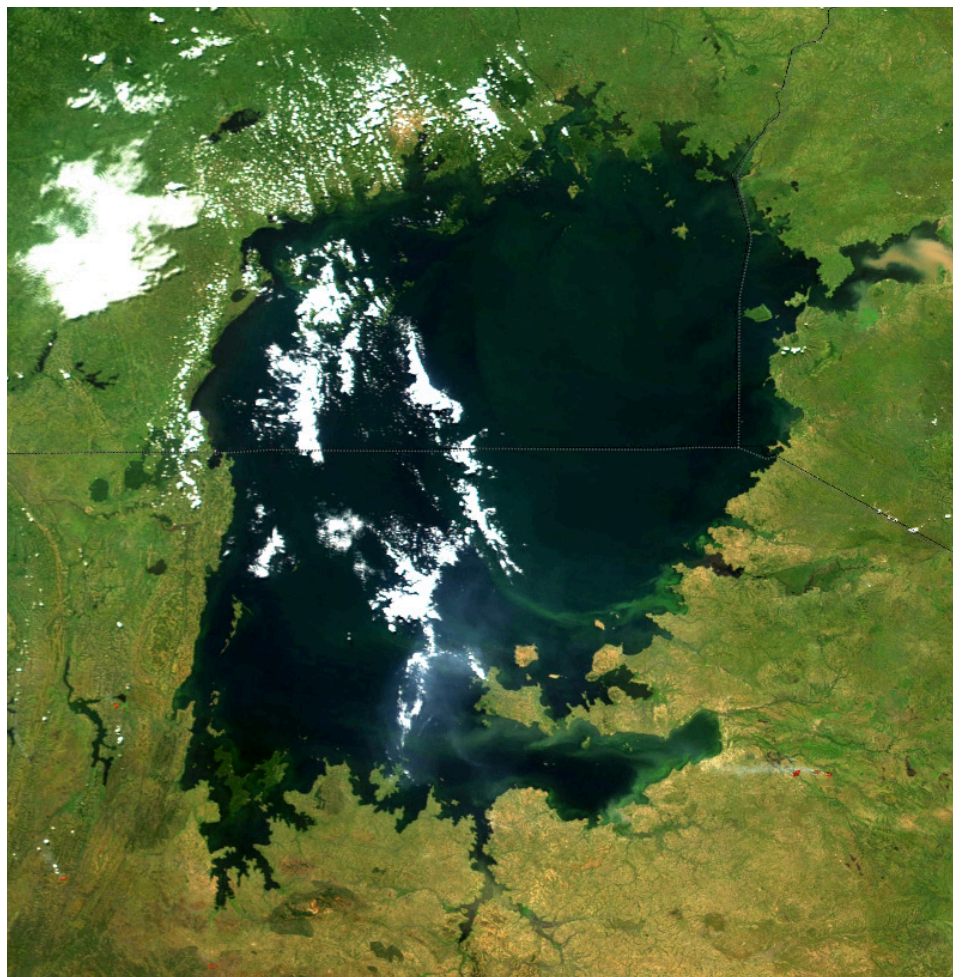
## CLEAR UP CONFLICTING NARRATIVES WITH ADEQUATE MONITORING

The controversy surrounding the declining water levels of Lake Victoria further highlights the importance of in-situ data. Between 2000 and 2006, the lake's water balance remained difficult to determine due to significant gaps in accurately measured components. According to Bosuben et al., this uncertainty allowed various actors to

exploit the situation, advancing conflicting narratives about the causes of the declining water levels and diverting attention from their own accountability. The study underscores the need for riparian countries to adequately monitor shared water resources within their territories and to ensure transparent exchange of ground-based information with neighboring countries.

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**Remote sensing can reduce dependency on on-site data sharing but cannot fully replace ground-measured data.**

■ © NASA, This is part of Lake Victoria the large water body shared by three East African countries, 2018







## ENGAGE STAKEHOLDERS IN THE PROCESS

Data collection and modeling often focus on technical aspects before engaging stakeholders. This is a recipe for failure. Early stakeholder involvement builds trust and aligns data and models with community needs. Establishing early engagement allows for the co-design of solutions and minimizes future conflicts.

In the Colorado River Basin, the focus of Wheeler et al., the Colorado River Simulation System was initially developed by the U.S. and later adapted for use by Mexico to support critical transboundary negotiations over water shortages. The challenge now is expanding access to the modelling tool to a wider range of stakeholders, including researchers and NGOs. Maintaining the tool's relevance requires ongoing updates and revisiting assumptions. This is complicated by the political sensitivity of the basin.

Collecting, developing, and applying data-driven tools for transboundary water governance is a delicate balancing act that requires aligning the opportunities and constraints of these tools with the political dynamics of their application. Achieving not only successful but also consensus-driven implementation depends on investing in relationships between people, institutions, data, and critical technologies to build trust and foster collaboration.

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**DRAWN FROM THE SPECIAL ISSUE**  
[www.tandfonline.com/toc/rwin20/48/8](http://www.tandfonline.com/toc/rwin20/48/8)

### **Exploring the use of data and models in transboundary water governance (2023)**

Water International 48:8.

In addition to the cases mentioned here, there are studies by Espindola and da Silva on the La Plata Basin and Slinger on the Scheldt Estuary.

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