Fostering data sharing

Arnaud Sterckx, IGRAC
Data vs. Information

- Data are **independent of the context**. Unlike information, they are unbiased.
- **Data can be reinterpreted** for multiple purposes.

Example: How would you merge different groundwater maps into one that covers the entire basin?
Groundwater data are translated into information by hydrogeologists.

Examples of groundwater information:
- Piezometric map
- Graph showing groundwater level trends
- Report on the state of groundwater
- Warning on groundwater pollution
Rio Declaration On Environment And Development (1992), article 10:

[...]

At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. [...]

SADC Regional Water Policy (SADC, 2005)

(i) Member States shall timeously share relevant available information and data regarding the hydrological, hydro-geological, water quality, meteorological and environmental condition of shared watercourses.

(ii) Member States shall ensure that members of the public in the region have access to relevant and understandable information regarding water resources impacting on their health or safety and on economic interests.

(iii) SADC, SWCIs as well as Member States shall establish mechanisms for regular interpretation and dissemination of essential information on water resources so that the public is regularly informed.
Several countries have developed online tools, platforms, dashboards, cellphone apps, etc. to share groundwater data and information.

Yet, in many countries, data must be requested. Sometimes a fee is asked. Answers might come after several days. Eventually, there might be no data available. See *IGRAC and IGS (2019) State of groundwater data collection and management in SADC Member States*.
Since 2004, IGRAC promotes the sharing of groundwater data and information through the Global Groundwater Information System (GGIS) and the Global Groundwater Monitoring Network (GGMN) platform.
The SADC Groundwater Information Portal

2010: SADC Hydrogeological Mapping Project (SADC et.al.)

Status: January 2012
Screenshot of original SADC-HGM web application (source: SADC et.al., 2010)
2014: The system went down.

Wayback machine – Internet archive
https://web.archive.org
2017: Resuscitating the SADC Hydrogeological Map
A viewer was created within the Global Groundwater Information System (GGIS)
Online Course on Groundwater Management in African Lake and River Basin Organizations
Search for meta information

Meta Information Module (MIM) is the reference core of the Global Groundwater Information System (GGIS). It contains all references documents of the GGIS, other interesting groundwater related documents and meta information on groundwater specialists and water organisations.

You can enter any search term to search the information you are looking for. The filter options on the left hand side of the page can be used to narrow down the total list of results.

Filtered By

- Content type: Document

Region/country of expertise

- Data for SADC module (10)
- Ramotswa Aquifer - Botswana (2)
- Ramotswa Aquifer - South Africa (2)

Theme

- Aquifer Characteristics (1)
- Aquifer Characteristics - Aquifer type (8)
- Aquifer Characteristics - Lithology (8)
- GW Quality (1)
- GW Quantity (1)

Show the remaining 2 items

Search Results (10 found)

- Procédures et directives pour la cartographie hydrogéologique-SADC HGM
  SADCgip - French version
  ("SADC, EU, GTZ, DGS-Botswana")

- Projet de cartographie hydrogéologique de la SADC - Rapport final
  SADCgip - French version
  ("SADC, EU, GTZ, DGS-Botswana")

- Projecto de Elaboração do Mapa Hidrogeológico da SADC - Relatorio final
  SADCgip - Portuguese version
  ("SADC, EU, GTZ, DGS-Botswana")

- Procedimentos e Directrizes da Elaboração do Mapa Hidrogeológico-SADC HGM
  SADCgip - Portuguese version
  ("SADC, EU, GTZ, DGS-Botswana")

- Hydrogeological Mapping Procedures and Guidelines - SADC Hydrogeological
ANYONE with internet access:

- Public viewer

REGISTERED & AUTHORISED users:

- Password-protected workspace
2019-2020: Expanding the SADC-GIP

The SADC Groundwater Information Portal (SADC-GIP) is a platform for sharing groundwater-related data and information in the SADC region. It includes the maps from the 2010 SADC Hydrogeological Mapping project (SADC-HGM), among others. Organisations and Individuals are invited to register and share relevant groundwater data and information in the SADC-GIP. Providing easy access to groundwater data and information is key to allow all stakeholders to actively participate in the sustainable management of groundwater resources in the SADC region. The SADC-GIP is managed by the SADC Groundwater Management Institute.

Search for Data.

Search

Advanced Search
• The new SADC-GIP operates as a Spatial Data Infrastructure, where many users can register for uploading/accessing data.

In most countries, the majority of groundwater data and information is held by the state, e.g. ministry of water, water authority (national or decentralized), geological survey... but additional data might be held by other ministries or departments, river basin organisations, water companies, universities, NGOs, private companies, etc.
Data providers remain in control of their data, through permissions and licenses.
• Licenses can be applied on the data

Copyright allows the departments to restrict the use of the data, even for open data shared in the public viewer. Readily available licenses like Creative Commons licenses can be used to specify different options in terms of attribution, processing or application. The following types of licenses are extracted from https://creativecommons.org/:

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• It supports international standards for spatial data exchange.

• Data providers decide who has access to the data and to what level
• Data users have access to up-to-date data
• Data users don’t have to store the data
• If not OGC standards, API can be tailored (but then the exchange of data is dependent of the application)

• It supports extensive metadata.

Many data are useless if not accompanied with metadata, e.g. coordinate system (for spatial data), units (for measurements), methodology, etc.

