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SWALIM
Somali Water and Land Information Management

THE SWALIM UPDATE

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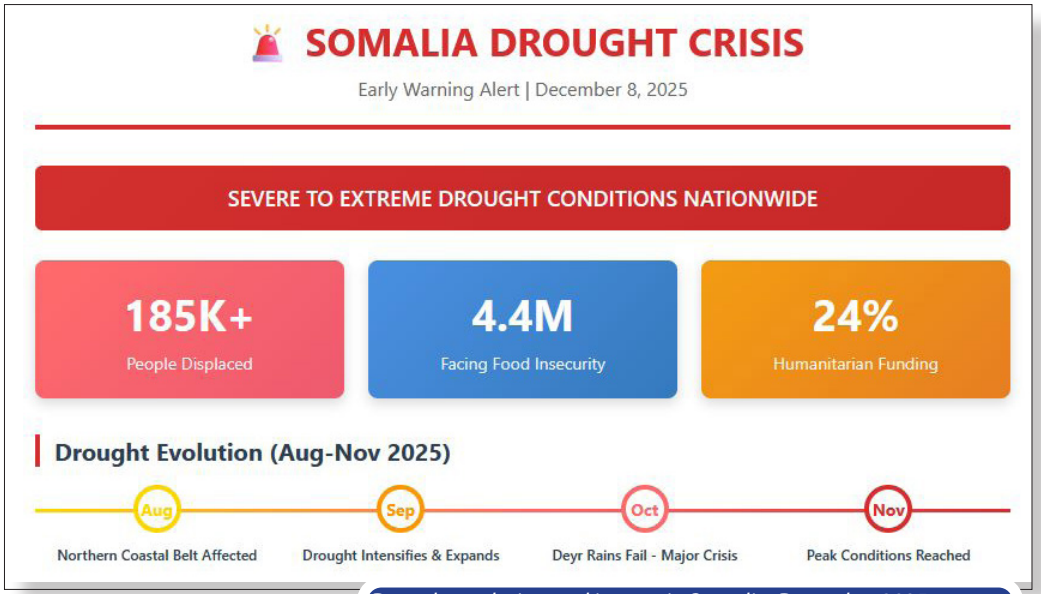
SWALIM's Critical Role in Somalia's Drought Emergency Response

Somalia is facing a severe drought emergency following consecutive seasons of below-average rainfall. On 10 November 2025, the Federal Government declared a national drought emergency as conditions spread across northern, central, and southern regions. An estimated 2.5 million people now live in drought-affected areas, with 4.4 million projected to face acute food insecurity through December 2025. The situation is particularly dire in Puntland, where nearly one million people need support. Humanitarian response has been severely constrained by funding shortfalls, with emergency food assistance dropping from 1.1 million recipients in August to just 350,000 by November.

FAO SWALIM serves as the backbone of drought monitoring and early warning in Somalia. The Combined Drought Index (CDI) integrates rainfall, temperature, and vegetation data to produce monthly drought severity assessments. The November 2025 CDI analysis shows severe to extreme drought conditions affecting nearly all livelihood zones in South and Central Somalia, parts of Puntland, and northwestern Somaliland—driven by substantial rainfall deficits and unusually high temperatures. This analysis directly informs where humanitarian agencies deploy water trucking and other emergency interventions.

SWALIM's strategic borehole monitoring dashboard provides real-time information on water sources across the country. Partners can access location, depth, functional status, water quality, yield, and pricing for each borehole—essential data for coordinating water trucking operations as surface water sources have dried up. With the next rains not expected until March/April 2026, SWALIM's information systems remain critical for guiding anticipatory action and ensuring limited resources reach the most vulnerable communities.



