

Applying digital water innovations for fragile and conflict-affected settings

Digital Innovation for a Water-Secure Africa (DIWASA) project

- Duration: February 2024 to January 2027
- Implementation led by the **International Water Management Institute (IWMI)**
- In partnership with **Digital Earth Africa** in collaboration with **AMCOW (African Ministers' Council on Water)** and national institutions across Africa relating to water, environment and agriculture
- Funded by the **Leona M. and Harry B. Helmsley Charitable Trust**



Through support from the **CGIAR Food Frontiers and Security Science Program**, DIWASA is now being scaled by IWMI into fragile and conflict-affected settings, where digital tools are most urgently needed.

Building resilience in a high-risk environment

Fragile and conflict-affected settings (FCAS) face some of the most severe water risks globally. In these contexts, weak institutions, rapid displacement and recurring droughts and floods converge to heighten vulnerability. Yet African river basins remain among the least gauged worldwide, leaving governments, humanitarian actors and communities without the data needed to anticipate and respond to crises. Earth observation, remote sensing and digital innovations present a unique opportunity to fill this gap. However, capacity constraints and fragmented governance mean that these tools are often underused where they are needed most.

Scaling proven tools for lasting impact in fragile and conflict-affected situations

Launched in 2020, the **Digital Innovations for a Water Secure Africa (DIWASA)** project harnesses satellite data, cloud computing and machine learning to generate actionable information on water availability, hazards, and use across Africa. Through **Digital Earth Africa** and IWMI's **SIWA+ framework**, DIWASA delivers open-access datasets on water accounting, hydrological hazards and climate extremes at scales ranging from river basins to national boundaries. These products already inform agricultural planning, disaster preparedness and water policy in multiple countries, providing the evidence base for food and water security, drought forecasting and early warning systems.

Building on this foundation, IWMI and partners are now refining DIWASA tools for fragile and conflict-affected settings, where humanitarians and development actors often lack reliable water data to guide response. With support from the CGIAR Food Frontiers and Security Science Program, these tools are being adapted to anticipate floods in Ethiopia's Somali Region through a digital twin, assess water risks with UNHCR in Sudan and expand the Vegetable Irrigation for Climate Resilience (VICR) into new humanitarian settings. This evolution ensures DIWASA not only strengthens water security in stable contexts but also delivers practical, conflict-sensitive solutions where resilience is most urgently needed.



What we have achieved

- Water accounts at basin and sub-basin levels (Volta, Lake Tana, Central Rift Valley) to guide irrigation and agricultural water use.
- Multi-hazard risk maps for Ghana, with expansion to floods, droughts, wildfires and storms across Africa.
- Continental drought hazard maps that identify hotspots of extreme vulnerability.
- River discharge modelling for 60,000+ river segments across Africa.
- DIWASA products are already being taken up by partners such as UNHCR, the Somali State Regional State Water Bureau, the Ethiopian Ministry of Water and Energy, AMCOW (through WASSMO) and basin authorities in Ghana, Zambia and Ethiopia.
- Humanitarian and development actors working in fragile contexts, including UNHCR and NGOs piloting the VICR platform, are beginning to use these tools to inform programming in displacement settings.



Next steps for scaling impact

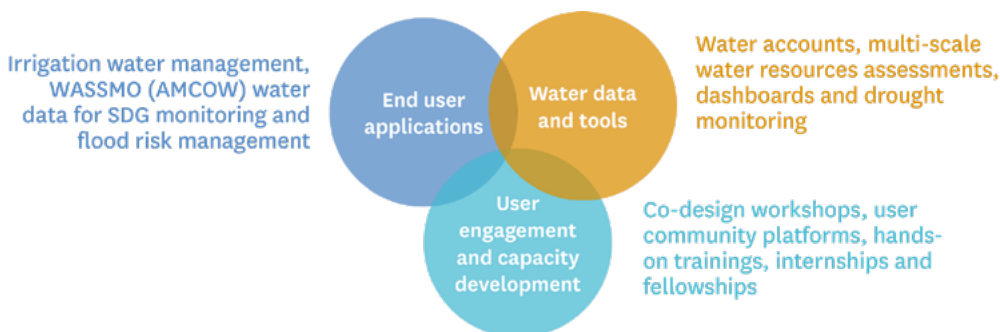
- Advance co-development of user-friendly tools that enable humanitarian agencies and fragile-state institutions to translate DIWASA data into timely crisis preparedness and response plans, building on prototypes already initiated with CGIAR Food Frontiers support.
- Expand flood and drought early warning systems into additional high-risk fragility and conflict-affected situations, aligned with anticipatory action and climate adaptation to cut costs and build resilience.
- Strengthen local capacity so ministries, disaster agencies and NGOs in fragile areas can own and apply DIWASA outputs.
- Pilot Digital Twins in fragile basins that integrate hydrological, climate and social data, allowing stakeholders to test and scale resilience strategies before crises hit, maximizing impact and value for money.

Our approach

Africa has 63 transboundary river basins, covering 64% of the continent’s land area and supporting over 600 million people. Yet in many conflict-affected and crisis-prone basins, governments and humanitarian actors are too often forced to respond reactively, relying on incomplete or outdated hydrological data. Communities face cascading

risks from droughts, floods, and declining water quality without the tools to anticipate, adapt or plan ahead, leaving lives and resources at greater risk. DIWASA directly addresses these gaps by combining Earth observation, cloud computing and machine learning to deliver open-access, analysis-ready datasets.

