

ANNEX I

General overview

The contribution of groundwater to Somalia's water resources is enormous, as surface water resources are limited to the two perennial rivers, Shabelle and Juba, both originating from Ethiopian highlands and the later having part of the basin in Kenya. In other parts of the country there are small dams, commonly referred to as Catchments where surface runoff is harvested during the two rainy seasons. Most of the catchments however dry within two months into the dry season, and communities turn to groundwater sources for water supply.

Water availability in the country is to a large extent depended on the two rainy seasons, Gu (April to June), and Deyr (October to December). During the rainy seasons there is less pressure on the strategic water sources, as the communities make use of surface runoff harvested in the water catchments to meet their water needs. The seasons are however changing, with the frequency and magnitude of climate induced shocks such as droughts and floods rising, as a result of climate change (Figure 1). Floods are mainly as a result of short and intense rains, generating huge volumes of runoff which is transmitted into the sea through seasonal wadis. There is very limited time available for water to infiltrate into the soil and recharge the groundwater aquifers, apart from the locations where infrastructure is in place to slow or harvest the runoff.

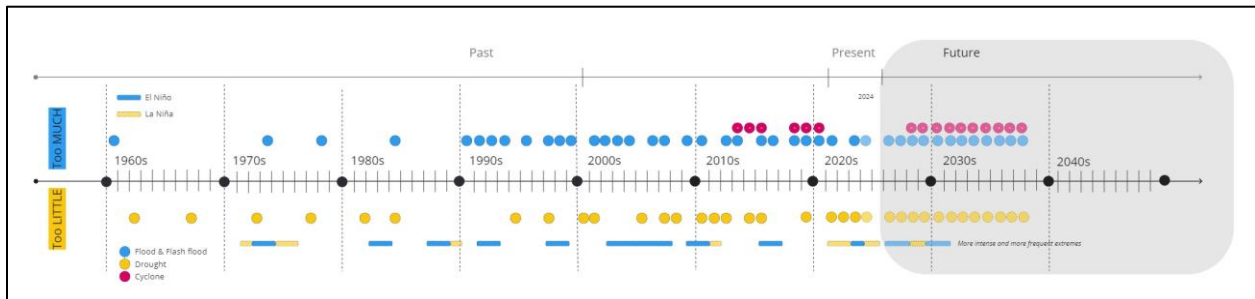


Figure 1 Past and Projected trends for climate induced Hazards in Somalia

During the dry period the over reliance of groundwater puts a lot of pressure to boreholes. In some cases pumping is done for 24 hours, with no time allowed for the boreholes to recover. This, coupled with the lack of monitoring risks over exploiting the aquifers, and eventually leading to water crisis especially in the urban areas which are rapidly expanding. Constant monitoring is critical for sustainable management and planning of groundwater resources.

Somalia groundwater monitoring

FAO SWALIM, in collaboration with the Ministry of Energy and Water Resources, WASH Cluster and other partners have been monitoring the strategic water sources across the country for over ten years. A number of countrywide surveys have been undertaken to update the database, the latest being in 2022. A monitoring systems was developed to manage the water sources data –

Somalia Water Sources Information Management System (SWIMS). The initial system was offline, but later developed into an online version, SWIMS live map [Dashboard :: SWIMS](#) (Figure 2)