Drought evolution and impact in Somalia, December 2025

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Contacts

Somalia Water and Land Information Management

Address: Thorn Loge, AAIA, Mogadishu, Somalia;

Website: www.faoswalim.org

Email: swalim@fao.org

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Building Somalia National Capacity in Land Cover Mapping

FAO SWALIM conducted a ten-day training course in Mogadishu from 10–21 August 2025, equipping seventeen technical staff from five Federal Government ministries and agencies with skills in land cover mapping using the FAO Land Cover Classification System Version 3 (LCCS3). Participants from the Ministry of Agriculture and Irrigation, Ministry of Environment and Climate Change, Ministry of Livestock, Forestry and Range, Somali National Bureau of Statistics, and Ministry of Energy and Water Resources gained hands-on experience across the complete mapping workflow—from satellite image interpretation using photo keys to feature digitization in QGIS and ArcGIS Pro, attribute editing, topological error detection, and final map production. Each participant produced a validated land cover dataset and detailed map covering riverine zones near Mogadishu. By establishing standardized methodologies across government institutions, this training strengthens the foundation for Somalia's National Land Cover Reference System, supporting evidence-based decision-making for sustainable land management.

Practical session of the land cover map training in Mogadishu

Building Somalia National Capacity in Land Cover Mapping

Under the World Bank–financed Somalia Crisis Recovery Project, SWALIM completed high-resolution land cover mapping of Hirshabelle's riverine corridor in collaboration with the Federal and Hirshabelle Ministries of Agriculture and Irrigation, as part of its ongoing government institutions capacity transfer programme. The activity was implemented through on-the-job training, during which 35 technical staff participated in all stages from inception and pre-field preparation to database harmonization and the final knowledge-sharing workshop. This collaboration ensured that standard methods, data protocols, and workflows have been embedded within government institutions.

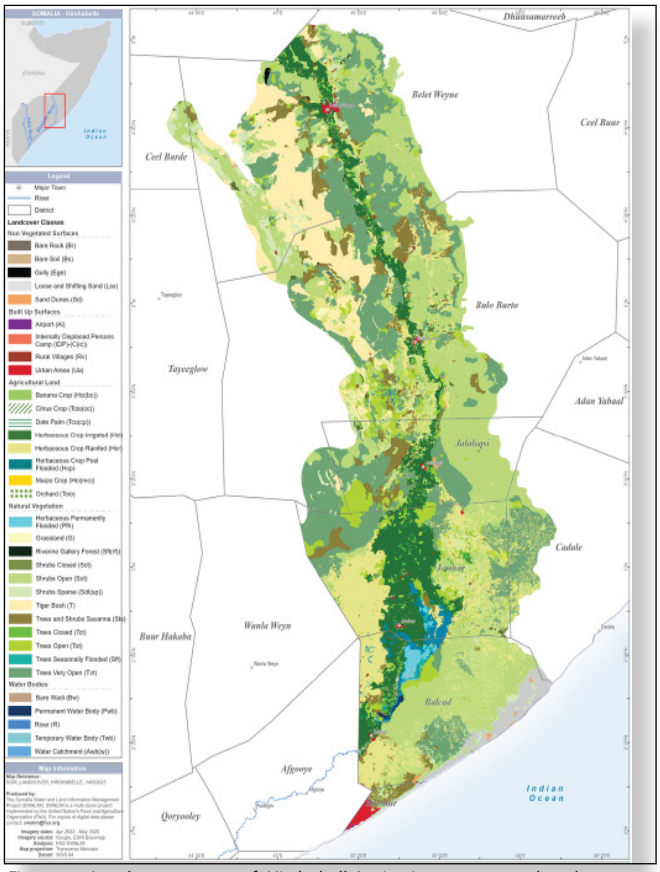

Figure 1: Land cover map of Hirshabelle's riverine areas, produced through a six-month on-the-job mapping exercise

The mapping covered six districts along the Shabelle River: Belet Weyne, Bulo Burto, Jalalaqsi, Jowhar, Balcad, and Cadale. Government and SWALIM teams applied the FAO Land Cover Meta Language (LCML), a globally recognized ISO 19144-2 standard that ensures consistent, flexible, and scalable land cover mapping. Additionally, the mapping aligned with the recently concluded SWALIM-led Somalia National Land Cover Reference System. Using very high-resolution satellite imagery (30–50 cm) interpreted at a scale of 1:5,000, the teams produced the most detailed and locally validated land cover dataset ever developed for Hirshabelle, offering robust spatial detail and thematic accuracy.

The dataset provides a reliable foundation for understanding the riverine landscape. Natural vegetation dominates, covering 1.8 million ha (73%), with diverse classes that contribute to ecosystem services and biodiversity. Agriculture spans 614,566 ha (24%), with a clear breakdown between rainfed systems (345,035 ha; 56%) and irrigated systems (269,531 ha; 44%).