→ Metadata are crucial! In particular in transboundary contexts where different standards might be in use.
3.2. Metadata required for monitoring data

Some metadata are collected in relation to the function of the data point: groundwater level monitoring well, groundwater sample point, and groundwater abstraction/flow discharge point.

3.2.1. Groundwater level

- Unit: Length, usually meters or feet
- Reference point to start measuring (e.g. sea level or ground surface)
- Date of recording (preferably including year, month, day, hour, minute and second)
- Method of measurement: manually or automatically. When data loggers are used, extra metadata should be collected following the instructions of the provider of the equipment (e.g. depth to probe, atmospheric correction, etc)

3.2.2. Groundwater quality

- Name of parameter, for instance: pH, temperature, total dissolved solids, etc.
- Unit (of concentration), for instance mg/L, ppm, pH units, etc.
- Method of measurement: Including whether it was measured in the field or in the laboratory, and which method was used (e.g. electrochemical analysis, spectroscopy, etc)
- Name of laboratory
- Relevant dates: Date of measuring in the field, date of sample collection, date of analysis in the laboratory

3.2.3. Groundwater abstraction

- Unit (volume/time, for example m³/L)
- Method of measurement: flowmeter, bucket/chronometer
- Date (preferably including year, month, day, hour, minute and second)

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Big Data Analytics and Transboundary Water Collaboration, 2019
Training material was produced, and workshops were held to reach out and engage national water departments in SADC

https://www.youtube.com/watch?v=1_loHepw9g&feature=youtu.be
The Stampriet Information Management System

2013-2015: GGRETA project – phase I, Stampriet Transboundary Aquifer System (Botswana, Namibia, South Africa)

3 pilot studies to advance “Governance of Groundwater Resources in Transboundary Aquifers”
2018: The Multi-Country Cooperation Mechanism (MCCM) of the STAS was integrated to the Ground Water Hydrology Committee (GWHC) of ORASECOM.

Location of the Stampriet Transboundary Aquifer System (in orange) and the Orange-Senqu River Basin (in green) (UNESCO-IHP & ORASECOM, 2018)

Launch of a new information management system at ORASECOM
gis.orasecom.org
The Ramotswa Information Management System (RIMS)

2015-2017: Ramotswa project – phase I (Botswana, South Africa)

The Ramotswa aquifer is a small transboundary aquifer close to Gaborone.
2019: LIMCOM launched its first Groundwater Committee to address conjunctive management of surface water and groundwater resources, with a focus on the 3 TBAs identified to date in the basin, among which the Ramotswa aquifer.

Support of LIMCOM by SADC-GMI settled in a MOU.
https://ggis.un-igrac.org/

The Global Groundwater Information System (GGIS)

The GGIS is an interactive portal for sharing data and information on groundwater resources around the world. It gives access to map layers, documents, and well and monitoring data. It also contains several thematic map viewers.

Explore the viewers

- Transboundary Aquifers of the World map
  - The GGIS provides access to the online versions of the Transboundary Aquifers of the World Map. The TBA map 2015, the most recent edition of the map, is based on the most recent results.

- Global Groundwater Monitoring Network (GGMN)
  - The Global Groundwater Monitoring Network (GGMN) is a participative, web-based network of networks, set up to improve quality and accessibility of groundwater data.

- MAR Portal
  - The MAR Portal contains the Global MAR Inventory, an inventory of over 1200 sites where Managed Aquifer Recharge is or has been implemented. The Global MAR Inventory.

- Senegal-Mauritania Aquifer Basin (SMAB) / Bassin Aquifère Sénégal- Mauritanien (BASM)

- Dinaric Karst (DIKTAS Project)
  - This DIKTAS Information Management System (IMS).

- Transboundary Aquifers (TWAP Project)
  - Recognizing the value of.
The GGIS contains thematic map viewers
Example: the TBA viewer

https://ggis.un-igrac.org/view/tba
Map layers, documents and well and monitoring data can be accessed
Free to use
Development is also open-source and free to share
Well and monitoring data are now integrated in the GGIS

https://ggis.un-igrac.org/view/ggmn
Senegalo-Mauritanian Aquifer Basin viewer

https://ggis.un-igrac.org/view/basm
Groundwater Resources in Africa viewer

https://ggis.un-igrac.org/view/groundwater-resources-africa
Lessons learnt

- Data sharing involves different organizations, at different levels (country level, regional/continental level, RBO level)
- International data sharing standards allow data to flow seamlessly through different platforms
- Spatial Data Infrastructure allow data providers to remain in control of their data
- Free and open-source software programs are available
- Data sharing is challenging and a never-ending effort
- A regional institution promoting data sharing is instrumental and cost-efficient (e.g. at REC or RBO level)
Protocols certainly help but are not essential for data sharing. In most RBOs, there is no distinction between surface water and groundwater, so no need for specific mandates. Willingness and dialog are more important.

“there is evidence that online platforms promote data exchange, whereas data protocols do not”
SDI have developed much over the last 15 years, in relation with the INSPIRE Directive, an EU initiative to develop SDI across the member states, to promote the flow of data and information in support of environmental policies and applications. The Directive came into force in 2007 and has been implemented gradually.
Harmonization

Data from various organisations and countries need to be harmonized. For example, datasets can be merged into one single, consistent dataset (same coordinate system, same unit).

Assessment

Data can eventually be analysed and interpreted

→ Data gaps can be identified and serve to improve the collection of data in the basin.

Data harmonization: IGRAC and UNESCO-IHP, 2015
Thank you for your attention