Cross-border water resources management in the Horn of Africa:

Digital platforms for collaboration and decision-making

This brief is part of a series of knowledge briefs on “Cross-border water resources management in the Horn of Africa”:

1. Status and trends in cross-border basins and aquifers
2. Regional and cross-border initiatives and frameworks for cooperation
3. Digital platforms for collaboration and decision-making

These knowledge briefs draw on the full report “Transboundary Water Resources Management for Resilience in the Horn of Africa: Mapping of actors, policies, and initiatives”, UNEP-DHI Centre on Water and Environment, 2020. The work supports the UN’s five-year Comprehensive Regional Prevention Strategy for the Horn of Africa (2019-2023), in particular Pillar 4 on sustainable natural resources development and climate resilience.

This knowledge brief gives an overview of: the socioeconomic dependence on cross-border basins and aquifers in the Horn of Africa; threats to socioeconomic development in the form of droughts and floods; the future impacts of climate change and socioeconomic shifts; and the importance of natural resources management for resilience.

This brief is intended as a dialogue starter that may be used in discussions with country governments and other national stakeholders in the IGAD region, UN Country Offices, IGAD, donors, and development partners.

Disclaimers

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Regional water resources

Three-quarters of the people in the Horn of Africa live within river basins and over aquifers that are shared by two or more countries, known as 'transboundary' or 'cross-border' basins and aquifers. Developing digital platforms to understand and manage these cross-border resources is vital for sustainable development and resilient communities.