This distinction between irrigated and rainfed systems enables targeted investments in water infrastructure and supports evidence-based agricultural planning, particularly in districts like Jowhar, where balanced irrigation systems demonstrate strong productivity potential.

The dataset provides a robust foundation for hydrological modeling, irrigation planning, food security monitoring, and land degradation assessment. The trainees are now fully equipped to maintain the land cover database, ensuring continuity and national ownership.

To ensure sustainability, SWALIM is developing the riverine agricultural monitoring system, which will enable regular tracking of agricultural extent and systematic dataset updates. This system will be critical for informed decision-making, climate resilience planning, and advancing long-term food security across Somalia.

SWALIM Monitors Over 600 Strategic Boreholes Weekly across Somalia

SWALIM, in collaboration with state authorities, conducts weekly monitoring of Somalia's strategic boreholes to track water availability, functionality, and community access. This monitoring involves collecting regular information on whether boreholes are operational, how much water they are producing, how much it costs, and how communities are using them. The data is essential for early warning and drought preparedness, as boreholes serve as the most reliable water sources in many rural and pastoral areas, especially during dry seasons when other sources dry up. A total of 609 strategic boreholes were assessed across the country.

This coincides with the Hagaa dry season, a period when surface water is scarce and communities depend heavily on groundwater. Understanding how boreholes perform during this season is critical for anticipating water shortages and ensuring that authorities and partners can respond quickly if problems arise.

During the reporting period, the South-Central States (South-West, Galmudug, Hirshabelle, and Jubaland) recorded 100% functionality, with all monitored boreholes fully operational. Somaliland also demonstrated strong performance, with 95% of boreholes functioning, while Puntland reported 89% functionality, highlighting areas that may require targeted attention.

The monthly average price for 20 liters of water during the reporting period ranged from USD 0.18 to 0.90, reflecting both regional differences and the typical pressures of the Hagaa dry season, when surface water is scarce and reliance on boreholes increases.

Jubaland reported the highest water prices, peaking at USD 0.10 in April to June before slightly easing to USD 0.80 in September. This pattern is consistent with seasonal dynamics in southern Somalia, where demand for groundwater rises sharply during Hagaa, often driving prices upward. At the other end of the scale, Galmudug maintained the lowest and most stable prices, ranging from USD 0.18 to 0.20 throughout the year. Stable prices in Galmudug may reflect better access to groundwater, shorter distances to boreholes, or the presence of

