PEACE, PROSPERITY AND
REGIONAL INTEGRATION

A Report on IGAD's Groundwater Information System (GWIS) Launch and Training



14th - 16th October 2024,

IGAD Climate Prediction & Application Centre (ICPAC), Nairobi - Kenya

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ABBREVIATIONS AND ACRONYMS

FAO	Food and Agriculture Organization of the United Nations
GAFA	Groundwater Access Facility for Africa
GWIS	Groundwater Information System
GW4R	Groundwater for Resilience
HoA	Horn of Africa
ICPAC	IGAD Climate Prediction and Application Centre
IGAD	Intergovernmental Authority on Development
IWU	IGAD Water Unit
MSs	Member States
NGWCs	National Groundwater Centres
RCGW	Regional Centre for Groundwater Resources
SDC	Swiss Development Cooperation
TTL	Task Team Leader
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UN	United Nations
WB	World Bank

1.0 BACKGROUND INFORMATION

The Groundwater Information System (GWIS) is an integral part of the Horn of Africa Groundwater for Resilience (HoA-GW4R) project, aiming to strengthen the sustainable management of groundwater resources across the IGAD region. GWIS will serve as a platform for sharing and managing groundwater data, with the ultimate goal of promoting regional cooperation and data-driven decision-making regarding transboundary aquifers and other key water resources.

The development of GWIS is part of IGAD's component 1 of the GW4R project focused on "Strengthening Regional Capacity & Information for Sustainable Groundwater Management". The activity has been implemented by an individual consultant in close collaboration with IGAD Water Unit (IWU) team, the World Bank (WB) and representatives of Member States (MSs) implementing the GW4R project since late 2023.

A launch of the GWIS was conducted on 14th October, 2024 at IGAD Climate Prediction & Application Centre (ICPAC) at the outskirts of Nairobi, Kenya. This was followed by a two-day training on the GWIS from 15th -16th October, 2024 at the same venue. This report presents a summary of the three-day event.

1.1 Launch and Training Objectives and Expected Outcomes

The launching and subsequent training on the GWIS had three broad objectives:

i. To officially introduce the GWIS platform and its capabilities in enhancing groundwater management across the IGAD Region.
ii. Engage stakeholders in discussions about the future of GWIS and its role in promoting regional collaboration on groundwater data sharing and management.
iii. Initiate capacity-building efforts by training national experts in the operation and management of GWIS.

The following four broad outcomes were expected from the launch and training events:

i. Successful launch of the GWIS platform, demonstrating its features and data-sharing capabilities.
ii. Discussions on the long-term vision for GWIS, including its role in managing transboundary aquifers and future expansions.
iii. Commitment from stakeholders (IGAD Member States, UN-family, World Bank and others) to use and contribute to the system for regional water security.
iv. Increased technical capacity of IT experts from National Groundwater Centers (NGWCs) through hands-on training.

2.0 LAUNCH OF GROUND WATER INFORMATION SYSTEM (GWIS)

The launch was preceded by opening remarks by representatives of ICPAC, WB, UNESCO and UNDP. This was followed by a presentation by IGAD on "importance of data in groundwater resource management", the official launch; a panel discussion focused on "vision for GWIS" and a discussion on next steps after the launch.

The launch was attended by 43 participants (32 male, 11 female) from three Member States: Ethiopia, Kenya and Somalia in addition to representatives from World Bank, UN agencies including UNICEF, UNDP, UNESCO and FAO. Others were from the Swiss Development Cooperation (SDC) and the Regional Centre for Groundwater Resources (RCGW) and the host IGAD. Details of launch and training attendance are presented in **Annex 1**.

2.1 Welcoming Session.

Representatives from four institutions: ICPAC, WB, UNESCO and UNDP made opening remarks.



Mr Atheru, ICPAC Deputy Director giving his opening remarks

Mr Zachary Atheru, ICPAC Deputy Director, on behalf of Dr Abdi Fidar, ICPAC Director, welcomed participants to ICPAC, Nairobi and Kenya.

Reading Dr Fidar's speech, Mr Atheru reported that *"Our journey with GWIS starts today but its impact will last for generations*".