Its work spans three pillars:



Open platforms for sharing data continent-wide

DIWASA integrates its datasets into Digital Earth Africa (DEA), a continental-scale platform that provides analysis-ready Earth observation data for decision-making, and the Africa Geoportal (AGP), which offers cloud-based geospatial tools and data services. By making all products freely accessible and analysis-ready, DIWASA ensures that governments, NGOs and local researchers can work from the same trusted evidence base. This open access approach reduces information asymmetries that often drive mistrust or conflict, while promoting collaboration across borders and institutions.

Hazard mapping and forecasting

Through Earth observation and machine learning, DIWASA generates drought hazard maps, flood forecasts and multi-hazard risk profiles. These products underpin early warning systems that are particularly vital in fragile settings, where communities are highly exposed to climate extremes and institutional response capacity is limited.

Capacity development

DIWASA builds the skills and systems needed to turn data into action. Through co-design workshops, training and user platforms, it equips ministries, basin authorities and humanitarian agencies to apply Earth observation products. This focus on local ownership ensures the tools are trusted, used, and sustained even in fragile, rapidly changing environments.

Water accounting at multiple scales

DIWASA applies IWMI’s Scale Invariant Water Accounting (SIWA+) framework to track water availability, withdrawals and stress at basin, national and sub-national scales. These accounts provide the evidence governments and humanitarian actors need to allocate scarce resources fairly, plan water supply and irrigation investments, support food production and energy needs and balance competing demands across sectors.

Vegetable Irrigation for Climate Resilience

The Vegetable Irrigation for Climate Resilience (VICR) is a decision-support platform developed by IWMI to help humanitarian actors, NGOs, and extension agents design climate-smart irrigation interventions for vegetable production. Originally piloted in Mali and Ethiopia with USAID support, VICR has since been expanded under DIWASA to fragile and conflict-affected settings, where reliable data and practical guidance are scarce. By walking users through crop selection, water source identification, and irrigation technology choices, the toolkit enables crisis responders and local institutions to integrate nutrition-sensitive, water-efficient food production into emergency and recovery programs.

The portal contains three modules:



The Resource Center



The Interactive Decision-Making Process Tool



The Irrigation Technology Suitability Dashboard



Integrated Water Management with the Limpopo Digital Twin

The Digital Twin of the Limpopo Basin provides institutions with a virtual model that integrates real-time monitoring, Internet of Things, and citizen science. It simulates ‘what if’ scenarios to test solutions for water allocation, irrigation expansion, and disaster preparedness before they are implemented, reducing risks, saving costs, and strengthening resilience across the humanitarian-development-peace nexus in crisis- and conflict-prone settings.

The digital twin includes:

1. 3D Topographic Model
2. Flood Forecasting & Sensors
3. Early Warning System
4. Scenario Builder & AI Chatbot
5. Damage Assessment Tools



Open platforms for sharing data continent-wide



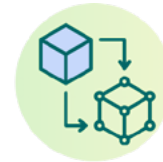
Capacity development



Water accounting at multiple scales



Hazard mapping and forecasting



Digital twin for better decision-making

Use cases

DIWASA's impact is demonstrated through practical applications tailored to end-user needs. From guiding irrigation modernization in Ethiopia's Amibara scheme, to developing flood risk maps for vulnerable communities, and supporting AMCOW's monitoring of SDG water targets, the project shows how open data can address real-world challenges. Each use case helps validate and refine the tools while highlighting pathways for scaling them across fragile and conflict-affected settings.

Benefits that go beyond local impact

Scaling DIWASA across fragile and conflict-affected contexts offers strong value for money because a single digital infrastructure serves multiple purposes, from agricultural planning and disaster preparedness to humanitarian response and peace building.

By keeping all datasets open access, each investment delivers regional benefits, enabling governments, NGOs, and humanitarian actors to work from the same trusted evidence base.

DIWASA is expanding its support across the continent, equipping humanitarian agencies and at-risk communities, including those hosting displaced populations or facing rapid demographic pressures, with vital tools. In contexts marked by limited capacity, weak governance, and scarce resources, DIWASA enables crisis anticipation, fairer water allocation, and stronger resilience in volatile environments.



Images: Irrigated home gardens, like this one in Ethiopia's Amhara region, are an important source of food, including in the dry season. Credit: Mulugeta Ayene/WLE

Acknowledgments

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CGIAR Food Frontiers and Security Program

The CGIAR Food Frontiers and Security Program focuses on strengthening fragile, urban and island food systems by catalyzing innovative policies, investments and local capacities to improve food and water security, nutrition and climate resilience for the world's most vulnerable communities. <https://www.cgiar.org/cgiar-research-portfolio-2025-2030/food-frontiers-and-security>

Contact

Abdulkarim Seid, Country Representative – Ethiopia, Regional Representative – East Africa (Rotational CR), International Water Management Institute (IWMI), Addis Ababa, Ethiopia (a.seid@cgiar.org)

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International Water Management Institute (IWMI)

Headquarters

127 Sunil Mawatha, Pelawatte, Battaramulla, Sri Lanka

Mailing address:

P. O. Box 2075, Colombo, Sri Lanka

Tel: +94 11 2880000

Fax: +94 11 2786854

Email: iwmi@cgiar.org

www.iwmi.org