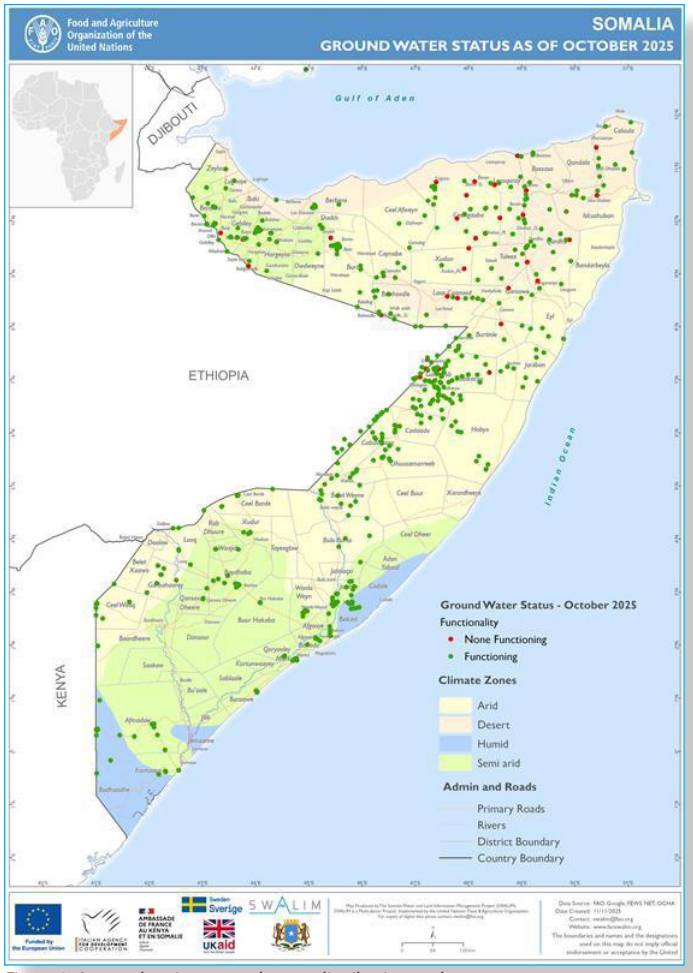

Figure 3: A map showing ground water distribution and status

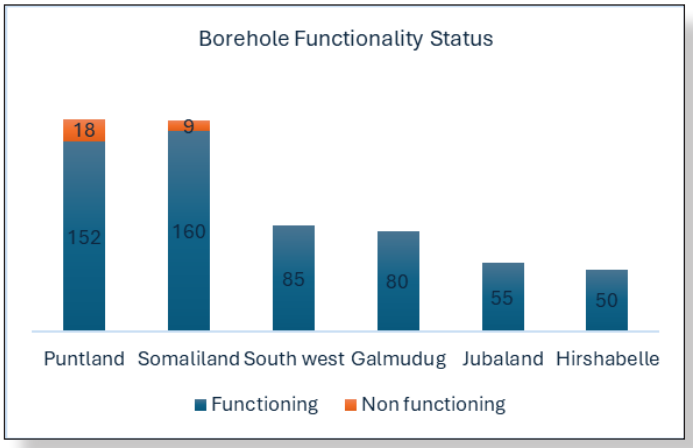

Figure 2: A graph showing functionality of boreholes by state

alternative water sources that ease pressure on the market. These variations largely mirror the differing levels of water scarcity across Somalia during Hagaa. Regions with limited groundwater recharge or higher transport costs tend to experience elevated prices, while areas with more reliable boreholes or shorter supply chains see greater stability.

Across all regions, boreholes continued to serve primarily domestic and livestock needs, with only limited use for irrigation, reflecting the priority placed on essential consumption during the dry season. Overall, 95% of monitored boreholes were functional, while 5% were non-functional. This high functionality rate during one of the driest periods of the year represents a positive indication of improved management and maintenance of Somalia's strategic water sources, helping communities withstand seasonal water stress more effectively.

The other states showed moderate price ranges typical for the season:

- **Hirshabelle:** USD 0.47–0.50
- **South-West:** USD 0.46–0.68
- **Puntland:** approximately USD 0.33–0.35
- **Somaliland:** approximately USD 0.31–0.46