He concluded ICPAC Director's remarks by asking participants and member states to commit to the vision of GWIS which is not just a tool for managing water, but a platform for fostering collaboration, building resilience, and ensuring the prosperity of the IGAD region. Details of his speech is attached in **Annex 2.1**.

Mr Victor Vasquez of WB making his opening remarks



The World Bank Task Team Leader (TTL) for the GW4R Project, Mr Victor Vasquez in his welcoming remarks underscored the importance of the GW4R project as one of the regional programs the WB is funding and that IGAD is the glue implementing the regional component of the project.

He reminded participants that although GWIS is a key activity, there are many other similar initiatives by the donor community with low sustainability. He therefore challenged participants to ensure sustainability of GWIS and posed the following observations and questions for considerations during the launch discussions, two-day training and beyond:

- *How do we ensure that this GWIS platform will be sustainable beyond the World Bank funding period?*
  What kind of data will we need from GWIS and for what?
- *Who is the user of the GWIS platform?*
- *How are countries going to use the GWIS platform?*

UNESCO's remarks were made by Dr Florence Tanui who underscored the critical role the GWIS platform represents as a part of a collective effort to address the environmental challenges of the Horn of Africa (HoA). She itemised water security initiatives UNESCO has implemented within the HoA either singly or jointly with other UN agencies. Details of UNESCO launch remarks are in **Annex 2.2**.

In his opening remarks, the UNDP representative reported that water use is the entry point to resilience and development challenges in the HoA. He made reference to Groundwater Access Facility for Africa (GAFA). He opined that a lot of resources is wasted due to lack of groundwater (GW) data which leads to use of trial and error in implementation of GW projects. He reiterated sustainability as a major challenge to planning and managing standardised data system access in countries. He emphasized that although countries collect data at the national level, sharing data is critical since *"water does not recognize boundaries"*. He concluded by acknowledging the continued global interest in groundwater including through GAFA.

2.2 Importance of Data in Groundwater Resource Management

In this presentation, Dr Ibrahim Ahmed, head of IGAD Water Unit covered overview of IGAD Region with 60% dependent on groundwater and the proportion of renewable GW used in each of the 8 IGAD member states by 2019. Also covered were the 13 Transboundary Aquifers (TBAs) across IGAD MSs, IGAD projects dealing with water security challenges since 2007 to date and beyond (2028), an introduction to the GW4R project, role of data in GW management and the GWIS.

Under next steps were presented six broad points including i) Data harmonization; ii) Data sharing protocols; iii) Integration of UN agencies and academic databases to GWIS; iv) Capacity building; v) Early warning systems to GW stress; and vi) Collaboration with International partners. Presentation details are in **Annex 2.3.**

Participants from Ethiopia, Kenya, UN Agencies and WB during the GWIS launch





2.3 Official Launch of the GWIS

This was led by the IGAD consultant; Nicholas Lomardi. Mr Lombardi took participants through the following as part of the official launch:

- A demonstration of the GWIS platform demonstrating an overview of the features including data access, borehole data and mapping capabilities
- An explanation of how member states can contribute data and benefit from the system.

Q&A

The following are highlights of questions, inquiries made, and some suggestions and feedback:

i. The system requires continuous enhancing. There is need for continuous assessments and updating
ii. What kind of data can we put in the system?
iii. What path should MSs take before the signing of the data sharing agreement?
iv. How is the data collected initially? Is it through technology like AI?
v. Data collection and sharing should be standardized
vi. GWIS was designed to be simple and flexible
vii. How will GWIS communicate with national databases?

