



NILE BASIN INITIATIVE
INITIATIVE DU BASSIN DU NIL

FLOWING UNDERGROUND

STORIES FROM THE KAGERA AQUIFER

TABLE OF CONTENTS

2-3	TABLE OF CONTENTS, INTRODUCTION
4	PROTECTING THE ENVIRONMENT TO SECURE GROUNDWATER
7	WATCH LISTEN TO STORIES FROM KAGERA BASIN
8	GROUNDWATER OFFERS LIFELINE TO DROUGHT RIDEN EASTERN RWANDA
13	GROUNDWATER TURNS EASTERN RWANDA INTO A BREADBASKET
15	MAKING GROUNDWATER SUSTAINABLE
16	A CALL FOR MORE GROUNDWATER
17	TANZANIA CALLS FOR MORE HARMONIZED LAWS TO PROTECT THE ENVIRONMENT AND SAFEGUARD GROUNDWATER
22	LEADERS EMPHASIZE CULTURE TO PROTECT GROUNDWATER IN TANZANIA
26	GROUNDWATER BRINGS SMILES TO COMMUNITIES IN BURUNDI
29	BURUNDIAN RURAL WOMEN CHAMPION COMMUNITY ON GROUNDWATER

Cover Photo

A man in Isingiro district digs a shall well. Groundwater is accessed through several ways including dug wells.

Photo by Fredrick Mugira.

Designed by Jonathan Kabugo

INTRODUCTION 2022

The Nile Basin is characterised by strong spatial and temporal variability of water resources availability; river flow is highly seasonal and substantial parts of the Basin are water scarce. This, coupled with the rapidly growing water demand resulting from high population and economic growth in the Nile Basin countries, is increasing pressure on the already scarce Nile Basin water resources.

Given that the Nile is a shared river, the challenge remains how to ensure that Basin countries sustainably and optimally utilise the shared Nile Basin water resources to meet the needs of all riparian States. Among other things, the Nile Basin Initiative (NBI) is facilitating Member States to cooperatively manage and develop their shared Nile Basin water resources taking into consideration the basin wide context, for win-win outcomes.

Goal 1 of NBI's 10-year Strategy focusses on Water Security. Given that water demand for various uses is rapidly growing and will outstrip the supply of conventional surface-based sources soon, **enhancing conjunctive use of groundwater and surface water** is one of the strategic directions under this goal.

NBI Member States recognise that the interaction between groundwater and surface water systems (rivers, wetlands, lakes) has not been adequately considered in the Nile Basin.

Through its five-year (2020 - 2025) groundwater project, NBI is supporting Member States

to monitor groundwater; improve the knowledgebase and capacity as well as put in place cross-border mechanisms for joint management and sustainable utilisation of shared aquifers. This is in addition to addressing the water related Sustainable Development Goals.

The Project - **'Enhancing Conjunctive Management of Surface Water and Groundwater Resources in Selected Transboundary Aquifers: Case Study for selected Shared Groundwater Bodies in the Nile Basin'** is implemented with financial support from the Global Environment Facility (GEF) through the United Nations Development Programme (UNDP).

Three aquifer areas have been chosen for the current intervention namely; Mt Elgon shared between Kenya and Uganda, Gedaref-Adigrat, shared between Ethiopia and The Sudan as well as Kagera shared among Burundi, Rwanda, Tanzania and Uganda.

This booklet features stories about groundwater in the four countries that share the Kagera aquifer. The purpose is to raise awareness about the importance of groundwater and its potential to close the gap between water supply and water demand, as well as in buffering the effects of climate variability.



GROUNDWATER STORIES FROM KAGERA

PROTECTING

Protecting the environment to secure groundwater

 By Fredrick Mugira
October 2022

A cattle keeper in Katebe, Mbarara, Uganda, pours water from a shallow well into a watering trough for his cattle.

Photo by Fredrick Mugira

Kakukuru-Rwenanura Town Council is found in Ntungamo District and lies within the Kagera basin in Uganda. Over the last six years, 12 shallow wells and 16 bore holes have dried up, according to Kahinda Misach, the former chairperson of the Rwiginiro sub-county who is now the Kakukuru-Rwenanura town council mayor.

Almost all shallow wells in this area are hand dug in and are usually hit hard by the mid-year dry season. Unlike in the past decades, well diggers now have to spend more days and energy digging deeper into the ground to find water. Sometimes they do not find it. And occasionally, even fresh wells dry up within months of excavation.

"We tried digging boreholes and shallow wells when I was the chairperson Rwiginiro sub-county, but the water table is very far," says Kahinda Misach. Amidst this water security challenge, Kahinda believes the solution lies deep within the ground; the deep groundwater.

Tumushangye Tom, the Ntungamo district water officer, agrees with Kahinda. He says the water table is far deep in this part of the district but can be reached if one carries out a feasibility study and dug further. "This is why we opt for boreholes in such sub-counties instead of gravity flow water schemes," narrates Tumushangye. According to the Nile Basin Initiative NBI, groundwater is one of the most

important sources of drinking water for people, livestock, and wildlife watering in the Nile Basin, with over 70 percent of the region's rural population depending on it. The Entebbe-based organisation also highlights increasing groundwater usage for other economic activities, including irrigation agriculture, mining, and industries. "Groundwater holds the promise of closing the growing gap between water demand and water supply as well as buffering the effects of climate change and variability in the Nile Basin," notes NBI in a report.

Accessed through boreholes, springs, reticulated systems, and dug wells, among other ways, residents of the Kagera basin have used water from underground for various purposes ranging

from domestic uses to watering livestock and crops.

Uganda's southwestern district of Ntungamo, together with Kabale, Isingiro, and Rakai districts, falls under the Kagera aquifer. Other countries that share this 5,778 km² aquifer are Tanzania and Rwanda. Unfortunately, all districts in Uganda under this aquifer continue to face water insecurity, especially during the mid-year dry season.

Tumushangye says some communities where the water table is close to the surface have planted eucalyptus species that dry the water sources and catchment areas. Most eucalyptus species have long taproots that sink deep into the soil layers sucking groundwater from the aquifers. Likewise, Muchunguzi Sam, the Ntungamo district chairperson, says people have converted wetlands into farmlands and settlements, impacting the water table. Wetlands trap runoff water, enabling it to sink into soil layers to form groundwater.

In Kabale, Jennifer Twasiima, a farmer from the Buhara sub-county, says vegetation cover was cleared in most parts of her community. This left nothing to trap surface water runoff, which is now lost to the valley bottoms, lakes, and streams. This gives no opportunity for the underground aquifer to recharge.

She calls for sensitisation of the local communities on the importance of conserving the environment, saying not many rural communities know about groundwater, describing it as "a hidden resource."

Milton Kwesiga, a Kabale-based environmentalist and the executive director of Africa Disaster Reduction Research Emergency Missions (ADREEM), also based in Kabale, says most watersheds in the district have been encroached on by farmers and constructions. This, he says, is a result of the increasing population in the district.

In Kamubizi parish, Isingiro district, the primary source of safe and clean water for the community is River Kagera, which is nine miles away from the community's settlement. According to the locals, the other option available is a well containing unsafe and sour waters that cannot be consumed.

GROUNDWATER STORIES FROM KAGERA

She calls for sensitisation of the local communities on the importance of conserving the environment, saying not many rural communities know about groundwater, describing it as "a hidden resource."

Milton Kwesiga, a Kabale-based environmentalist and the executive director of Africa Disaster Reduction Research Emergency Missions (ADREEM), also based in Kabale, says most watersheds in the district have been encroached on by farmers and constructions. This, he says, is a result of the increasing population in the district.

Most watersheds in the district have been encroached on by farmers and constructions. This, is a result of the increasing population in the district.

In Kamubizi parish, Isingiro district, the primary source of safe and clean water for the community is River Kagera, which is nine miles away from the community's settlement. According to the locals, the other option available is a well containing unsafe and sour waters that cannot be consumed.

Tweyogyere James, a resident of this area and a father of five, testifies to having left school because of the water problem at the parent's home. "I had to choose between going to school and fetching water for my family; I chose fetching water," narrates Tweyogyere.

Jeconious Musingwire, an environmental scientist and manager for the national environment watchdog- NEMA in the southwestern region, blames these water challenges on "people who destroy the environment." He says, "groundwa-



RIGHT: A man stands in a dried-up water well in the Isingiro district of Uganda. Photo by Fredrick Mugira

ter directly correlates with surface water and the environment."

