Blue IQ

MANUAL

Table of Content

1. Innovative Technologies for Water and Climate Data

Welcome to a unique digitization opportunity for water and climate resilience!

Closing water and climate data gaps is essential for strengthening climate information services, water and disaster management, and our capacity to understand and adapt to climate change.

The United Nations Environment Programme Climate Technology Center & Network (**UNEP CTCN**) has supported the Government of Malawi in developing and innovating new technologies to boost the digitisation of water and climate data in Malawi during 2024-2025.

New solutions have been developed, leveraging mobile phone and cloud computing technologies. All thanks to UNEP CTCN, the Government Working Group, and the startup Water in Sight Ltd (Sweden) with T-Notch Consulting (Malawi) and Malawi University of Science and Technology (MUST).

Users, project participants and beneficiaries - from Gauge Readers and Observers at monitoring stations to staff in the Department of Water Resources (DWR), the Department of Climate Change and Meteorological Services (DCCMS) and the National Water Resources Authority (NRWA) - have guided the designs of all features and interfaces to ensure a sustainable and tailored solution.

With this manual, you will gain in-depth insights and guidance on how to use, administer, and replicate the technology solution for:

- Deployment of **digitisation of manual water and weather observation data** - from river and lake depths to daily rainfall and temperature - using simple and free SMS, to boost Gauge Reader and Observers' capacity and uncover swathes of localised and sustained climate monitoring data, countrywide.

and

- The new software solution **BlueIQ** for easy management, analysis, and use of bulk water and climate observations from manual monitoring[1], country-wide communication with Gauge Readers and Observers collecting water and weather observations across the country, and management of station equipment.

Figure 1. Gauge Reader Sabina Kasiya on the Linthipe River, Dedza District

[1] With full integration capacity of observation data from automatic sensor and satellite API services.

2. Countrywide Digitisation of Manual Observations: Deployment Guide

2.1. Overview

The digitisation of manual water and weather observations is a transformative step toward improving accuracy, timeliness, and national integration of hydrological and meteorological data in Malawi and in low-income countries facing challenges with closing data gaps and ramping up in-situ hydrological and meteorological observation coverage.

Traditionally, manual observations are recorded on paper or transmitted in reports sent by post, and verbally over the phone/WhatsApp. Whilst there are little government funds to print or send reports, the traditional technology approach involves delays, data gaps, and challenges in using data in forecasting.

Through the UNEP CTCN project, the BlueIQ system was developed to build on earlier piloting and scaling a mobile-based and cloud-integrated solution that **allows Gauge Readers, Rainfall Observers, and Synoptic Meteorologists to submit daily observations using their phones** (free SMS or WhatsApp). These simple, accessible technologies feed into the cloud based web platform of BlueIQ enabling government users at all levels to receive, visualise, validate, and act on observation data in near real-time.

The digitisation initiative has relied on strong inter-agency and private-public partnership collaboration. The Department of Water Resources (DWR), the Department of Climate Change and Meteorological Services (DCCMS), and the National Water Resources Authority (NWRA) each with their distinct yet complementary roles in administration, coordination, training, maintenance, and systematic monitoring of Malawi's weather, water, and climate.