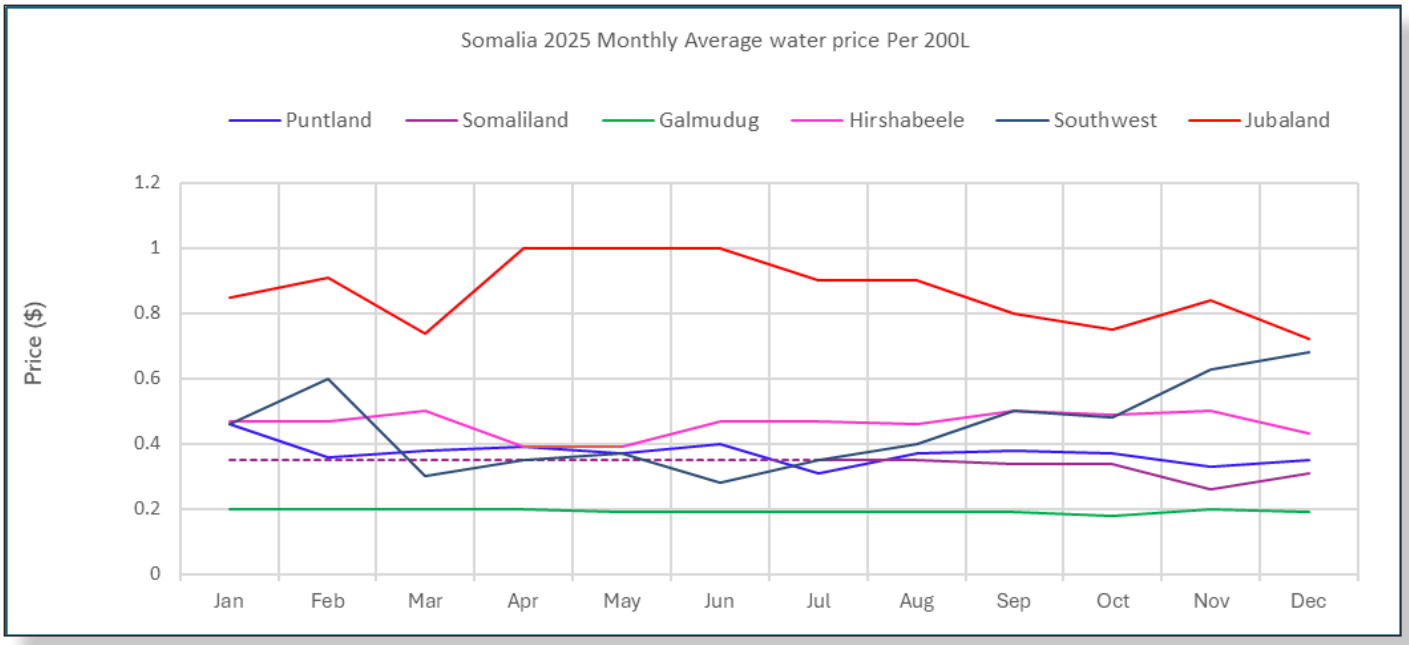

Figure 4: A graph showing water price per 200L (USD) from Jan to Dec 2025 per state

Highlights of the second National Climate Outlook Forum (NCOF-2)

The 2025 Deyr Climate Outlook marked another important step in strengthening Somalia's national capacity for early warning and preparedness. It brought together government institutions, technical experts, and humanitarian partners to review the state of the country's climate, discuss forecasts, and agree on actions to reduce the impact of droughts and floods in the coming season.

The Second National Climate Outlook Forum (NCOF-2), held in Mogadishu from 2–3 September 2025, was a key coordination event led by the Ministry of Environment and Climate Change (MoECC), with technical support from SWALIM, WMO, ICPAC, and SoDMA. The meeting reviewed the performance of the Gu and Hagaa 2025 seasons, during which many parts of Somalia experienced crop failures, livestock losses, and water shortages. The forum also launched the official Deyr 2025 seasonal forecast, providing a national platform for dialogue between government agencies, scientists, humanitarian actors, civil society, and the media.

National climate outlook forum 2 meeting

Experts presented the main climate drivers influencing the coming season, noting that a developing La Niña and a negative Indian Ocean Dipole (IOD) are likely to result in drier-than-normal conditions across most of the country. It was also mentioned that monitoring subseasonal drivers such as the Madden–Julian

Oscillation (MJO) will support the co-production of subseasonal forecasts, including weekly weather bulletins. MJO is a large-scale tropical atmospheric disturbance that moves eastward around the globe every 30–60 days and can temporarily enhance or suppress rainfall. Overall, these factors point to a season of below-average rainfall, hotter temperatures, and a delayed start to the rains, especially in southern Somalia. The outlook indicates that rainfall will likely remain below normal in most regions, with a few isolated wet areas expected in parts of Puntland and the north-eastern highlands. The onset of rains is predicted to occur later than usual in Jubaland, South-West, and Hirshabelle, while some parts of Somaliland and Nugaal may experience an earlier start due to the overlap of the late Karan rains. Although the general forecast is dry, there remains a possibility of localized flash floods and river overflows in low-lying and riverine areas. This risk is compounded by existing weak river embankments along the Juba and Shabelle Rivers. Recent field assessments by SWALIM identified over a hundred open breakage points and several overflow zones that require urgent maintenance to prevent potential flooding

SWALIM trained rainfall observers across Somalia

Accurate and timely rainfall data plays a vital role in Somalia's climate monitoring, early warning, and disaster preparedness systems. SWALIM program continues to strengthen the country's capacity in climate observation by supporting local rainfall observers with skills, tools, and knowledge to collect reliable data that feeds into national and regional monitoring systems.