According to NBI, "the surface water systems, especially the forests and wetlands, play an essential role in sustaining water quality and quantity, providing a storage medium for water, and supporting complex ecosystem niches of economic and environmental importance."

James Byaruhanga, a resident of Omundizi, in Isingiro district, also a part of the Kagera basin, welcomes the NBI's idea of raising awareness about groundwater. "You need to sensitize the local communities on how to protect and regenerate groundwater; otherwise, they do not know," says Byaruhanga.

WATCH | LISTEN TO STORIES FROM KAGERA BASIN

Communities within the Nile basin heavily depend on groundwater for domestic, industrial, and agricultural use.

It is the most important source of drinking water for people as well as livestock and wildlife watering in the 11 countries in the region.

According to the Nile Basin Initiative, an intergovernmental partnership of 10 Nile Basin countries, over 70 percent of the rural population in this region depends on groundwater.

We took our microphones and cameras to the local communities and water experts to discover the current reality of groundwater in the Kagera basin aquifer – and the work being done to conserve it.

WATCH



Groundwater Voices from the Field: Kagera Aquifer – Uganda

LISTEN



Exploring the Threats Facing Groundwater: The Kagera Aquifer

We worked with journalists to bring you community voices on groundwater from the Kagera basin. Listen to these podcasts by scanning the QR Codes:



Understanding What Groundwater Is



Understanding Aquifers and Challenges Facing Groundwater



How the Nile Basin Initiative is Bridging the Groundwater information Gap

GROUNDWATER OFFERS LIFELINE FOR DROUGHT-STRICKEN EASTERN RWANDA

 **By Fred Mwasa**
October 2022

While government-led interventions such as massive afforestation have improved the situation, the rains are not as widespread as in other regions – mainly because of the flat terrain.

Access to water for human consumption and other uses remains a challenge for the more than three million Rwandans in six of the seven districts that make up the eastern province. Had it not been for groundwater reserves that dot the area, the drought-stricken region would probably be uninhabitable for any life.

The eastern region has been divided into two water supply corridors: the upper corridor comprising Nyagatare, Kirehe, and Ngoma districts with heavy population and water infrastructure.

The lower corridor comprises Gatsibo, Kayonza, Bugesera, and Rwamagana districts that were minimally inhabited until 1994 as the vast

portion of it was a national park. The water infrastructure was established in these areas in the past two decades and is ongoing. According to central and local government officials, the lower corridor has experienced a population explosion composed of post-1994 returnees and people from other regions. The resultant impact has been an increasing need for water, yet it already has negligible amounts of surface water.

Over 80 percent of the population in the six districts depends on crop and livestock farming, which is still largely rain-fed, while demand for drinking water is also increasing.

Official data shows water coverage rate for the Eastern Province stands at 82 percent, far below the country's average of 85 to 90 percent for rural areas. The actual situation could be worse.

The solution the authorities have been looking at is groundwater, through boreholes and valley dams, among other ways. Besides domestic use, groundwater is also being sought for industrial and commercial agriculture.



According to the Nile Basin Initiative (NBI), groundwater is one of the most important drinking water sources for people in the basin.
Photo by Avit Ndayiziga and Gaspard Maheburwa

Kakukuru-Rwenanura Town Council is found in Ntungamo District and lies within the Kagera basin in Uganda. Over the last six years, 12 shallow wells and 16 bore holes have dried up, according to Kahinda Misach, the former chairperson of the Rwikiniro sub-county who is now the Kakukuru-Rwenanura town council mayor.

"We tried digging boreholes and shallow wells when I was the chairperson Rwikiniro sub-county, but the water table is very far," says Kahinda Misach. Amidst this water security challenge, Kahinda believes the solution lies deep within the ground; the deep groundwater.

Tumushangye Tom, the Ntungamo district water officer, agrees with Kahinda. He says the water table is far deep in this part of the district but can be reached if one carries out a feasibility study and dug further. "This is why

we opt for boreholes in such sub-counties instead of gravity flow water schemes," narrates Tumushangye.

According to the Nile Basin Initiative NBI, groundwater is one of the most important sources of drinking water for people, livestock, and wildlife watering in the Nile Basin, with over 70 percent of the region's rural population depending on it.

The Entebbe – based organisation also highlights increasing groundwater usage for other economic activities, including irrigation agriculture, mining, and industries. "Groundwater holds the promise of closing the growing gap between water demand and water supply as well as buffering the effects of climate change and variability in the Nile Basin," notes NBI in a report.



According to the Nile Basin initiative, the interaction between groundwater and surface water systems (rivers, wetlands, lakes) has not been adequately considered in most trans-boundary river basin management initiatives, including the Nile Basin. Photo by Andrew Aijuka

BY 2016
GOVERNMENT
+ PARTNERS
DUG UP

5,600

WELLS AND BOREHOLES

Indeed, some visible efforts are in place. By 2016, the government and its partners dug up over 5,600 wells and boreholes to take advantage of groundwater.

In January 2018, China and Rwanda signed a USD32 M deal to dig up more than 250 both hand pump and solar-powered boreholes, mainly in eastern Rwanda.

The project also involved establishing a training program at Technical and Vocational Education and Training colleges that would increase local knowledge of the latest borehole drilling technologies and manage existing infrastructure.

The solar-powered boreholes are a recent phenomenon whereby they bring water effortlessly from the ground, reducing congestion at water spots and making it easy for women and children to access.

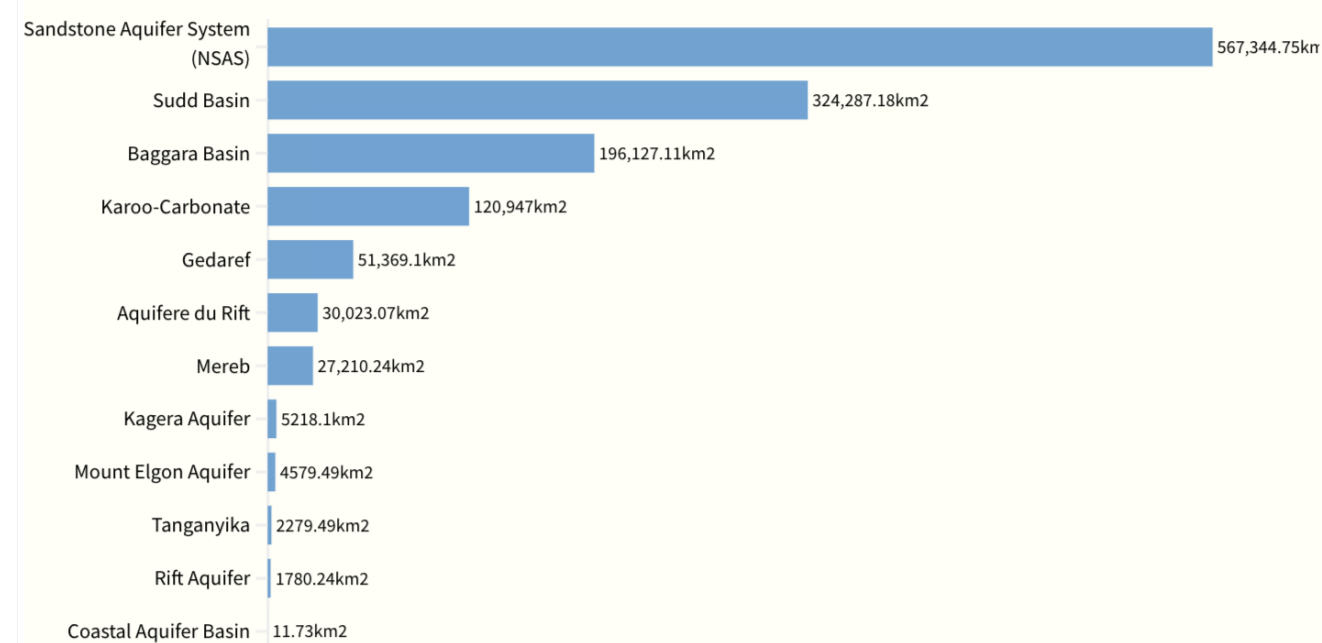
However, solar-powered boreholes are very expensive. A cost estimate provided by Eng. Jean-Paul Ngarambe from the water utility Water and Sanitation Corporation (WASAC), a Solar-powered pump costs over Rwf35 million (\$35,000) while the hand pump borehole goes for between Rwf 8 to 16million (\$8,000-\$16,000) He also pointed out that a Solar-powered pump has to be installed from a source with a lot of groundwater and that drilling extraction for a borehole is done to get water from about 50-100 meters deep.