viii. What is the future of GWIS beyond WB funding timeline?
ix. There is need for development of a framework within which countries will share data.
x. IGAD is taking care of GWIS server
xi. What is the quality assurance mechanism of data to be uploaded in the system?
xii. Why was BGS adopted?
xiii. There is need for support by MSs for sustainability
xiv. Who will access data in the GWIS?
xv. Can databases be inter-phased?
xvi. How long will the system take to be operationalised? Because currently there are data gaps.
xvii. Uploading of data in the system will be by national IT Specialists who are part of the national groundwater centres
xviii. Commitment by MSs in data sharing agreement is missing, no final signature since the initial discussions were done in Ethiopia in May 2024; we need to convince our political leaders to hasten the signing process
xix. What are the formats for data sharing?
xx. Now that a GWIS demo has been performed, there is need to approach the data sharing agreement/ protocol through a top-down approach. According to Mr Lavuon Versmaete of UNICEF, "The more the data is shared among MSs, the more the water resources will be correctly managed"
xxi. Why don't we collect enough nor have enough data in the region?
xxii. Why are we not sharing data? Is it political or technical roadblock? What is paid by tax payers' money should go back to the tax payers.
xxiii. Data harmonization is imperative; however, historical data may not be harmonized.
xxiv. Alot of GW data is in the hands of NGOs and private sector players and not necessarily with governments. What can we do to help gov access such GW data?
xxv. Are organizations drilling boreholes mandated to share data?
xxvi. Do we have a strategy or a simple roadmap now that we have a GWIS platform?
xxvii. Some data are sensitive but we can start by sharing other data
xxviii. Can countries collect, process data jointly for joint program development?
xxix. Data accuracy is a major challenge. There are gaps in most data on GW information, these gaps may be transferred to the GWIS. Further, owners of data with gaps or inaccurate data may not wish to share such data.
xxx. UNESCO to lead in consultation for data sharing
xxxi. We need to value data the same way we value water. "Look at our water through the data we have"
xxxii. SADC has signed a data sharing protocol, what can IGAD learn from them?
xxxiii. IGAD will provide training and continuous capacity building to GWIS users.
xxxiv. What can GWIS serve as is now? a) A repository for GW data; b) Reporting for open data.

xxxv. We cannot solve all GW data related problems at once using the GWIS. On this launch day we are starting along journey, we shall consolidate all the feedback and prioritize based on the GWIS vision and capability

2.4 Panel Discussion: Vision for GWIS and Next Steps

Three presentations were made under this session: i) The long-term vision of GWIS in sustainable water management across IGAD Member States by IGAD; ii) The assessment of the need of the stakeholders under Pillar1 on collaboration by UNESCO; and iii) How Groundwater Access Facility (GAFA) will complement IGAD regional Database by UNDP.



Participants during the GWIS launch

2.4.1 Long-term Vision of GWIS in sustainable water management across IGAD MSs

A four-pronged long-term vision of the GWIS in sustainable water management across IGAD was presented. With a primary objective to provide an integrated and data-driven approach to groundwater management, ensuring sustainable resource use and resilience in the face of climate change, the broad visions are:

Regional Cooperation
Climate Resilience
Agriculture and Food Security
Supporting Livelihoods through Water Management.

Presentation details are presented in **Annex 2.4**

Comments/ Feedback:

- This is unique and linked to more than GW database as it is linked to food security and regional integration. SADC's system is simpler than GWIS. We need such ambitions by linking to other systems
- Vision is good, however, are they based on water evidence including rainfall pattern to help us realise the visions? Have you factored political and social conditions into the visions?

2.4.2 Assessment of Stakeholders Needs

The presentation was made by UNESCO as part of Pillar 1 on "Enhancement of the HoA GWIS". The UNESCO led pillar has three objectives: i) Public data collection for IGAD GWIS; ii) Regional data sharing framework which is a consultative approach towards developing a framework for the creation of a collaborative data sharing framework, and iii) Capacity building for IGAD and dissemination through training and Support towards effective operation, update, and maintenance of the Data Hub.

The presentation also included the following next steps after the launch:

- Facilitate continuous improvement of the GWS based on User Needs
- Capacity building trainings based on IGAD's priority areas
- Facilitate dissemination of groundwater data
- Interoperability of GWIS with UNESCO's IHP WINs

The presentation details are in **Annex 2.5**.

During Q&A session, it was observed that before the framework, there is need for stakeholder engagement and a clear vision on what needs to be done and who are the beneficiaries.