To reinforce this effort, SWALIM conducted climate training sessions in Mogadishu, Garowe, Bossaso, Baidoa, Burao and Borama for rainfall observers from different districts. The total number of observers trained was 143. The objective was to refresh their technical skills, introduce new data collection methods, and create a platform for peer learning and experience sharing. The training also featured sessions on SWALIM's climate data portals and mobile reporting tools. Observers were guided on how to take geotagged photos, update station metadata, and verify their records online. For many participants, this was their first time using these digital tools. The interactive, hands-on approach made it easier to grasp these new methods and see their potential for improving accuracy and efficiency in data

Participants explaining how manual weather stations operate

Location	Observers Trained	Enhanced Skills
Mogadishu	17	Manual rainfall data collection and reporting
Garowe	19	Improved understanding of Automatic Weather Stations (AWS) and data comparison methods
Bossaso	24	Strengthened capacity to identify and resolve inconsistencies between AWS and manual observations
Baidoa	15	Introduced the use of SWALIM's climate data portals for easier access to rainfall information
Burao	33	Understanding of mobile based tools for geotagged data collection, meta data updates and accurate reporting
Borama	35	Fostered peer-to-peer learning and collaboration among observers, encouraging experience sharing and problem-solving across districts.

Table 1: A table showing training achievements

Status of River Breakages - August 2025 update

Flooding along the Juba and Shabelle Rivers remains one of Somalia's most recurrent and devastating natural hazards. The two rivers are vital for irrigation, domestic water supply, and sustaining agricultural livelihoods in southern Somalia, yet they also pose a continuous threat when embankments fail. During high river flows, especially following heavy rainfall in the Ethiopian highlands, weak or unmaintained riverbanks frequently breach, allowing water to spill into surrounding farmlands and settlements. These breakages have led to extensive crop losses, damaged infrastructure, and repeated displacement of vulnerable communities along the riverine zones. SWALIM has maintained a systematic monitoring program to track and document river breakages since 2014. The monitoring supports both humanitarian response and long-term flood management planning. Each update provides a comprehensive understanding of riverbank conditions before and after the rainy seasons, helping authorities and implementing partners prioritize interventions at the most

critical points. The August 2025 assessment represents the latest update following the Gu season and offers a detailed picture of current vulnerabilities along the Juba and Shabelle Rivers.

The assessment combines multiple geospatial and hydrological datasets. Very High-Resolution (VHR) satellite images were used to visually identify and track open breaches, overflows, and canal failures along both rivers. Digital Elevation Models (DEM) supported topographic interpretation, helping to confirm flow direction and flood paths from potential weak points. Historical breakage records and previous seasonal assessments were used for temporal comparison, ensuring that both long-standing exposure and vulnerabilities could be distinguished from newly formed breaches.

Where possible, ground verification and field reports from local partners and river observers were integrated to validate image interpretation, particularly in areas with dense vegetation or where recent rehabilitation works were reported. However, due to access limitations and cloud cover during the peak rainy months, the analysis remains primarily based on satellite interpretation. Despite these challenges, SWALIM's methodology provides the most reliable national-scale monitoring framework for identifying riverbank vulnerabilities in Somalia.

The August 2025 update identified five main breakage categories; Open (O), Overflow (Of), Canal Breakage (CB), Canal Intake Flooding (CI), and Closed with Sandbags (Cs).

River	Open Breakage	Canal Flooding point	Overflow Points	Closed with Sanbags
Juba	105	14	31	2
Shabelle	126	55	188	7

Table 2: A table showing breakage categories in both Juba and Shabelle rivers

The analysis shows persistent vulnerability in several critical zones, particularly around Beledweyne, Jowhar, Kurtunwarey, and Jamame, where long stretches of weak embankments have been repeatedly affected in recent years. Several open and overflow points remain active, indicating the need for urgent reinforcement before the onset of the next rainy season. The Shabelle River continues to experience more frequent breaches compared to the Juba, mainly due to sedimentation, encroachment on the riverbanks, and the proliferation of unauthorized canal openings.