Workers at a China-government-funded scheme digging up thousands of boreholes in Gatsibo, eastern Rwanda. Photo by Fred Mwasa

Size of aquifers in the Nile Basin (sq. km), according to IGRAC

The Kagera Aquifer is found in Burundi, Rwanda, Tanzania, Uganda. 90.3% of it is in the Nile Basin



Aquifer areas in the Nile Basin (sq. km)

Source: Nile Basin Initiative, IGRAC

The other major use for groundwater in eastern Rwanda is a supply source to the vast Kanzenze Water Treatment Plant that is meant to provide piped water to parts of Kigali and the fast-growing Bugesera district, where a new multimillion-dollar Bugesera International Airport is currently under construction.

Inaugurated in February 2021, the water plant was designed to extract groundwater from the southern bank of River Nyabarongo. Some 30,000m³/day of water is supplied to the City of Kigali and 10,000m³/day to Bugesera District.

In 2016, the government of Rwanda developed a

strategy for rainwater harvesting. It included groundwater recharge techniques meant to ensure the water table isn't depleted, which could have far-reaching consequences.

The highlighted techniques for groundwater recharge include multipurpose dams, check dams, gullies plugging, and water ponds.

This article was supported by InfoNile with funding from



GROUNDWATER TURNS EASTERN RWANDA INTO A BREAD BASKET



According to the Nile Basin Initiative, there is ample evidence that groundwater recharge in the Nile Basin is under threat. This is partly attributed to climate change, high rainfall variability, and land use/land cover changes leading to declining amount of surface/ground water interaction in different areas. Photo by Andrew Aijuka

set its target to develop 40,000 hectares of irrigated land by 2017 and 100,000 hectares by 2020. As of June 2018, some 52,936 hectares had been developed, according to the Rwanda Agriculture and Animal Resources Development Board (RAB)

By 2024, Rwanda aims to develop 102,284 hectares of irrigated land. These systems use surface and groundwater sources, including lakes, rivers, wetlands, or water reservoirs of various sizes—small, medium, or large dams.

There are three major irrigation sites in eastern Rwanda: Kagitumba, Nasho/Mpanga, and Gashora.

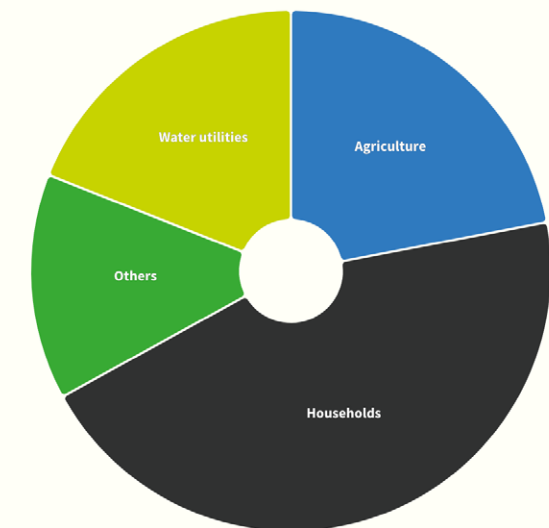
One such impactful irrigation project is the Nasho Solar-Power Irrigation project located in the Kirehe district, funded to the tune of USD54 M by billionaire philanthropist Howard G Buffett's foundation as part of a broader USD500M financing he committed in 2015 to Rwanda's agricultural development. The mega irrigation scheme was unveiled in March 2020 at a fanfare ceremony presided over by President Paul Kagame. Buffett himself was present.

The 3.3 MW Nasho Solar power plant commissioned in 2017 powers up the irrigation system, which draws water from Lake Nasho to farmland, reaching 1,173 hectares belonging to about 2,000 smallholder farmers. The surplus power is sent to homes within the community.

Collette Nyiransabimana, a resident of Munini cell, Mahama sector in Kirehe district, owns a plot of land, about half a hectare, on the bank of the Akagera River that flows from Lake Rweru in

More than 70% of the rural population in the Nile Basin depend on groundwater, not just for domestic use but also their livestock as well as wildlife heavily rely on groundwater.

Groundwater use in Rwanda, according to the National Institute of Statistics of Rwanda



Source: Rwanda NCA Water Accounts 2019

Rwanda through Tanzania to lake Victoria in Uganda.

For many years, Nyiransabimana and several other residents of the Kirehe district underutilized the Akagera River and constantly lived in fear of drowning in it.

Little did they know that the water from the river could be a source of much-needed income when they used it in irrigation.

It was not until recently that the local leaders mobilized them to start irrigation using the same water that farmers embraced the practice.

"I started irrigation using buckets to fetch water from Akagera River, and it was so tiring; I used more energy; I used to grow vegetables and some fruits," she says. That was about three years ago. Nyiransabimana owns the land of about a hectare.

Two years ago, she learned about the district's plan to offer generators in a subsidized scheme and rushed there to get it.

"When I heard that the district offered a generator on a subsidized scheme, I went there; I paid only 103,000 Rwandan Francs to get it, and the district covered the rest," she says.

"I now use the generator to practice irrigation using Akagera river water; the generator pumps water from the Akagera River. We use the water to grow vegetables such as carrots,

onions, bell peppers, cabbages, etc.," she says.


And life has changed since she started irrigation using the generator that pumps water. She sells the produce to the refugees hosted in the neighboring Mahama refugee camp.

"We have a big market as the camp hosts thousands of refugees who come and buy vegetables," she says.

"Akagera river water is essential for us; life has changed since we started practicing irrigation. We grow and irrigate, and we no longer depend on rain to grow. We grow whenever we want, and the harvest is good," Nyiransabimana says with pride. More has been achieved so far.

Nyiransabimana is one of the hundreds of farmers who practice irrigation around the Akagera River using its water. She says that a lot has been achieved thanks to the practice.

"I have managed to pay mutually de sante for my children, and I can feed them; I have built my own modern house worth 17 million Rwandan francs of 30, and I also bought a plot of land worth 1,2 million Rwandan Francs," she says.

 By Fred Mwasa and Emma Marie Umurerwa
October 2022

The Eastern part of Rwanda had been an underutilized land for decades before

the government found a use, turning it into the country's breadbasket through irrigation.

Farmers have traditionally irrigated rice by lowering groundwater into marshlands by digging drains. They typically build unsaturated zones between drains by piling up excavated soil. When groundwater levels drop during the dry season, farmers construct soil check dams in gutters to maintain groundwater levels at crop root zones. When groundwater is insufficient, farmers build 'wood-pole weir structures' across main streams to divert water into earthen canal networks.

Following the national irrigation master plan development in 2010, the Rwanda government has implemented additional irrigation projects, mainly in the eastern part and other regions using hillside irrigation. With these projects, the Rwandan government



According to the Nile Basin Initiative, long the Nile Basin countries, reliance on groundwater is rapidly increasing due to the increased demand over water supply. Photo by Andrew Aijuka

She is also grateful for the central government, especially the district that assisted her in getting the generator on the subsidized scheme.

"I am grateful to the government for offering the generator; without it, life would be worse," she says. "I am committed to working hard to get more returns; I hope my future is better thanks to the Akagera river," she adds.

Jean Paul Nzabonimpa, also from the Mahama sector, says he practices modern agriculture using a generator to pump water from the Akagera Riv. He says he harvested crops that he sold Rwf2,5 million (\$2,315) last season. He currently has crops grown on three hectares and looks for more yields.

