

Rwanda Water Resources Board: From Scattered Data to Real-Time Early Warning Detection System

When a River Rises Overnight, Someone Has to Be Watching

The Rwanda Water Resources Board (RWB) is a government institution under Rwanda's Office of the Prime Minister, established in 2020 to bring water resources planning and monitoring under one dedicated institution. Before RWB was formed, these responsibilities were split across several agencies.

Some of the rivers RWB tracks are known quantities. RWB watches them closely because they have a history of rising fast, often overnight. When one crosses a threshold, the difference between a fast decision and a slow one can mean a road closed in time, or a driver stranded for hours trying to cross it. After the devastating floods of May 2023, RWB's mandate got bigger fast, and its data infrastructure had to keep up.

The Challenge: One Network, Built From Everyone Else's Equipment

RWB's monitoring ambitions are wide by design. Mid-term targets include at least 86 river stations upstream and downstream, an expanding groundwater network, and 101 lakes under observation, including 10 major lakes that require close attention, on top of rotating water quality campaigns. Altogether, RWB's monitoring footprint spans an estimated 300 to 500 stations nationwide, with disaggregated SDG 6 reporting and catchment level water stage monitoring next on the roadmap.

Much of that network exists because donors fund it, station by station, and RWB does not always have a say in what instrument arrives or what protocol it speaks. That has been true from early on: different applications, built into different protocols, pushing data in different formats and different time conventions, arrived long before there was ever a single system built to receive all of it consistently.

RWB's Mid-Term Targets

- ✓ At least **86 river stations** upstream & downstream
- ✓ Expanding groundwater network
- ✓ **101 lakes under observation** including **10 major lakes** that require close attention
- ✓ **Rotating** water quality campaigns

Future Targets

-  Disaggregated SDG 6 reporting
-  Catchment level water stage monitoring

That patchwork got harder to manage after the floods of May 2023. RWB added new stations quickly to give local leaders sharper, location specific information, including flood thresholds for particular communities, and the number of monitored points grew faster than the existing database could keep pace with.

What RWB needed was not just more storage. It needed a system that could hold continuous, high-frequency sensor readings and discrete field samples side by side, keep years of historical records intact and easy to retrieve, and stay reliable no matter how many new stations came online next.

How Aquarius Connects It All



COLLECT & INTEGRATE

Seamlessly collect data from river, groundwater, lake and water quality stations in real time.



MANAGE & VALIDATE

Store, validate, and quality assure data with built-in workflows and QC rules.



ANALYZE & VISUALIZE

Visualize trends, compare catchments, and generate insights with powerful analytics.



REPORT & SHARE

Deliver disaggregated SDG 6 reports and share trusted data with stakeholders confidently.

The Turning Point: One System, Whatever the Source

RWB worked with Aquatic Informatics to upgrade its Aquarius Time-Series platform from a medium capacity system to a large-scale system capable of supporting more than 1,000 hydrometric stations, giving the network enough room to keep growing without hitting the same wall twice.

Aquarius channels incoming data through an intermediate HTTP server, absorbing whatever format, protocol, or timestamp convention each donor funded station happens to use, and consolidating everything into one database that holds continuous sensor streams and discrete field readings side by side.

On top of the upgraded system, RWB layered real time dashboards and open APIs, along with a proxy server that mirrors the public API for an added layer of security. A public facing Water Portal now lets registered users, including researchers, partners, and Rwanda's Ministry of Emergency Management, pull data directly rather than waiting on RWB to compile it. RWB is one of the only agencies in the region publishing open, machine-readable water data this way.

The data itself matures the way real monitoring data should. The most recent 15 minutes of reading are available as soon as they arrive, and each figure is updated as it passes through quality review, so a dataset pulled tomorrow is more refined than the one pulled today, without ever hiding the raw record it came from.

"Combining data from many different stations into one database has genuinely changed things for us. Some organizations still assume it is impossible or think Aquarius can only handle water and not other types of monitoring like meteorological data. We know that is not the case."

BERNARD MUSANA, HEAD OF KNOWLEDGE AND FORECASTING HUB, RWB

From Rising Water to Safer Roads

HOW AQUARIUS KEEPS RWB ON TOP OF OPERATIONAL EMERGENCIES



Rivers
Monitored



Water Level
Threshold Exceeded



Automatic
Aquarius Alert



RWB Flags
Risk



Emergency
Center Acts



Road Closures &
Broadcasts Sent



Why It Worked

- Consolidated a fast-growing, donor-funded network into one database, regardless of instrument, format, or protocol
- Upgraded to a large-scale system built to support more than 1,000 hydrometric stations
- Automated the graphing, forecasting, and alerting that used to require a site visit and an afternoon
- Opened a public Water Portal, putting real-time and quality-checked data directly into partners' hands
- Provided training, led by Terry Kenney, principal hydrologist at AQI to a new generation of hydrologists to move beyond storage into trend analysis and forecasting in March 2026

Why It Matters

RWB sees Aquarius as central to the country's long term water security. As Rwanda works to balance supply and demand across dams, cities, and stormwater infrastructure, RWB is expanding monitoring beyond natural water systems to include infrastructure itself, such as dam levels, and systems shaped by human activity, which will call for even greater analytical capacity.

The goal is a more complete, real-time understanding of how the country's catchments interact, informing planning decisions well into the future.

"The more data we have, the better we plan. Planning for water resources is important because in the future we need to balance supply and demand, and that relies entirely on how good your data is."

BERNARD MUSANA,
HEAD OF KNOWLEDGE AND FORECASTING HUB, RWB

The Results

- ✓ Upgraded from a medium-capacity to a large-scale system, supporting more than 1,000 hydrometric stations
- ✓ Added roughly 20 new groundwater monitoring stations in a short time following the upgrade
- ✓ Real-time data delivery down to the last 15 minutes, through open APIs and a public Water Portal
- ✓ One of the only agencies in the region publishing open, machine-readable water data
- ✓ Established a full-time database specialist role dedicated to Aquarius and its connected services
- ✓ Learned about the data management tools, quality assurance capabilities, and intuitive UI that Aquarius is known for

"Since the website update and the upgrade to the new Aquarius system, we can finally scale up our groundwater monitoring. Where we used to be limited in the number of stations we could manage, we can now add roughly 20 more stations and deliver additional services in a very short time."

BERNARD MUSANA,
HEAD OF KNOWLEDGE AND FORECASTING HUB, RWB

Ready to move from fragmented systems to a single source of truth?

Standardize your data, scale your visibility, and give every level of your organization the clarity it needs to act with confidence.

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