2.4.3 How Groundwater Access for Africa will complement IGAD Regional Database

UNDP's presentation was focused on groundwater data collection and management information assessment for the borderlands of the Horn of Africa. The focus was on project investment pipeline with an objective to identify 50 sites for either public, private, or PPP investment across the 8 member states of the IGAD Horn of Africa region. Presentation details are in **Annex 2.6**.

Q&A: Comments/ Feedback

- GW flows in different levels in an aquifer context and therefore the issue of downstream versus up-stream countries does not apply
- The country using water first in a transboundary or cross-border aquifer situation will be the first to feel GW depletion. Therefore, management of GW in a borderland area is intertwined among neighbouring countries that needs close collaboration.
- MSs who are not part of a resource sharing or who do not see any potential benefits do not have incentives to sign data sharing protocol. It is therefore important to collect data through studies for MSs to see potential benefits like in the case of the Merti Aquifer.
- What are the challenges encountered by UNESCO during data cleaning process?

3.0 GWIS TRAINING

As shown in the attendance list in **Annex1**, the GWIS training was attended by 31 participants (21 male, 10 female) on day 2 and 28 participants (20 male, 8 female) on the last day.

Topics covered on day 1 of the training include: i) Introduction to GWIS including its purpose and scope; ii) Demonstrations of three webpages: the knowledge base page; iii) Boreholes page demonstrations; iv) Introductions and demonstrations on graphs module, and v) Demonstrations on the use of Map module. Others topics included vi) Introductions and demonstrations on Geoserver (GIS connections) and vii) How to register as editor and input editing module. Introductions and demonstrations of each topic was followed by a Question and Answer (Q&A) session.

3.1 Questions, Observations and Feedback from Day 1 Training Sessions

The following are highlights of the questions, observations, general comments and feedback during day 1 GWIS training sessions:

- Does the system have an administration manual?
- The system is nice and straight forward to navigate through.
- Is there a way to download results from the system? Work still in progress, however, need to be careful with downloading results. However, downloading data at this point is still affected by lack of data sharing agreements between MSs.
- Explore the type of data available for immediate downloading or export: Work in progress. The tool is currently exploratory a reason why users are requested not to download results yet.
- Does the system have options for GW data? Not yet, will need to develop codes for that but will be done once signals are in place
- Is the webpage dynamic or static? Information updated if entered manually.
- There are no coordinates and they are not clickable; what are the use of the tables if not interactive? Can we skip the tables if we do not have coordinates? Or limit the tables to summary ones?
- GW cycle is so slow, so there may be no need for real-time data.
- Well usage charts: Legend has two issues: need to create in the user manual distinct definitions for urban, rural, commercial versus domestics etc.
- Scatter plot: Differentiate null from zero in the graph
- Water chemistry and hydrogeological maps: Is there a way a borehole can be overlayed on the hydrogeological map?
- GWIS: Can we have an executive summary on the first page on what to expect as you explore GWIS?
- Hydrogeological maps: Need maps with better scale for better analyses instead of the current common 1:5,000,000 scale. Maps of the following scales are available in the three member states; Ethiopia- 1:250,000; Kenya- 1:1,000,000 and Somalia- 1:500,000. Currently, the only

harmonized maps are in the scale of 1: 5,000,000. Hydrogeological maps will be replaced with harmonized versions.

- Is it possible to have cross-sections to help understand geology in a vertical manner? That information is currently not available.
- Filtering: Is it possible to filter wells based on another attribute rather than the use of geographical coverage? Yes, this can be done.
- The analytical tool is dynamic and supposed to create questions for further exploration
- What is the level of expertise required to use the information system? Users are government ministries, agencies and development partners. This depends on the kindly of information one requires.
- Transmissivity: Do you have pump testing data to derive transmissivity? Is the pumping period same for all the wells? We have some test duration data from SGI-Dawa study
- Geoserver layer: Is there a difference between a geonode and a geoserver? A geonode uses a geoserver as one of the four compoenents.
- Can the name geoserver be changed to something like "data catalogue", "data resource" or something else? Yes, it will be changed to IGAD data repository
- Does geoserver need the "welcome" page? Click and go directly to the data
- Do we have metadata? Cannot be shown since the view of for the general users. Metadata is available for those who will have log-in credentials

3.2 Day 2 Training Sessions

On the last day of the GWIS training, the focus was on: i) Reviewing and updating data input; ii) Filling out excel template; iii) Discussions on routine data needs from GWIS by MSs and open data sources currently available that MSs would sharing with IGAD for uploading in GWIS, and iv) Final Q&A session and recommendations.