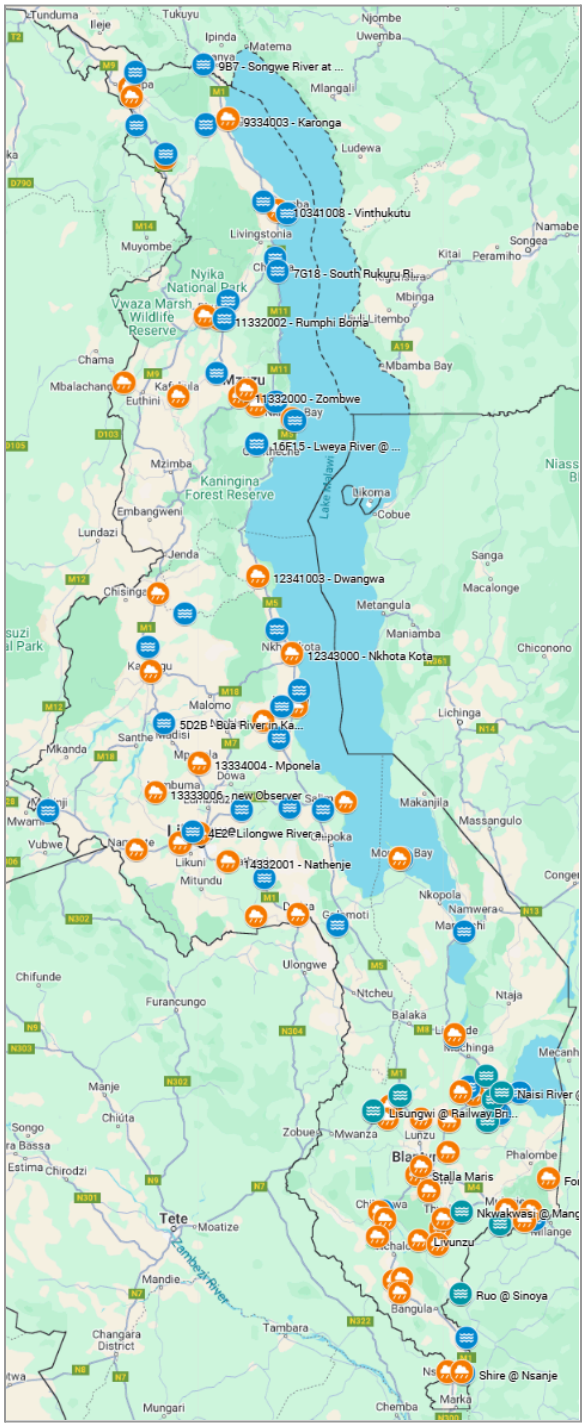


Figure 2. Rainfall and river/lake level monitoring piloting digitised manual observations 2021-2025

The collective efforts of DCCMS, DWR, and NWRA ensure that manual observations can be seamlessly integrated into forecasting, planning, disaster risk reduction, and climate adaptation strategies.

This section outlines the roles and responsibilities, and step-by-step guidance for government actors and their partners in coordinating the deployment and long-term management of the digitised system.

The Manual also highlights the importance of engaging with local communities and providing sustained support to the frontline Gauge Readers and Observers who provide a backbone service to Malawi's climate observation networks.

By taking a structured and user-centered approach, Malawi is now able to unlock a new era of resilience-building and informed water and climate governance - one SMS or WhatsApp at a time.

Figure 3. Observations sent through free SMS and WhatsApp.

2.2. Roles & Responsibilities

2.2.1. Administration and coordination

Government departments mandated with national monitoring of hydrology and meteorology, are ultimately responsible for administration and coordination of in-situ manual and sensor observation systems. They manage logistical arrangements to deploy digitisation technologies for in-situ manual observation, and can choose to select a service provider to support any scaled training, data collection, surveys among the many sub-tasks.

Government agency responsibility for deployment ensures deployment and maintaining the technology aligns with their core mandate, operations, systems, staffing and cross-government collaboration.

2.2.2. Logistical arrangements and communication

Logistical arrangements, communication, and documentation during deployment, involves three main areas of in-field activities:

1) Training and registration of Gauge Readers, Observers, and Meteorologists (collectively 'Observers' hereon) in using their mobile phones to transmit manual observations.
2) Station assessment and inventory.
3) Engagement and endorsement of local communities.

Once Observers are trained, government agencies are responsible for continuous communication with them and government representatives, enabling remote support, trouble-shooting and guidance on any challenges being faced on a day-to-day basis.

Communication is done via several means: individual phone calls, physical visits, WhatsApp and through the Chat App in BlueIQ.

2.2.3. Feedback

Soliciting feedback from Observers and communities at stations, as well as decentralised staff during deployment is important for the identification and resolution of any issues with the use of the technology or any misunderstandings on the documentation.

Close cooperation with district offices and departments who may be beneficiaries or users of data is encouraged, such as the Ministry of Agriculture, Ministry of Natural Resources and Climate Change, and the Department of Disaster Management Affairs - especially as many monitoring stations serve sectoral purposes, from early warning/flood monitoring stations to rainfall stations at agricultural research centers.

2.3. Deployment activities

2.3.1. On-site training and deployment at monitoring stations

At the station location (i.e., river, lake, rainfall and synoptic weather stations), deployment involves training, survey and station assessments with Gauge Readers, Observers, and synoptic Meteorologists as well as local community members and district government staff.

Station assessment is necessary to collect metadata, and identify rehabilitation needs of any equipment or station infrastructure, clearance of vegetation and sedimentation, and/or updating river cross-section measurements.

The training of the Observers who will start sending their observations through free SMS or WhatsApp takes approximately one hour and involves testing and answering questions. Deployment further includes doing a survey of the Observer and registering their personal details and signing a Terms of Reference as part of seeking their endorsement of using the technology and having their personal information stored by the government. To complete all surveys and training, each station require on average two to three hours.

Below follows itemised actions recommended.

Gauge Reader/Observer registration

- Register Observer using the Registration Form.
- Go through, confirm and request signature from the Observer, to document their approval to participate, undertake tasks, and maintain required standard operating procedures using the Terms of Reference template. Leave one copy with the Gauge Reader and Observer.
- Take a pen-photograph and copy the ID of the Gauge Reader or Observer with their consent.

- Secure signature for DSA for training events in alignment with the government policy.

Gauge Reader/Observer training

Train Gauge Reader and Observer in using free SMS or WhatsApp by demonstrating the tool and using the instruction sheets and illustrations.

Let the Gauge Reader or Observer test extensively and address any questions that may arise.