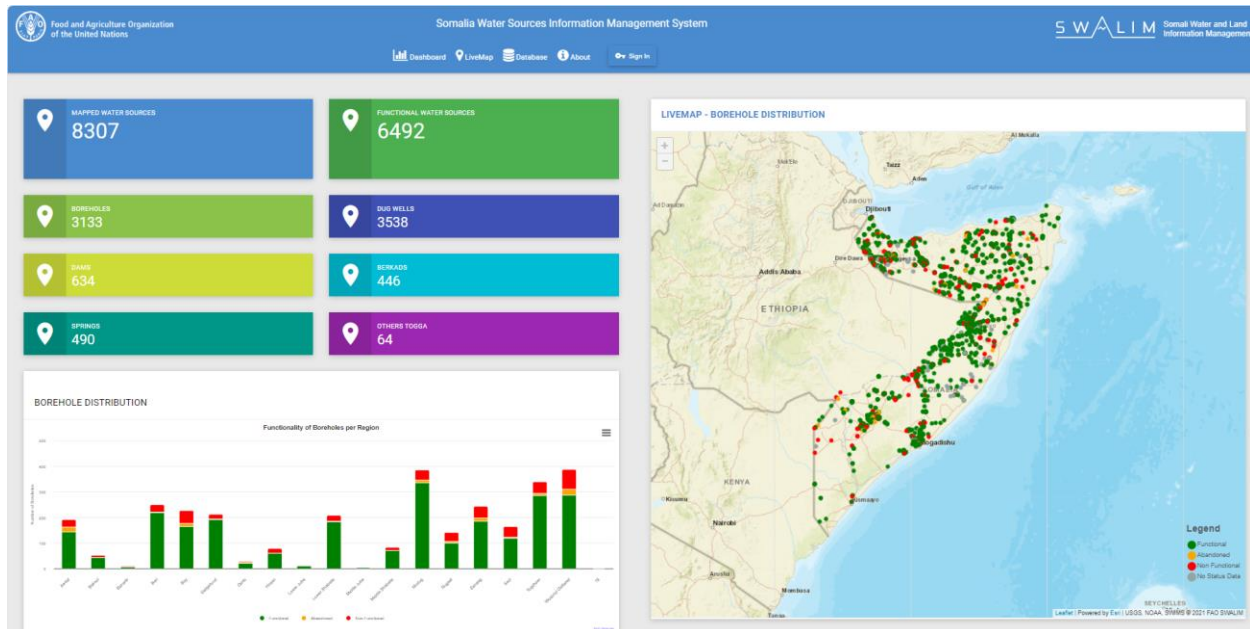


Figure 2 SWIMS Dashboard

The SWIMS dashboard is updated on ad hoc basis whenever a national survey is carried out, or data is received from partners. The initial plan was to have the countrywide survey at least once every year, but this has not been possible due to resource limitations. This has created a gap in the usefulness of the data, owing to the dynamic nature of the water sector in the country.

Weekly borehole monitoring

In view of the above, FAO SWALIM, through BHA funding, set up a weekly monitoring network across the country for 600 strategic boreholes. The monitoring, implemented in collaboration with the FGS and States Ministry of Energy and Water Sources, involves data collection on the functionality of the borehole, usage, water price, and basic water quality parameters. The data is collected at the beginning of each week by the borehole operators using a mobile app and transmitted to an online server for quality control by the ministry staff, and later by SWALIM before uploading to the dashboard. The primary use of this data is for quick identification or boreholes which require intervention to ensure uninterrupted water supply to communities especially during drought periods.

The data collected from the weekly monitoring is provided online for partners to access. Figure 3 shows the dashboard, which can be accessed through the link: [Weekly Monitoring Dashboard :: SWIMS](#) (Figure 4).