"I practice irrigation using generators, and this has

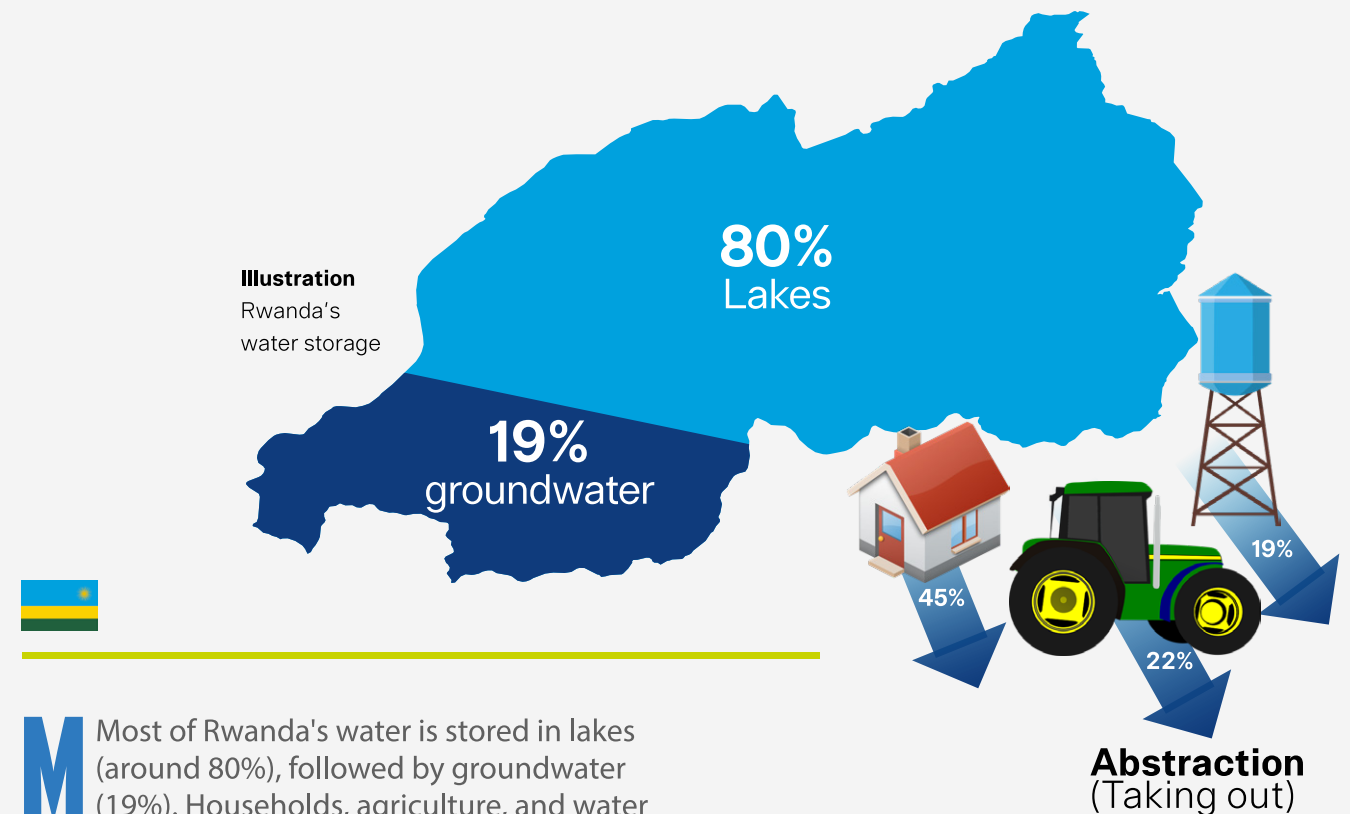
changed my life; I employ casual workers to plant and irrigate; we are grateful that the Akagera river is no longer a threat to us but serves as a water source for us to irrigate," he says. "We now don't have worries of seasons and droughts that used to hit the areas," he adds. According to Bruno Rangira, the Kirehe district Mayor, the eastern province part, especially that bordering Tanzania, is prone to disasters.

He said that farmers benefit from the Akagera River and practice water irrigation. He says that the district gave generators to individuals on subsidy, and "It has paid off as all of them get improved yields compared to before when disasters could not allow them to harvest," he says

He added that the district has encouraged farmers to join cooperatives and apply for subsidized generators rather than as individuals for support.

"Some have started regrouping on cooperatives, and it is easier for them to get generators; using Akagera river water has been instrumental in fighting poverty among farmers, and we hope more will be achieved," Rangira added.

MAKING GROUNDWATER SUSTAINABLE



Most of Rwanda's water is stored in lakes (around 80%), followed by groundwater (19%). Households, agriculture, and water utilities lead to groundwater abstraction (taking out), with around 45%, 22%, and 19%, respectively.

In the year 2000 planting season, farmers in the Bugesera district went to their farmland as usual. They planted seeds. However, months went by without a drop of rain. Farmers there vividly remember the period. The situation here had been as such since the 1970s when forests in the area were destroyed for firewood and charcoal. The disappearance of forest cover in Bugesera was the same in the entire eastern region.

According to FONERWA, a national environment fund, the different lakes in eastern Rwanda were slowly drying up because there was no rain to replenish them. The groundwater table was, without a doubt, affected. The situation was so dire government had to do something.

In 2001, the government secured USD 48.16 M (Rwf 50 billion) funding from the African Development Bank for planting 567.56ha of trees around the Bugesera area, Lake Muhazi, and other lakes to cover 149,487ha.

Bugesera region has visibly changed today. It is greener, produces more food, and gets some rain – a notable impact of the tree planting scheme from many years ago. During 2007 - 2008, although lakes in east Rwanda had begun reviving, a new threat emerged; the destructive water hyacinth weed. It created a new threat to fish survival.

The year 2013 was for action. The government hired more than 1,000 local villagers, including fishers and their families, to clear the weed from the lake in Bugesera. The weed is still there on some lakes, but the scale is much smaller.

Lake Cyohoha, for example, whose fish had disappeared completely, is said to currently contribute at least 35-50 tons of fish annually to the national annual production. Experts note that preservation of surface water bodies like it was done with the eastern Rwanda lakes helps "recharge" (increase) groundwater reserves.

A CALL FOR MORE GROUNDWATER DATA



As the situation stands, there is a need for a comprehensive database on groundwater in Rwanda. This, they argue, will enable better planning for the sustainable use of natural resources.

The lack of data on the depths and volume of aquifers could pose land degradation risks.

Some estimates, like a 2021 World Bank-commissioned study, suggested that in terms of annual water volumes, Rwanda has about 6 to 7 billion cubic meters of surface water, 4.50 to 5 billion cubic meters of groundwater, and 27.50 billion cubic meters of rainwater.

The government has partnered with UNICEF for a groundwater mapping project. A call for consultancy services to carry out the study was issued in October 2021, with the tendering process planned for completion by October this year. Despite efforts by Rwanda's government, reads the call in part, considerable gaps remain with regard to groundwater resources.

A similar study was planned in 2018 by a joint team of Rwandan and Dutch experts funded by the Netherlands. The advertised tender said the study would assess the availability of groundwater, depth of potential aquifers, possible yields, and water quality, in addition to recommending the optimum sites for long-term production boreholes. The results are yet to be released.



A wetland in Kabale. Wetlands trap runoff water, enabling it to sink into soil layers to form ground water.

Photo by Fredrick Mugira.



It is of vital importance to build and expand on the understanding of groundwater resources characteristics through detailed investigation, mapping and assessment of the Nile Basin aquifer systems.

Groundwater is an essential source of water throughout rural and urban areas in Tanzania. Cities like Shinyanga, Singida, Babati, Arusha, Moshi, and Dodoma rely heavily on groundwater for public water supply.

According to the Lake Victoria Basin Water Board Director, Dr. Renatus Shinhu, environmental degradation in the Kagera Basin has led to the drying up of several surface water sources, such as springs, especially along the river. The most affected districts, he says, are Ngara, Kyerwa, Misenyi, and Karagwe.

Dr. Shinhu adds that communities in these districts have now turned to groundwater as their primary water source for domestic use.

"Up to 66 wells have been drilled to provide water to communities that have long struggled with water shortages in this area," he further revealed.

Geoffrey Nyamgali, a resident of Muhweza village in Ngara district, says his village has had several streams and shallow wells dry up.

"That is why our village has set up a system to have water resources management committees, where I am a committee accountant, and we have to make sure we protect the available water sources as well as coordinate water use," narrates Nyamgali.

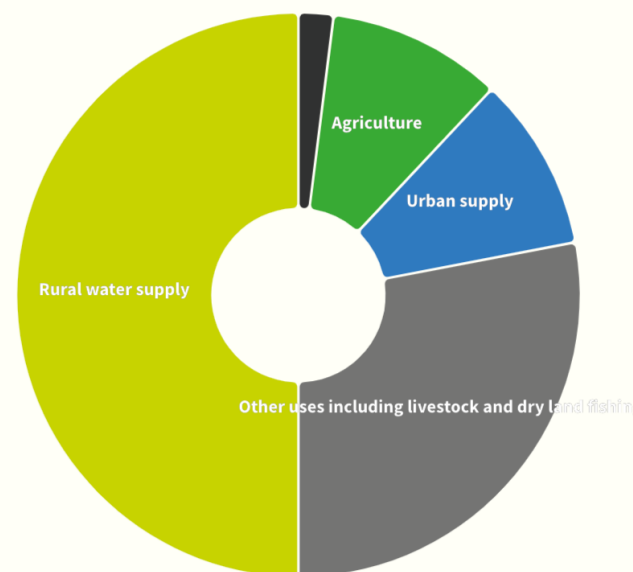
He blames the drying up of their water sources on "deforestation, cultivation very close to water springs and grazing within valleys."