The updated assessment emphasizes the importance of continuous monitoring, early interventions, and coordinated flood preparedness actions. The findings are being shared with the Federal Government of Somalia, State Ministries of Agriculture and Water Resources, and humanitarian partners to guide rehabilitation and preventive measures. Strengthening embankments at high-risk locations and regulating canal openings remain key to reducing recurrent flooding and improving community resilience.
The updated maps and detailed legend are available through the SWALIM River Breakages Database

Building capacity for water resilience: surface water mapping training in Mogadishu

Somalia continues to face recurrent droughts and highly variable rainfall, highlighting the need for reliable data on surface water resources to support sustainable water management and early warning. To address this need, SWALIM organized a training on the application of GIS and Remote Sensing for Surface Water Mapping and Analysis in Mogadishu. The training brought together 25 technical participants from key line ministries to strengthen national capacity in surface water monitoring and analysis. The training was conducted shortly after the Gu 2025 rainy season, during a period of increasing concern about below-average rainfall conditions expected later in the year. Seasonal forecasts issued by the NOAA Climate Prediction Center (CPC), the European Centre for Medium-Range Weather Forecasts (ECMWF), and the IGAD Climate Prediction and Applications Centre (ICPAC) all indicated a developing La Niña event likely to bring drier-than-normal conditions to Somalia. SWALIM, which continuously monitors climate indicators across all sectors, analyzed these forecasts together with sea surface temperature anomalies to produce its national outlook. The combined assessment pointed to rising risks of water scarcity following the Gu season, especially for communities reliant on surface water sources for domestic use, livestock, and small-scale irrigation.

Surface water mapping training in Mogadishu

The main objective of the training was to equip government and institutional partners with practical skills to identify, map, and monitor surface water bodies using geospatial and remote sensing tools. The two-week programme, facilitated by SWALIM's GIS and Remote Sensing Unit, combined theory, group discussions, and extensive hands-on exercises using real-world datasets.

Participants were introduced to key concepts of the hydrological cycle and the interaction between surface and groundwater systems. They explored earth observation products from MODIS, Landsat, and Sentinel missions, learning how these datasets can be used to assess hydrological changes across time. Through guided exercises, they applied spectral indices such as the Normalized Difference Water Index (NDWI) and the Normalized Difference Moisture Index (NDMI) to detect and monitor surface water and soil moisture conditions.

A key practical component was the development of surface water photo keys visual reference tools used to distinguish between water body types such as rivers, ponds, and dams. This session enhanced participants' ability to conduct accurate visual interpretation and feature categorization from satellite imagery. Midway through the training, participants were introduced to global water monitoring and data platforms, including FAO's WaPOR, SWALIM's Water Data Portal, and the Zamzam Rainwater Harvesting Platform. They learned how to access, visualize, and download spatial datasets related to rainfall, evapotranspiration, and biomass production. They also practiced accessing imagery from the Copernicus Open Access Hub and USGS Earth Explorer, selecting appropriate scenes and adjusting image bands for hydrological interpretation. In the final sessions, participants focused on digitizing surface water features using Google Earth Pro and QGIS. They created digital maps of natural and artificial water bodies, catalogued features using unique codes, and performed spatial analyses to estimate water storage potential. Exercises included calculating approximate catchment capacities and potential harvestable water volumes essential for drought resilience planning and local water resource management. To ensure that technical outputs lead to actionable insights, the training concluded with a session on report preparation and communication. Participants learned to summarize analytical results, develop evidence-based recommendations, and use standardized reporting templates for consistency across institutions.

By the end of the training, participants had acquired practical skills in satellite data interpretation, hydrological analysis, and surface water mapping. The exercise also fostered collaboration among institutions responsible for water resources, environment, agriculture, and planning.

This initiative forms part of SWALIM's ongoing capacity development programme aimed at empowering Somali institutions with the skills and tools needed for evidence-based water management. Integrating satellite-derived data and geospatial analysis into national planning processes will help Somalia better anticipate water shortages, design targeted interventions, and build long-term resilience to drought and climate variability.

SWALIM Delivered Drone and UAS Licensing Training to IMC PL, IMC SL, and SNBS

Drone technology has become an important component of the geospatial sector for managing land and water resources, including flood-affected areas, canal infrastructure rehabilitation, and monitoring of urban expansion. Through UAV operations, data acquisition, and geospatial applications, drones enable the collection of high-resolution data in areas that are difficult or impossible to access through conventional methods. To build national capacity and introduce the latest drone technologies, national staff from IMC Somaliland, IMC Puntland, the Somali National Bureau of Statistics (SNBS), together with FAO SWALIM GIS staff, participated in a two-week professional licensing drone and Unmanned Aerial Systems (UAS) training held in Nairobi and delivered by Fahari Aviation in collaboration with the Regional Centre for Mapping of Resources for Development (RCMRD).