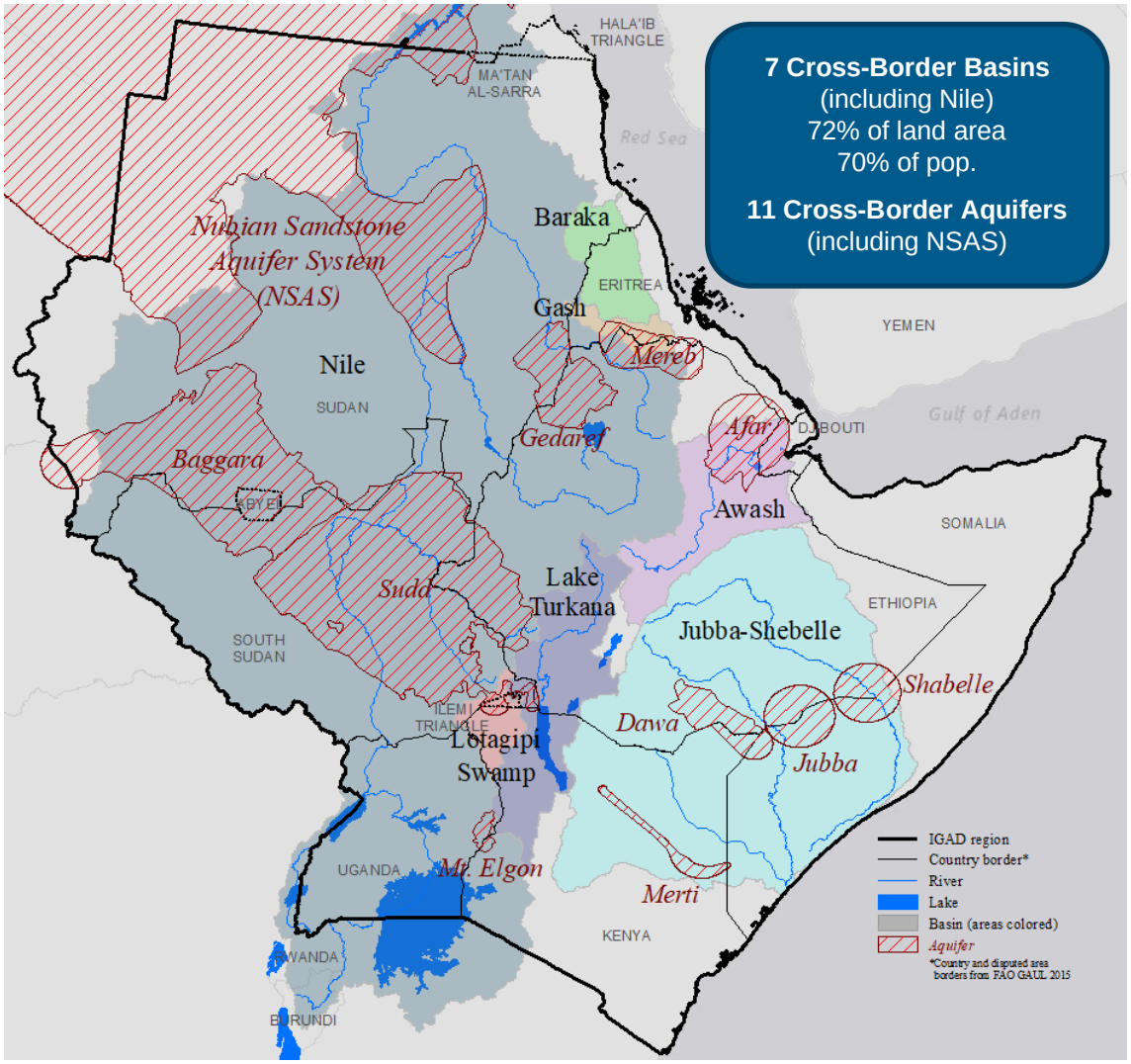


Figure 1 - Cross-border river basins and aquifers entirely contained within the IGAD region (8 countries), as well as the Nile basin and the Nubian Sandstone Aquifer System, which extend beyond the region.[1]

The region is dominated by the Nile river basin, which includes all IGAD countries apart from Somalia, Djibouti, and Eritrea (though Eritrea is an observer member of the Nile Basin Initiative (NBI)). The Nile has two sources: the White Nile with headwaters flowing from Lake Victoria (Uganda, Kenya, Tanzania), and the Blue Nile originating in Ethiopia.

The next most significant basin in the region is the Jubba-Shabelle, with these two rivers originating in Ethiopia and flowing into Somalia. The Lag Dera sub-basin originates in Kenya and joins at the mouth of the Jubba-Shabelle in Somalia. Due to its central location in the region, and highland areas, Ethiopia contains the headwaters of 5 of the 7 cross-border basins in the region.

[1] Cross-border basin delineation: UNEP-DHI and UNEP, TWAP (2016), cross-border aquifer delineation: IGRAC, TWAP (2016).

A summary of digital platforms and institutional arrangements

The existing landscape of digital platforms, a term to include information portals, data repositories, data visualisation interfaces, and analysis tools, is already populated and a number of institutions are involved. An extensive, descriptive list of platforms and hosting institutions can be found in the full report that accompanies this knowledge brief. The following is a general summary of the status of the digital platform and institutional landscape:

Digital Platforms

1. Over the past two decades, many digital platforms for data and information management related to natural resources and climate change have been developed in the region. Some are embedded in long-term programmes, while others are developed through research programmes or short-term projects.

2. Many of the digital platforms are constructed like ‘libraries’ of maps and figures. While this is helpful in some contexts, they do not have the capacity to combine and use the information in a more integrated manner.

3. There is no overarching regional level platform that provides a unified entry point to water resources management and related information. Such a platform would support regional and cross-border planning and management of water resources including impacts of climate change and other drivers.

4. Cross-border surface water basins: multiple tools for the Nile basin are incorporated into decision-making processes, and there are fledgling tools recently developed for the Omo-Turkana and Juba-Shabelle basins. Cross-border aquifers: tools are mainly limited to global level tools, and some research-based tools.

Institutional Capacity

1. There are existing regional, cross-border and national institutions that have the potential to manage, operate and use a regional and/or cross-border water resources digital platform. However, to make such a platform sustainable and effective:

    a. Institutional and technical capacity needs to be increased in most cases.

    b. Institutional arrangements need to be coordinated and streamlined.

2. At the cross-border level, the Nile Basin Initiative (NBI) has two decades of experience with developing and using platforms with ownership from every basin Member State. This experience should be built upon.

Existing digital platforms for cross-border collaboration

Building on existing technologies and institutional capacities is recommended wherever possible – no one wants to reinvent the wheel.

There are dozens of portals, tools, and datasets that, when viewed together, can give a complete picture to inform cross-border water management strategies. However, none of these present the data and information in an integrated format to truly serve as a foundation for shared understanding.