"Young people may not know, but the truth is that our water sources are drying up," insists Nyamgali. For this reason, among others, authorities in Tanzania want countries that share the Kagera river Basin, namely Burundi, Rwanda, Tanzania, and Uganda, to harmonize laws to protect the environment, safeguard groundwater and thus contribute to socio-economic development in the Basin.

Groundwater use in Tanzania, according to UPGro

The current volume of groundwater used across Tanzania (1,265,000 m³/day) is estimated to be 12% of the total available volume.

■ Rural water supply ■ Agriculture ■ Urban supply ■ Other uses including livestock and dry land fishing ■ Industry and mining



Source: UPGro Tanzania Profile

Groundwater is an essential source of water throughout rural and urban areas in Tanzania. Cities like Shinyanga, Singida, Babati, Arusha, Moshi, and Dodoma rely heavily on groundwater for public water supply.

According to the Lake Victoria Basin Water Board Director, Dr. Renatus Shinhuh, environmental degradation in the Kagera Basin has led to the drying up of several surface water sources, such as springs, especially along the river. The most affected districts, he says, are Ngara, Kyerwa, Misenyi, and Karagwe.

Dr. Shinhuh adds that communities in these districts have now turned to groundwater as their primary water source for domestic use.

"Up to 66 wells have been drilled to provide water to communities that have long struggled with water shortages in this area," he further revealed.

Geoffrey Nyamgali, a resident of Muhweza village in Ngara district, says his village has had several streams and shallow wells dry up.

"That is why our village has set up a system to have water resources management committees, where I am a committee accountant, and we have to make

sure we protect the available water sources as well as coordinate water use," narrates Nyamgali.

He blames the drying up of their water sources on "deforestation, cultivation very close to water springs and grazing within valleys."

"Young people may not know, but the truth is that our water sources are drying up," insists Nyamgali. For this reason, among others, authorities in Tanzania want countries that share the Kagera river Basin, namely Burundi, Rwanda, Tanzania, and Uganda, to harmonize laws to protect the environment, safeguard groundwater and thus contribute to socio-economic development in the Basin. Professor Faustin Kamzora, the Kagera Regional Administrative Secretary in Tanzania, says uniform laws and collaborative governance would help safeguard water sources, including surface and groundwater reservoirs in the shared Kagera River Basin.

"Our people are the same; they have the same cultures, traditions, and customs, even the use of environmental resources is the same," explains Prof. Kamzora, further stressing that "if we all agree to have a single system of environmental management, especially water resources, we will achieve great success instead of each country having its



Groundwater can be accessed through boreholes, springs, reticulated systems, and dug wells, among other ways. Photo by Avit Ndayiziga and Gaspard Maheburwa

Ngara district enacted the sanitation by-law in 2014, enabling the promotion of sanitation and hygiene as well as conservation of the environment. Under this law, people, especially those living in commercial areas, contribute a small amount of money per month (1000 Tanzanian shillings (USD 0.42) for households and 1500 shillings (USD 0.63) per business entity). This money is used to support environmental conservation initiatives.

Like the local government authorities, individuals are also taking active roles in protecting their water sources. One of such individuals is Joyce Katabaro,

a Kayunga Karagwe, Tanzania resident.

"As a woman who recognizes water sources' importance, I ensure they are not degraded. When I find out someone is destroying a source, I report them to the village leaders so that legal action can be taken against them," discloses Katabaro.

According to the Nile Basin Initiative NBI, surface water systems, especially forests and wetlands, play an essential role in sustaining water quality and quantity, providing a storage medium for water, and supporting complex ecosystem niches of economic and environmental importance.

system."

This system could include uniform regulations among all the Kagera basin countries on agriculture in water catchments, the uniform distance between human activities and the water source or river, protection of aquifers and creation of water catchment boundaries, sanitation and sewerage management, he said.

And as more surface water catchments dry up in most parts of Tanzania, just like in other countries within the Basin, the government is now heavily dependent on groundwater for domestic, industrial, and agricultural use.

According to the Nile Basin Initiative (NBI), groundwater is one of the most critical sources of water for people, livestock, and wildlife throughout the Nile Basin. More than 70 percent of the rural population in

HOW A TRANSBOUNDARY AQUIFER WORKS

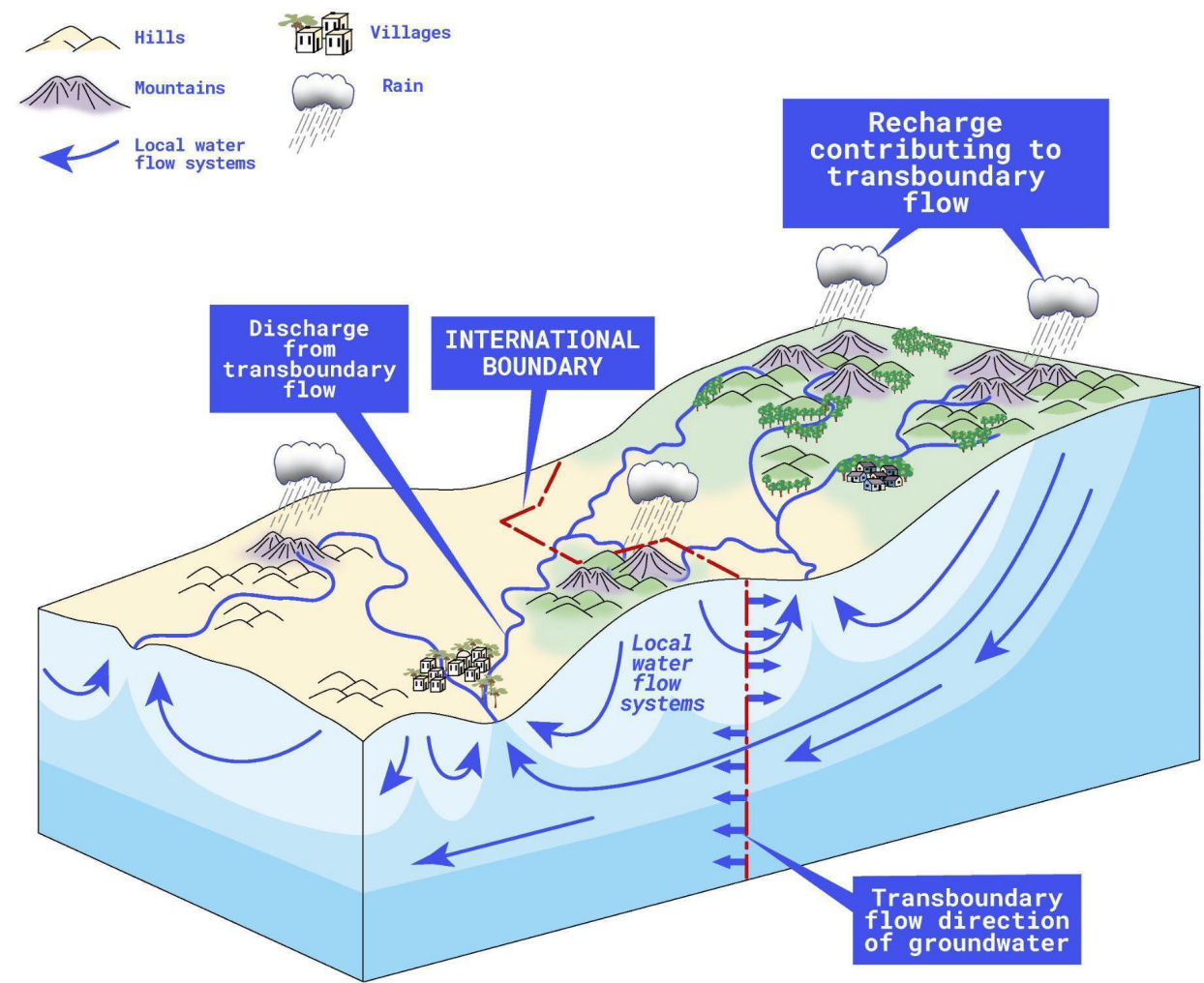


Illustration redesigned from CGIAR / International Water Management Institute 2014 report

Source: UNESCO 2004



Increasing population, coupled with climate change, is straining the available water sources in Ntungamo district.