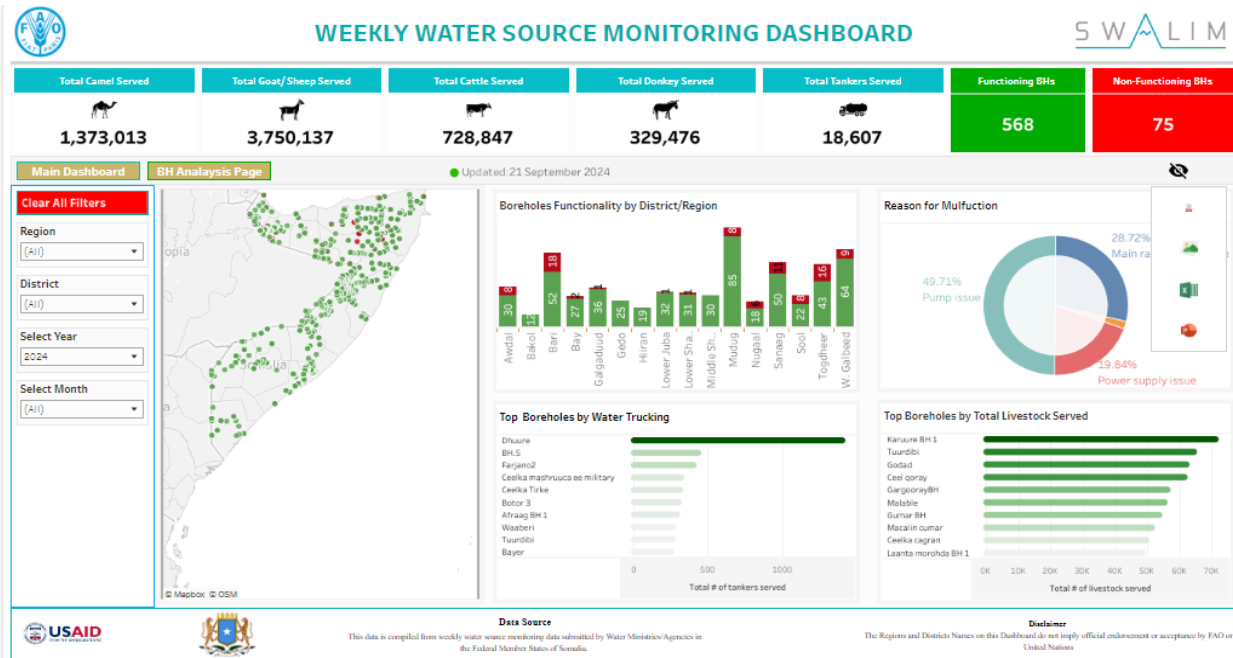


Figure 3 Weekly Water Sources Monitoring Dashboard

The dashboard provides a snapshot of the basic statistics on the borehole usage and functionality. It also provides filters to select a particular dataset of interest. Users are also able to download the data in different formats, including Microsoft Excel, for further analysis.

Telemetric groundwater monitoring

Another initiative, again by BHA funding, is groundwater monitoring using telemetric stations. A total of 35 boreholes have been installed across Somalia, where hourly data on water level, temperature and electrical conductivity (a proxy indicator for salinity) is collected and transmitted to online servers. The data is made available to partners through the link [Ground Water Stations :: Somalia Hydromet TimeSeries Data](#).

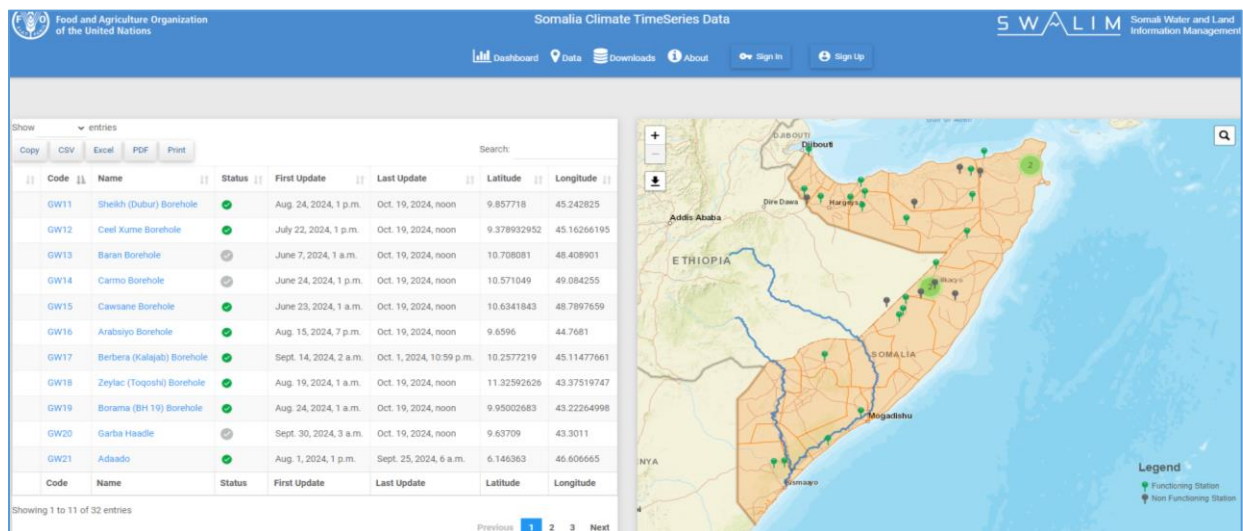


Figure 4 Groundwater Monitoring Dashboard

The usefulness of data coming from the groundwater monitoring stations is twofold: monitoring of the fluctuations of water level in the boreholes in relation to daily pumping; and long term monitoring of the aquifer performance as a result of continuous water extraction from the borehole. The former is critical to ensure continuous borehole functionality for water supply in critical drought period, and setting alerts for timely intervention in case of an alarming trend, while the later is useful for long term planning and management of groundwater resources. This information is crucial for design and development of effective water supply systems, and ensuring sustainability of this vital resource. Moreover, quantitative groundwater monitoring helps to mitigate the impacts of climate change and human activities on aquifers, ensuring a more resilient and sustainable water use.

Data analysis and production of groundwater status bulletin

Data collected from the weekly and telemetric groundwater monitoring is used to produce groundwater status bulletin for Somalia. The analysis is been divided in two: quantitative and qualitative. The quantitative analysis is based on the 35 telemetric stations installed across the country, and which record data on hourly basis. The qualitative analysis is done from data collected through the weekly monitoring of 600 boreholes across Somalia.