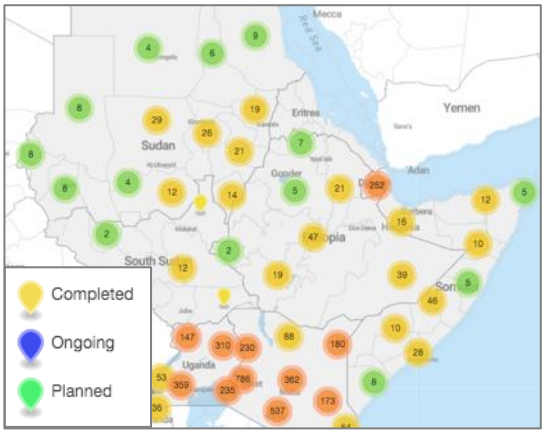
Below is a selected list of digital platforms with a description of their strengths and limitations, including their ability to incorporate projections, ability to present an integrated picture or analysis of multiple factors, and associated institutional considerations. Some are used in the Horn already, while others have potential for application in the region.

ICPAC Apps Portal: an umbrella portal to the following ICPAC portals (see image):

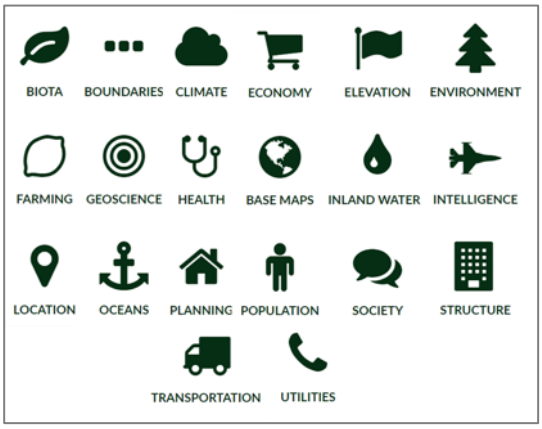
These portals are promising. The ICPAC Geoportal appears to feed into the IGAD Spatial Web Portal (similar content). The remaining portals require login. ICPAC provides daily, weekly, and seasonal (3 month) climate forecasts (primarily precipitation and temperature) on a 10x10 km grid for the IGAD region. They are working on developing hydrological models for all major basins and sub-basins, though data remains a challenge.

IGAD Resilience Portal (IDDRSI): serves as an umbrella portal to information related to resilience in the region and provides access to validated tools and information systems that could support programming and implementation, investment tracking, project transparency and donor visibility. The portal provides an entry to the following:

IGAD Resilience 3W Mapping Portal: 'Who is doing What and Where'. This comprehensive repository of project overviews related to resilience, useful for programming and coordination. However, does not contain any data and information relevant for decision-making related to natural resources management and does not appear that project status is updated after it is added to the portal.

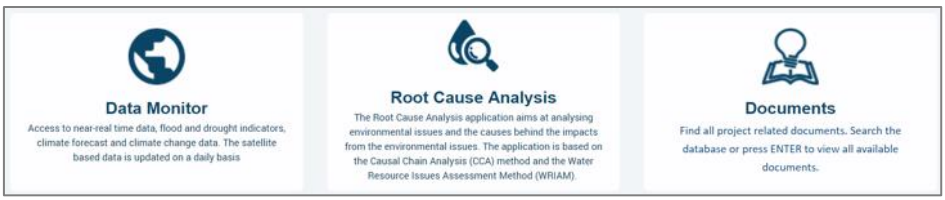


IGAD Spatial Web Portal: intended to facilitate the sharing and collaborative use of geospatial datasets in the categories shown on the right. This portal has potential, with links to key IGAD Centres (ICPAC, CEWARN, ICPALD, Economic Cooperation Division). However, it appears to be rather static information, no time-series, and not regularly updated. For example, the only drought data (drought events) seems to be from 1980-2000, and the only flood data (flood prone areas) is from 2012.

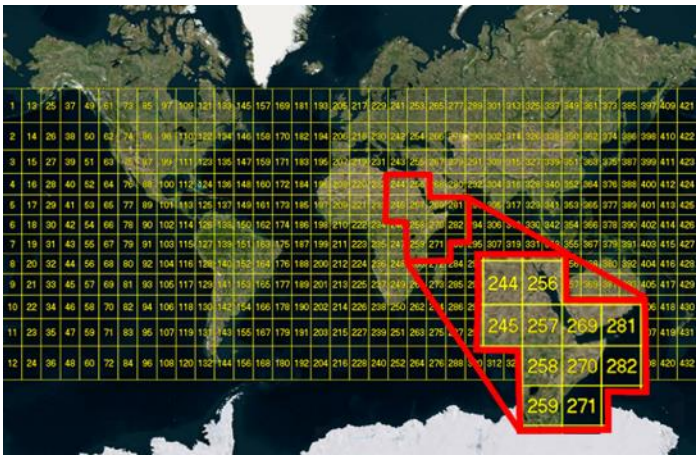


IGAD Land Governance Portal: The Land Governance Portal was developed as a part of the Land Governance Programme, which started in 2015. This portal is a collection of maps and documents. The maps display information including land degradation and drought, but nothing directly related to surface or subsurface water or cross-border basins or aquifers. The link to water resources management is present, but not in focus. There is potential for intersecting interests, as IGAD's mandate on land governance includes sustainable management of shared natural resources.