Photo by Fredrick Mugira



Groundwater holds the promise of closing the growing gap between water demand and water supply as well as buffering the effects of climate change and variability in the Nile Basin.

Photo by Avit Ndayiziga and Gaspard Maheburwa

LEADERS EMPHASISE CULTURE TO PROTECT GROUNDWATER IN TANZANIA.

 By Fred Mwasa and Emma Marie Umurerwa
October 2022

Kagera, Despite having contributed significantly to the lives of Africans, indigenous knowledge, traditions, and norms are slowly fading away, especially after being disrupted by the formal education systems.

According to traditional African folktales, in the centuries before the advent of scientific guidelines and western civilizations, indigenous knowledge, norms, and traditions had well-founded and robust principles that enabled water sources and forest reserves to be protected by communities.

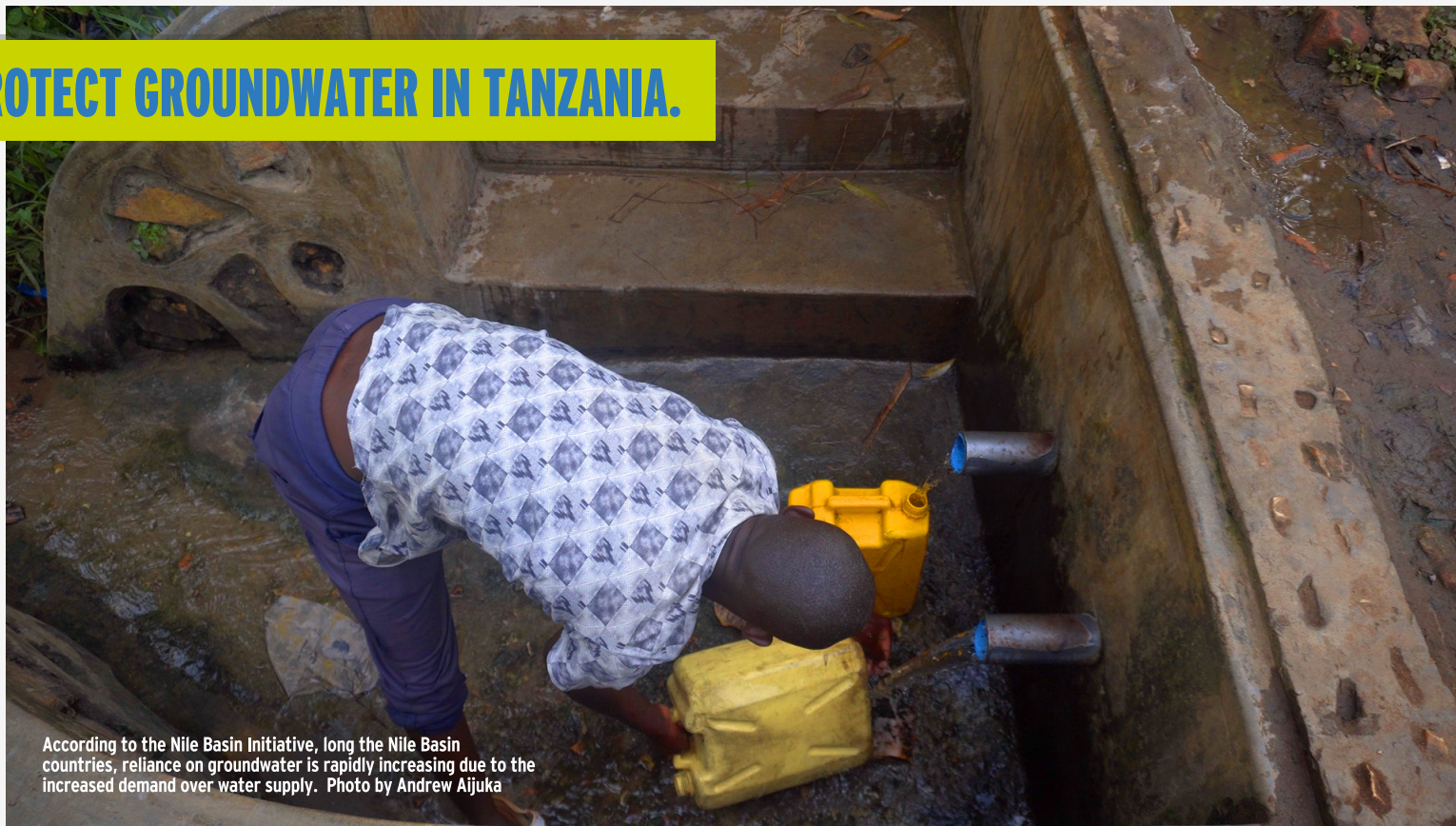
In Tanzania, one of the regions still relying on indigenous knowledge, traditions, and norms to conserve water resources is the Karagwe district, found in the Kagera Basin, which is paying.

"We have our traditional elders, and they are united. When they meet with the youth, they provide them with indigenous knowledge regarding the conservation of water resources and the environment. Some of our water sources are present today because our elders have preserved them," narrates Mwalimu Julieth Binyura, the Karagwe District Commissioner.

These traditional leaders come from the Nyambo indigenous tribe. Dr. Godfrey Aligawesa is one of the community leaders of this tribe. He says his tribe has specific customs and norms that prevent environmental degradation, and these customs spell out punishments for anyone found to be destroying water sources.

"For example, they prohibit children from playing in water bodies, and if caught, one of the punishments is between two to ten strokes at the buttocks depending on how old they are," explains Dr. Aligawesa. He adds that community members are prohibited from cultivating near water sources, cutting down trees, and washing clothes or dishes in springs, lakes, or rivers.

According to the water and environment experts in the Kagera region, climate change has led to irregular rainfall patterns, affecting agriculture in the area. This leads to encroachment on water



According to the Nile Basin Initiative, long the Nile Basin countries, reliance on groundwater is rapidly increasing due to the increased demand over water supply. Photo by Andrew Aijuka

catchment areas, but leaders in the area are scaling up community sensitization on the importance of and how to protect water sources.

"We are all aware that agriculture involves deforestation and the removal of natural vegetation in areas around water sources, but we are ensuring that people farm as per the existing water management system," emphasizes Mwalimu Binyura.

"I urge the people to continue to conserve water sources as guided by our elders, traditional leaders,

and experts because if we preserve our environment, we will continue to get enough clean water," adds Mwalimu Binyura.

Most of the Karagwe district residents use surface and groundwater simultaneously. They fetch water from shallow wells, streams, rivers, lakes, and also springs, and boreholes.

Engineer Simon Ndyamkama, the Rural Water and Sanitation Authority Manager for the water-rich Ngara district, which is also part of the Kagera

Basin, highlights the need to engage the community through various ways, including traditional leaders, bylaws, and central government laws to protect and save water resources, including underground aquifers.

Andrew Athanasio, the acting Head of the Environment Department of Ngara District Council, agrees with Engineer Ndyamkama. He says community members' involvement, knowledge, norms, and tradition in forest conservation have been vital in replanting trees.

"Geographically, our district is mountainous, and almost every mountain has a water source below. We are now conserving natural vegetation, and our citizens have been told to ensure that they preserve the environment to conserve underground aquifers," adds Athanasio.

Kagera Region falls under the 5,778 square-kilometer Kagera aquifer that extends to parts of southwestern Uganda, Burundi, and Rwanda.