Group photo: Participants of the Drone and UAS Licensing Training

FAO SWALIM, participation in this training directly supports its mandate to strengthen national systems for land, water, agriculture, and climate impacts across Somalia. The skills gained in UAV data collection and geospatial analysis enhance the ability to generate timely, high-resolution spatial information to support drought-flood risk assessment, land and water resource management, and evidence-based planning and interventions. Therefore, integrating drone-derived products into existing geospatial workflows, SWALIM continues to reinforce its role in supporting government institutions with reliable data for decision-making.

The training began with core theoretical modules covering UAV fundamentals and operational safety. Participants were introduced to UAS types, aviation safety principles, air legislation, and regulatory frameworks governing drone operations. Key topics included human factors, meteorology, navigation, and flight planning, with emphasis placed on understanding airspace, weather conditions, and risk assessment to ensure safe and compliant UAV missions.

Building on the theoretical foundation, the second module focused on practical flight operations and mission execution. Participants learned principles of flight for multi-rotor systems, aircraft technical components, radio telephony, and operational procedures. The sessions covered real-world applications, including site assessment, hazard identification, checklist use, and decision-making processes required for effective and safe drone deployment.

The second part of the training focused on hands-on practical sessions, during which participants conducted supervised flight operations and applied data acquisition techniques. Additional emphasis was placed on translating UAV data into usable geospatial outputs such as extraction of Digital Elevation Model (DEM), Digital Surface Model (DSM) and Digital Terrain Model (DTM).

Following the practical flight training, participants underwent formal examinations administered under the Kenya Civil Aviation Authority (KCAA) framework for the Unmanned Aircraft Systems (UAS) Remote Pilot Licence (RPL). The final assessment was an important milestone in the training programme, because of ensuring that participants met the required competency and regulatory standards for professional drone operations.

The training concluded with a closing session attended by representatives from the organising institutions, who commended the participants for their commitment and active engagement throughout the programme. Participants were encouraged to apply the skills acquired in their respective institutions to support operational mapping, planning, and decision-making. Certificates of participation were awarded to all trainees, and appreciation was expressed to Fahari Aviation and RCMRD for delivering the training.

Advancing Land Cover Mapping and Invasive Species Detection in Somaliland

As part of the ongoing efforts to strengthen the capacity of national institutions, SWALIM delivered a three-week training in Hargeisa to enhance the technical skills of government staff in land cover mapping and invasive-species detection. The programme engaged twelve technical staff from the Information Management Centre and representatives from six line ministries: Ministry of Water Resources Development; Ministry of Environment and Climate Change; Ministry of Agricultural Development; Ministry of Planning and National Development; Ministry of Livestock and Rural Development; and the National Disaster Preparedness and Food Reserve Authority (NADFOR).

The training covered the full land cover mapping workflow, from conceptual foundations to hands-on application. Participants learned to apply the FAO Land Cover Classification System
Version 3 (LCCS3) and the national land cover legend as the classification framework, while using QGIS to digitize land cover features and refine datasets through topology checks and error correction. Advanced modules introduced Google Earth Engine (GEE) for satellite imagery analysis, including the calculation of the Normalized Difference Vegetation Index (NDVI) to assess vegetation health and detect invasive species.

A key focus of the training was the application of machine-learning techniques for invasive species mapping. Participants applied Random Forest algorithm to classify *Prosopis juliflora* and cactus, two invasive species threatening rangelands and agricultural productivity across Somaliland. The training highlighted the value of combining field observations with supervised classification for more accurate mapping and included practical exercises in mobile data collection using KoboToolbox for field validation.

The newly trained professionals will apply their skills in Baki District through a pilot land cover mapping exercise to support restoration planning and rangeland management. This initiative is part of SWALIM's broader efforts to strengthen local expertise and promote sustainable land and resource management in Somaliland.

Group photo: Participants of the Land Cover Mapping Training

SWALIM and FSNAU are multi-year programmes managed by FAO and currently funded by The European Union, UKaid, SDC, AICS, GCF, World Bank, AFDB, Canada and Government of Sweden