SECCCI observatory tools: basin-level portals have been developed for the Omo-Turkana and Jubba-Shabelle basins. They automatically harvest Earth Observation data such as precipitation, temperature, land use and vegetation cover, and convert this into easily accessible maps and graphs. The portals also contain socioeconomic information, climate change data, and have the potential for additional datasets. They feature decision-making tools such as "Root Cause Analysis", which helps users analyse the impacts of given environmental issues by identifying the underlying causes, and "Planning", which allows users to compare and analyse river basin development, rehabilitation, adaptation, and climate change scenarios. **Recommendation:** investigate options for using this technology in other basins in the region and embedding them into regional and/or national institutions (e.g. ICPAC) so that they might support decision-making.

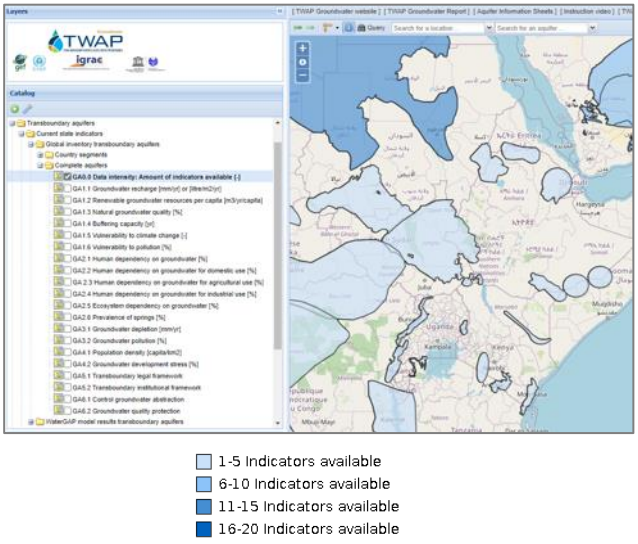


DHI Global Hydrological Model: simulates river discharge for all the world's major rivers. The model produces historical discharge with historical climate data inputs, and with forecast inputs produces short-term (hourly) to long-term (seasonal) outputs. The model continually harvests remote sensing data and can generate output fast enough for real-time applications. It does not rely on *in-situ* data in the same way that traditional modelling does, and therefore has good potential to be applied in cross-border basins. There is the possibility to downscale the model to the regional level, where regional/local forecasts can be used as inputs and discharge can be simulated for sub-catchments of a size suitable for the needs of the region.



IGRAC Groundwater tools: IGRAC has expertise disseminating groundwater information, has established partnerships with regional African organizations, and is familiar with cross-border work.

TWAP Groundwater Information System: This global, IGRAC portal contains information on 199 groundwater aquifers from Transboundary Waters Assessment Programme finished in 2016. The TWAP Groundwater portal shows current and projected indicators for each cross-border aquifer, both as a whole and as reported by country-units. A variety of climate, hydrogeology, management, and socioeconomic indicators can all be displayed simultaneously on the interactive map. A factsheet can also be generated for each aquifer. The information contained in the portal is limited by what is available from or reported by each country.



SADC Groundwater Information Portal (GIP): SADC has partnered with IGRAC in creation of the GIP. The setup for the portal is similar to the IGAD Spatial Web Portal, in that it is a library of data and maps and does not appear to include time series data or analysis functionality. Layers are primarily viewed individually in the portal, with the exception of four interactive maps with multiple layers. The portal includes many references to other groundwater resource pages for Africa, which could also be useful in the IGAD region.

Nile Basin Decision Support System: This DSS platform for the NBI is used for communication and information management. The platform includes maps, models, databases, and workspaces to support decision makers. Technical expertise and software are needed for operation, and each member state has been trained in its use. The result is a common, useful, computer-based platform for communication, information management and analysis of water resources.