A man in Isingiro district digs a shall well. Groundwater is accessed through several ways including dug wells,

Photo by Fredrick Mugira.JPG





KAGERA AQUIFER

TOTAL AREA
5,800 km²

AREA IN THE NILE BASIN
5,218 km²

PERCENTAGE AREA
WITHIN THE NILE BASIN
90%

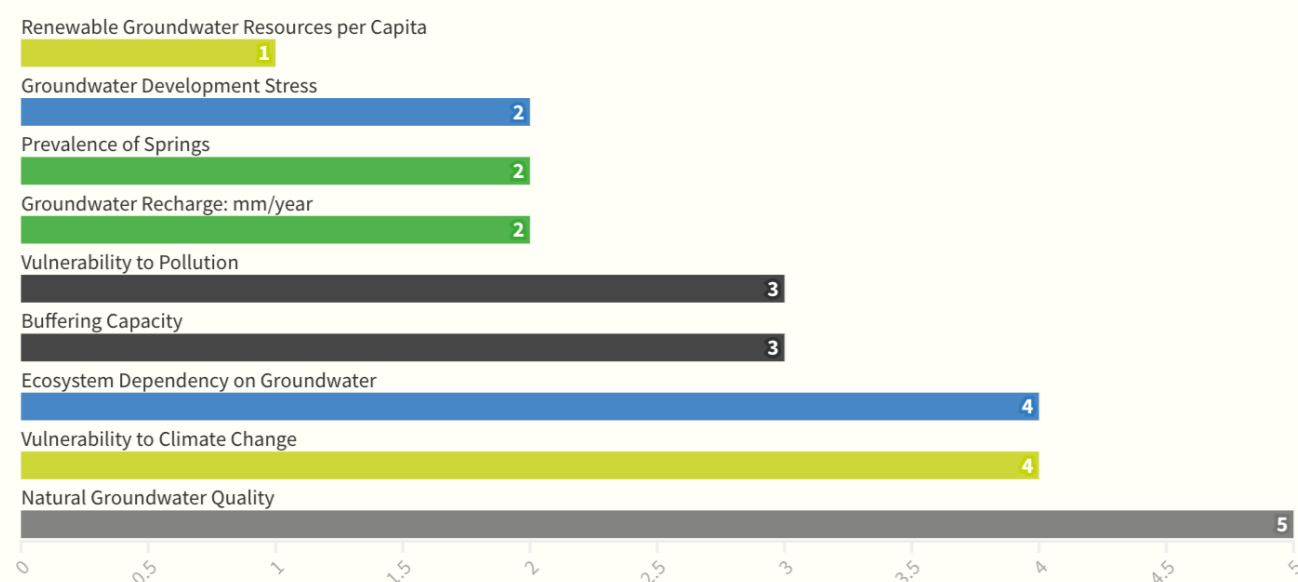


A man collects spring water: Photo by Andrew Aijuka.

State of the Kagera Aquifer, according to IGRAC

While renewable groundwater resources and the groundwater recharge rate are low for the Kagera aquifer, ecosystems are highly dependent on it, and the water quality is very high.

1 = Very Low; 5 = Very High



Source: Global Groundwater Information System by the International Groundwater Resources Assessment Centre (IGRAC).



A wetland in Ntungamo district of Uganda. Wetlands provide a storage media for water. Photo by Fredrick Mugira

This article was supported by InfoNile with funding from





GROUNDWATER BRINGS SMILES TO COMMUNITIES IN BURUNDI

Muyinga Province Gasorwe Zone. Children fetching water from the community tap. Photo by Avit Ndayiziga and Gaspard Maheburwa



By Avit Ndayiziga and Gaspard Maheburwa
October 2022

In Burundi, just like elsewhere in the countries that share the Kagera River Basin (Rwanda, Tanzania, and Uganda), water remains a limited and vulnerable resource. According to UNICEF, Burundi's national drinking water coverage rate stands at "82.8%, of which 80.9% is in rural areas and 98.1% in urban areas."

Experts attribute this to various factors, including the often unfavorable and changing climatic conditions. This has resulted in the drying up



Sindahebura notes that "groundwater is generally available in the entire Burundi but at different depth levels." Most of the country falls under the shared 5,800 Km² Kagera aquifer.

LEFT:
Muyinga Province Gasorwe Zone. Youths fetching water from the community tap. Photo by Avit Ndayiziga and Gaspard Maheburwa

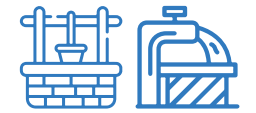
of some water sources that were once a lifeline for communities.

Appolinaire Sindahebura, the General Director of the Agence Burundaise de l'Hydraulique et de l'Assainissement en Milieu Rural (AHAMR), translated as Burundian Agency for Hydraulics and Sanitation in Rural Areas, says that in Burundi, at least 5000 surface water sources, mostly boreholes, and shallow well have entirely dried up in the last 20 years. He adds that several other surface sources, not yet documented, are gradually drying up and could soon disappear too.

But as surface water sources dry up, there are hopes that massive reserves of water underground could provide people with adequate safe water for drinking and hygiene needs if exploited.

Groundwater, a solution to water shortage According to the Nile Basin Initiative (NBI), groundwater holds the promise of closing the gap between water supply and demand and buffering the effects of climate variability.

BURUNDI



5,000 SHALLOW WELLS AND BOREHOLES ENTIRELY DRIED UP

The government of Burundi established the AHAMR project in 2015, to cope with the glaring shortage of clean water in many parts of the country,

The project drills groundwater and supplies it to communities through water pipes. It has established various water supply points across rural Kirundo province, especially in all zones of the Bugabira commune. This was one of the most water-stressed areas in the country, with only 15% of the population having access to safe water before the project.

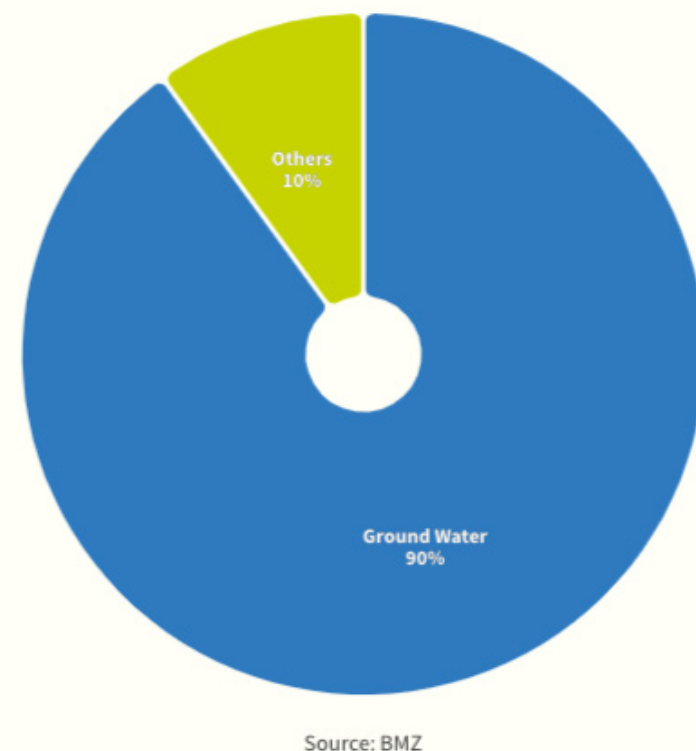
A significant amount of people in this commune has access to safe water, according to Sindayihebura. The project targets to have all communes in the country having access to clean water within an estimated distance of 500 meters from each household, by 2025.

SCAN FOR VIDEO



Groundwater Voices from the Field: Kagera Aquifer – Burundi

Water supply in Burundi, according to BMZ
Groundwater is the main water source and provides approximately 90% of the water supply in the country.



Consolidating the gains

The Kagera shared aquifer is one of the three transboundary aquifers selected as a case study under the Nile Basin Initiative (NBI) 's Groundwater Project – 'Enhancing Conjunctive Management of Surface Water and Groundwater Resources in Selected Trans-boundary Aquifers: Case Study for selected Shared Groundwater Bodies in the Nile Basin. The others are Mt. Elgon and Gedaref-Adigrat aquifers, respectively.

Community members share their experiences

Charles Mbindi, a beneficiary of the AHAMR project in Muyinga province in the Gasorwe zone, says they are now finding life easier than in the pre-project days. "Access to safe water enables us to live a good life," he observes. He is particularly delighted that since the arrival of the taps, their children dress in clean clothes and no longer suffer from intestinal worms. "Having this tap in our village is a great advantage to our families. We are doing all it takes to protect it," notes Mbidi.

A resident of Nyamabuye village, Renate Man-irakiza says they used to trek for more than two hours to fetch water from unclean sources, but this is now no more. "It has eased our domestic chores like cooking and laundry, she adds.

According to the Buye Zone Representative Joseph Rugonumugabo, all households in his village, have access to safe water. "The water is sufficient in our locality," he says.



A Man in Gasorwe Zone collects water. Photo by Avit Ndayiziga and Gaspard Maheburwa



A Man in Muyinga Province Gasorwe Zone collects water. Photo by Avit Ndayiziga and Gaspard Maheburwa



Avit Ndayiziga and Maheburwa Gaspard
October 2022

Authorities in Burundi are including more women in the maintenance, conservation, and restoration of groundwater, saying that as primary groundwater users, they are also considered key groundwater decision-makers at the grassroots.

Like in other African countries, in Burundi, women are often responsible for fetching water from various points, including shallow wells, springs, and boreholes, often walking long distances before reaching such points.