Access to Data from the Groundwater Monitoring Stations

Data from the 35 groundwater monitoring stations can be accessed online through the link provided above. For each station there are six tabs, under which different information is available. Users can access the information by navigating across the different tabs.

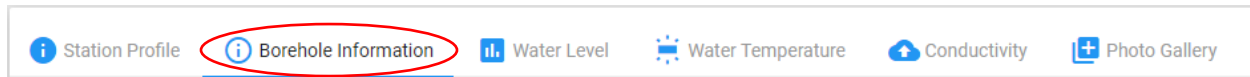
Ground Water Station: GW44 - Xudur - Buulow BH

Navigation: [Dashboard](#) [Data](#) [Downloads](#) [About](#) [Sign In](#) [Sign Up](#)

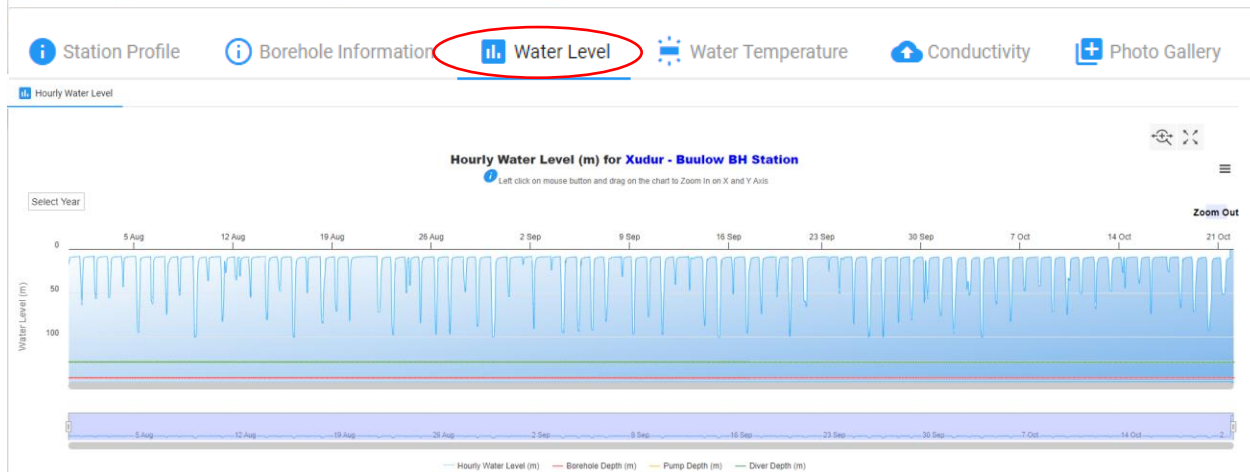
Station Profile | Borehole Information | Water Level | Water Temperature | Conductivity | Photo Gallery

Station Name:	Xudur - Buulow BH	Status:	✔
Town/ Village Name:	Buulow	First Data Update:	July 31, 2024, 1 p.m.
District:	Xudur	Last Data Update:	Oct. 22, 2024, 6 a.m.
Region:	Bakool		
GPS Coordinates:	4.11991, 43.894126		
Installation Agency:	SWALIM		
Installation Date:	July 28, 2024		
Data Frequency:	Hourly		

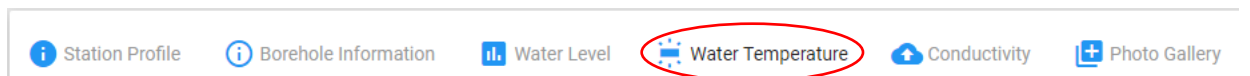
Station Profile tab describes the monitoring stations, including location, date of installation, and the current operational status.