3.2.1 Routine Data Needs from GWIS and Opensource Information Available

While group one consisting of IT experts from member states, UNESCO and IGAD focused on filing out data in excel templates through the guidance of the consultant and WB, a second group made up of technical officers from MSs, WB and IGAD addressed the questions on routine data needs and opensource data or information available.

Data entered by the IT group included hydrological models and salinity data among others.

A. Routine data/ Information that MSs will need from GWIS.

At the outset, the group agreed on the type of data requirements for GW in general. Information on data needed, tools to analyse the data, links to the tools and manuals/ guidelines on how to operate the tools. Routine data requirements will include:

i. Shapefiles
ii. High resolution imageries
iii. Borehole recharge related data
iv. Administrative boundaries

v. Climate data
vi. Study reports, factsheets – JRS
vii. Interphases for linking of software
viii. Water quality data
ix. Salinity maps
x. Abstraction data
xi. Structural data: fault lines
xii. Basemaps: topographical changes
xiii. Land use/ land cover maps
xiv. Addition of temporary data for comparison
xv. Time series data for wells
xvi. Drilling history including techniques used
xvii. Catchment water balance: annual recharge, evapotranspiration etc
xviii. Mapping potential of GW zones
xix. Raster data (DEM=Digital Elevation Model)

Tools for Data Analysis will include:

i. Rockware
ii. QGIS
iii. Modflow
iv. Surfer
v. Piper diagram
vi. Aquachem: for water quality

B. **Opensource Information/ Data currently available in Countries that may be shared for Uploading in GWIS:**

Ethiopia:

i. 1:250,000 geological and hydrogeological maps
ii. Masterplans

Kenya:

i. Hydrogeological maps: scale to be confirmed
ii. Topographical maps: to be purchased from survey of Kenya offices
iii. Geological maps: Open access
iv. Borehole data: Available to Water Resources Authority
v. Study Reports: Merti, Turkana, Marsabit etc

Somalia:

i. Hydrogeological and geological maps at the scale 1: 500,000
ii. Wells inventory

iii. Studies

Further, the following **water quality parameters** were discussed:

i. EC conductivity
ii. Temperature
iii. Floride
iv. Bacteriological
v. Salinity

Matters Arising:

The following are some further questions, clarifications sought by participants:

- Who is going to assess the quality data from MSs before uploading in GWIS? Each MSs' Groundwater Center (NGWC) has an IT focal point while on IGAD side Ougas and Igbal will support.
- UNESCO may assist reviewing of data with duplicates and outliers
- Parameters to be seen in the system depends on the data template provided

3.2.2 Recommendations and Next Steps

- Database and frontend had some glitches when migrating data from different formats. The consultant to address various glitches noted in the system by 26th October, 2024
- The Consultant to immediately embark on migrating data into GWIS with the help of UNESCO
- IGAD will notify MSs whenever there will be any changes in the GWIS template
- There is need for a closer review for migrating raw data into GWIS.

ANNEXES

A1.1 Annex 1: IGAD GWIS Launch and Training Attendance



IGAD GWIS Launch and Training Attend

A1.2 Annex 2.1: Welcome Speech by ICPAC Director, Dr Abdi Fidar



Welcome Address of Director Dr Abdi F

A1.3 Annex 2.2: Welcome Remarks by UNESCO.



UNESCO_GWIS Launch Remarks.doc

A1.4 Annex 2.3: Importance of Data in Groundwater Resources Management



Importance of data in groundwater mar

A1.5 Annex 2.4: IGAD Vision for GWIS



IGAD Vision for GWIS.pptx

A1.6 Annex 2.5: Stakeholder Needs Assessments



UNESCO-GWIS Presentation-ICPAC

A1.7 Annex 2.6: UNDP's GAFA contribution to GWIS



UNDP GAFA HoA Launch of GWIS.ppt