Underscoring the role of women, Gervais Ndagijimana, the Director of Technology Department at the Burundian Agency for Hydraulics and Sanitation in Rural Areas (AHMR) says, "We form a five-person group to guard the taps when they are installed. Three women must be included on the team. These people have been taught how to take good care of the water. They learn how to fence and clean the taps," notes Ndagijimana. He insists that women are important stakeholders and play a vital role in water user associations and water source management.

The government of Burundi established the AHAMR project in 2015 to cope with the glaring shortage of clean water in many parts of the country,

The project drills groundwater and supplies it to communities through water pipes. It has established various water supply points across rural Kirundo province, especially in all zones of the Bugabira commune. This was one of the most water-stressed areas in the country, where before

This article was supported by InfoNile with funding from



the project, only 15% of the population had access to safe water.

Today, a significant amount of homesteads in this commune have access to safe water. The water is pumped to villages and accessed at several strategically located points. Most of these points are being maintained by women.

In Gika, Kirundo province, women take care of water points to maintain the sanitation and hygiene around them, enabling them to last longer. Every Thursday, a group of women is selected to clean around the taps. This is in addition to planting trees and maintaining the buffer zones every Saturday during community service.

According to Prisca Dusabimana, women usually turn up in big numbers during community service days.

Dusabimana notes that “While men do not have time to collect water, we need them to construct a fence around the well.”

In Buye village, Regina Habonimana, a guide, who is also a village leader, says that compared to men, women often need access to water for sanitation and hygiene. For this reason, she adds, women should be empowered to be managers of the water points.

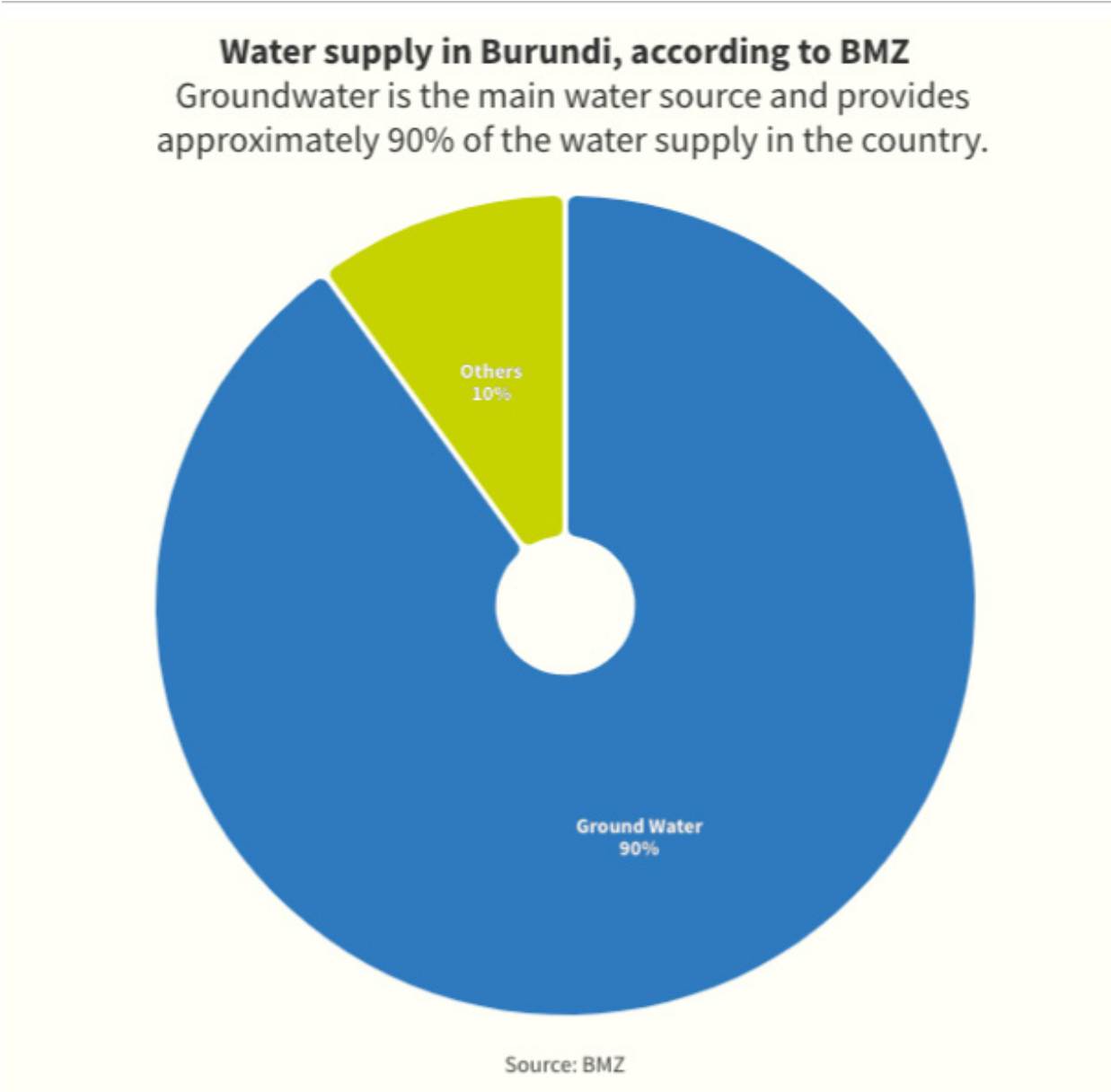
He says that women should also be trained to conserve groundwater to ensure their surface

water points do not dry up.

According to the Nile Basin Initiative (NBI), groundwater is one of the most important sources of drinking water for people, livestock, and wildlife watering in the Nile Basin, with more than 70 percent of the region's rural population depending on it. The Entebbe-based organization also highlights increasing groundwater usage for other

economic activities, including irrigation, agriculture, mining, and industries.

"Groundwater holds the promise of closing the growing gap between water demand and water supply as well as buffering the effects of climate change and variability in the Nile Basin," notes NBI in a report.



Groundwater is one of the most important sources of drinking water for livestock. Photo by Fredrick Mugira.

FLOWING UNDERGROUND

Nile Basin Initiative
November 2022

More than 70% of the rural population in many parts of the Nile Basin depends on groundwater. There is also an increasing use of groundwater for other economic activities such as irrigation, mining, and industries. This is partly attributed to climate change, high rainfall variability, and land use/land cover changes leading to declining amounts of surface water in different areas. Subsequently, this has forced people to turn to groundwater sources as an alternative to support their livelihoods.

According to the Nile Basin Initiative, groundwater holds the promise of closing the gap between water supply and demand and buffering the effects of climate variability. However, pressure on groundwater resources through overexploitation and pollution is already felt in many small aquifers in the upper Nile riparian countries.

In the production of this multimedia story, Water Journalists Africa- InfoNile and Nile Basin Initiative invited journalists based in the countries that share the Kagera aquifer, namely Burundi, Rwanda, Tanzania, and Uganda, to submit in-depth story pitches on conjunctive use of surface and groundwater.

The stories contributed to the project implemented by the Nile Basin Initiative entitled “Enhancing conjunctive management of surface and groundwater resources in selected transboundary aquifers: A case study for selected shared groundwater bodies in the Nile Basin.”

Water Journalists Africa- InfoNile supported top journalists to produce a minimum of eight feature stories (two stories for each of the four countries that share the Kagera sub-basin) on the conjunctive use of surface and groundwater.

The stories explained to key stakeholders, including policymakers, technicians, and the regional/international community, the importance, values, and benefits of groundwater in supporting livelihood development and protecting the environment within the Kagera sub-basin.



SCAN QR CODE
TO VIEW STORY



Most journalists worked in teams of two, sharing sources and resources to report in-depth stories on groundwater in their countries where the stories were published on at least two different

platforms reaching different audiences, such as an online journalist working with a local radio reporter.

The journalists reported in multiple languages, including English, French, Swahili, Kinyarwanda, and Kirundi. After publishing in the local media houses, Water Journalists Africa- InfoNile also translated all stories into English, French, and Swahili for cross-publishing on the InfoNile platforms.

The Water Journalists Africa- InfoNile data team worked with each journalist individually to source, analyze and visualize data for their stories, emphasizing “geo” visualizations such as maps and satellite imagery graphics.

Water Journalists Africa- InfoNile produced a cross-border online multimedia story that brought together elements from the journalists’ reporting in the four countries and came up with this story.