Regional institutional capacity

The IGAD Climate Prediction and Applications Centre (ICPAC) is the regional Centre with the highest technical capacity and is a designated WMO Regional Climate Centre. Their services include: climate forecasting (daily, weekly, and seasonal forecasts); water resources (hydrological) modelling; disaster risk management; and agriculture and food security.

> Challenges: (a) water resources modelling is hampered by national reluctance to sharing data; (b) multiple portals, libraries and 'products', while useful in particular instances, make it challenging to get a clear overview that would support integrated decision-making; (c) most of the outputs are available at either regional or national level, without aggregating to basin level, which is critical for cross-border water resources management.
>
> Recommendation: (a) build on ICPAC's technical capacity; (b) develop a regional appreciation of the value of sharing data for cross-border water resources management; (c) investigate the potential for using new modelling technologies that use 'big data' and rely less on in-situ data.

The IGAD Drought Disaster Resilience and Sustainability Initiative (IDDRSI): much of the work related to sustainable natural resources management and climate resilience has been channelled through the long-term IDDRSI programme (2012-ongoing). While IDDRSI does not have the technical capacity for developing a digital platform on water resources management, it would appear to be logical for such a platform to be embedded within IDDRSI.

The Nile Basin Initiative (NBI) is another regional body, with two decades of experience in developing and using digital platforms and technical tools with ownership from every basin Member State. All countries in the region are members of NBI, with the exception of Somalia and Djibouti (Eritrea is an observer).

> Recommendation: Build upon this experience in building trust and developing platforms for other cross-border basins in the region.

UN Country Teams have the mandate to support countries in working towards their sustainable development objectives, which includes water resources management. Furthermore, many countries in the region have a UN Peace and Development Advisor, to support national stakeholders in conflict prevention and sustaining peace. With most of this work being focussed at national level, there is scope to promote an appreciation of the value of coordinated development and management of water resources management in border areas. The Office of the UN Special Envoy for the Horn of Africa may have a role to play in coordinating UN country efforts across the region.

Recommendations

Main recommendation: Develop an integrated, sustainable digital platform for cross-border water resources management for the Horn of Africa that builds on existing technologies and institutional capacities where relevant and provides an evidence base to support implementation of work on sustainable natural resource management and climate resilience.

Further recommendations: During design of such a platform, it is recommended that the following be considered to address the challenges presented by existing digital platforms.

Sustainability: Given the number of disused and unfunded digital platforms, it is critically important that any new platform should serve a clear purpose and be designed with longevity as a focus. During development the questions who, why, what, where, and when should be answered and short and long-term funding sources should be identified.

Functionality: The platform should encompass the following:

- **Objectives**: support efforts to facilitate constructive dialogue and consensus building in the Horn of Africa, towards decisions and actions that enhance equitable and transparent sharing and governance of transboundary water resources between and within regional states.
- **Integration of issues**: integrated information is vital for integrated water resource management. This includes hydrological, land use, climate, and socioeconomic data.
- **Integration across scales**: separate but linked 'workspaces' at different scales, such as a workspace at the regional level, and dedicated workspaces for each cross-border river basin and aquifer in the region. Each basin/aquifer workspace would developed according to capacity and priority within a common framework.
- **Groundwater and surface water**: while there are huge differences in the knowledge on groundwater and surface water in the region, management should consider both water sources, and as such, the platform would be flexible enough to incorporate both groundwater and surface water.

Content: Knowledge is only valuable to the user when it can be digested and analysed, therefore content organisation and presentation, as well as content areas, is important to consider. Furthermore, inclusion of data should be transparent, trusted, reliable, independent (e.g. remote sensing data), regularly updated, cost effective, and gridded (with potential for aggregation to basins, sub-basins, and aquifers).

Challenges: The following should be addressed during design of a platform, to ensure that these obstacles can be overcome when the platform is operational:

- Internet instability and low speeds for access and maintenance
- Data can become stuck in the processing pipeline, from collection to analysis
- Reluctance of countries to share data with regional organizations and other countries
- Lack of capacity and institutional memory at regional, national, and local levels
- Limited longevity due to lack of funding and/or inability to meet the users' needs

Development process: Ultimately, one of the most valuable aspects of digital platforms is their creation and shared maintenance. The process of working together to create something that is owned by all members of a cross-border basin fosters shared understanding, normalizes cooperation, and lays a foundation for more complex or sensitive topics at a later stage. It is therefore recommended that the process of developing a digital platform is given sufficient attention to try to achieve these outcomes.