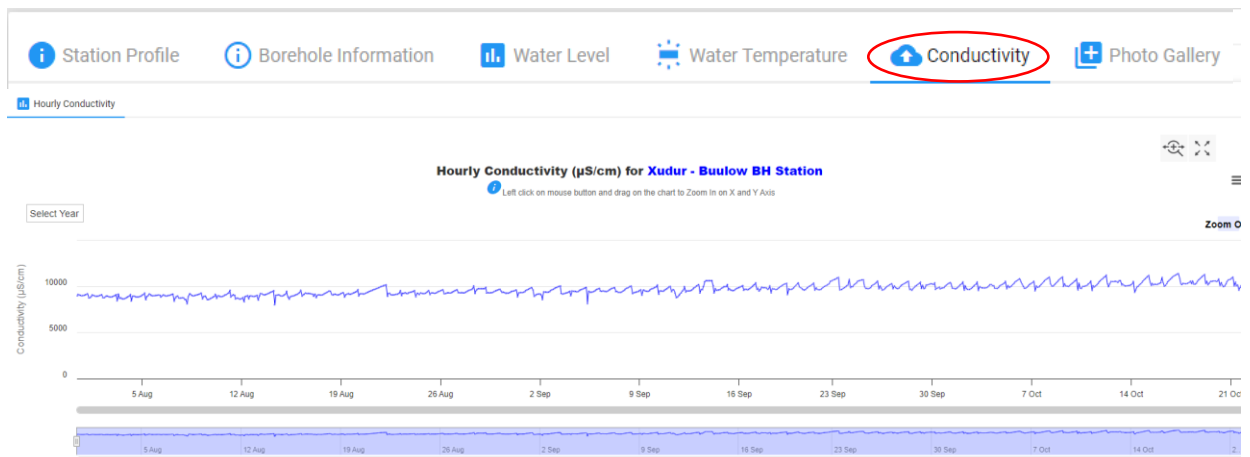
Under **Borehole Information** tab there are details about the borehole where the station is installed. Information under this tab include when the borehole was established, usage depth, field, and other physical parameters.



In the tab **Water Level** there is a graph showing the hourly fluctuations. Depending on the productivity of the aquifer the fluctuations may be gradual, or very pronounced (over 50 meters in some cases). The graph clearly indicates the drop in the water level during pumping, and recovery when the pump is switched off. The water level is measured in meters.



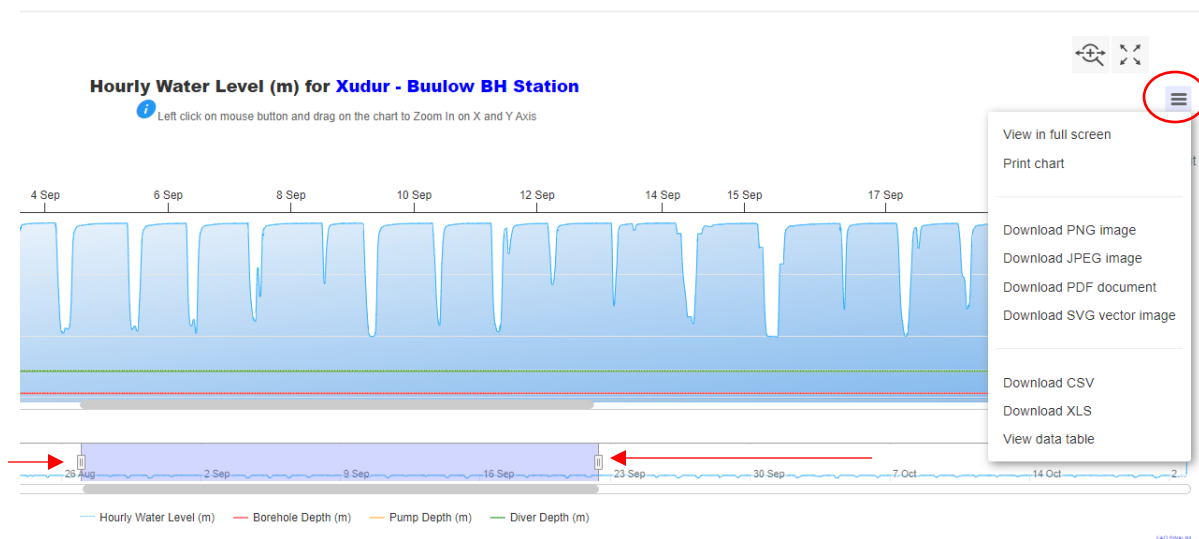
The next tab is on **Water Temperature**, where a similar graph to the water level is available, showing the variations on hourly basis. The temperature is reported in $^{\circ}\text{C}$.



Under the tab **Conductivity**, users can access a graph showing the variations, as measured on hourly basis. The conductivity, which is proxy for salinity, is measures and reported in $\mu\text{S/cm}$.

The last tab is on **Photo Gallery**, where a number of photographs for the station are presented.

Data Download



Downloading of data into Ms Excel is done through the highlighted tab on the top right corner. Clicking on it opens a drop down list to select the format for the download, which includes also images. Moving the tabs in the direction indicated in the red arrows expands or shrinks the period under review.