Figure 4. Training with Observer Martha Chilokoteni by Ms Thokozani Mtewa at Thilasembe Rainfall station (2024)

- Note:
    - Free SMS is intended for Observers, Meteorologists and Gauge Readers who only use a simple phone.
    - WhatsApp is intended for Observers, Meteorologists and Gauge Readers who have a smartphone and prefer this end point.
- Go through the standard operating procedure, including expected data submission:
    - Free SMS: in one message…
        - WS code, followed by
        - observation data submission format
        - schedule of data submission
    - WhatsApp: in separate messages…
        - location sharing
        - observation data submission format (with parameter code for weather observations)
        - schedule of data submission
- Go through important additional information:

    - No observation if monitoring poses a risk to health or life.
    - If Gauge Reader and Observer is unable to send observation s/he can submit later but needs to enter date and time in message:
        - for example: “WS 5.2 26/10/2024 am”
    - The Gauge Reader or Observer report on special conditions, such as:
        - equipment failure
        - flooding conditions, extreme rainfall (“Flood1”, “Flood2”, “Flood3”)
        - Any other issue
- Provide the Gauge Reader and Observer with:
    - Manual: the laminated instruction and illustration sheets
    - Personal Protection Equipment, PPEs (raincoat, gumboots, slasher, spade).
    - Phone number to department representative for any follow up communication.

Figure 5. Distribution of PPEs with Gauge Reader Hilda Mtemula and daughter at Naisi River @ Mwandama station (L) and with Observer John Bizeck Billy Ngabu rainfall station (R)

Gauge Reader/Observer engagement

- Share risks and guidance related to gender based violence per the Terms of Reference.
- Interview the Gauge Reader or Observer using the survey form.

Station assessment

- Register/review station inventory and details
    - Take photographs (of the broad location, detailed station equipment etc.)
    - Register and review GPS location and election above sea level. Use **Google maps** app and **My Altitude** App.
    - Confirm station details per the station assessment form.
    - Register details about station purpose, adjacent automated sensors and their status, and any information or risks of extreme events.
- Assess station status.
    - Using the station assessment form, register the condition of the station.
    - Register the needs for rehabilitation and renewed equipment.
    - Register needs and update of rating curve details.

Figure 6. Station and equipment assessment (top left, clockwise): Billy Ngabu, Ruo River @ Sinoya, Chididi, and Lisungwi @ Railway Bridge.

Community engagement

- Hold a meeting with Group Village Head(s), community chiefs/leaders and representatives to solicit support, and protection of monitoring stations.
- Take minutes for any decisions taken and recommendations shared.

Figure 7. Community consultations at Mkwakwasi River @ Mangunda station (2024)

2.3.2. Preparation checklists

Logistical arrangements:

- ☐ Develop maps of the testing stations.
- ☐ Estimate travel distances, duration and routes using tools, such as google maps.
- ☐ Organise multiple teams for parallel deployment and on-site training.
- ☐ Coordinate with DCCMS, DWR, and NWRA staff (HQ/District) on notifying Gauge Readers and Observers on planned visit and involvement in the pilot.
- ☐ Estimate fuel requirements and budgetary allocation.
- ☐ Rent cars, if needed or book department vehicles.
- ☐ Book accommodation.
- ☐ Confirm insurance status of deployment participants.
- ☐ Cash or mobile money services for DSA payments.

Documentation (see annex A-D for templates):

- ☐ Community Endorsement Letter template.
- ☐ Print documentation for assessing station status and equipment.
    - ☐ Station inventory assessment form for meteorological stations.
    - ☐ Station inventory assessment form for rainfall stations.
    - ☐ Station inventory assessment form for river gauging stations.
- ☐ Print documentation for engaging Gauge Readers and Observers.
    - ☐ Training instructions and illustrations (laminated).
    - ☐ Terms of Reference for signature.
    - ☐ Gauge reader/Observer registration form.
- ☐ Gauge reader/Observer survey form.
- ☐ DSA forms for signature by drivers, government staff, and consulting team including photos of ID (see annex, government circular June 27, 2024).
- ☐ DSA forms for Observers (see annex, government circular June 27, 2024).

Materials to prepare:

- ☐ Personal Protection Equipment for Gauge Readers and Observers.
    - ☐ Slasher.
    - ☐ Spade.

- [ ] Gum boots.
- [ ] Rain coats.

- [ ] GPS.
- [ ] Microphones for interviews, phones for photographs.

Expenses to consider:

- [ ] Taxi and fuel for purchasing and printing materials
- [ ] Data bundles and airtime for communication in the field

Monitoring equipment:

- [ ] River level gauge.
    - [ ] gauge plates.
    - [ ] angle iron, bolts and nuts, paint and cement.
- [ ] Rain gauge.
    - [ ] Rain Gauge (127 mm diameter) with funnel and collecting buckets (WMO standard).
    - [ ] Rainfall measuring cylinder (20 mm capacity for 127 mm diameter rain gauge).
    - [ ] Concrete stand.
    - [ ] Stevenson Screen (double door) and wooden stand.

2.4. Maintenance and support

2.4.1. Registration of Stations and Observers

Once deployment, training and station assessments are completed, stations need to be registered in BlueIQ (see the **Station** app, section 3.5).

Once stations are registered, you can connect the correct Gauge Readers, Observers, and synoptic Meteorologists to their correct station (see the **Observer** app, section 3.7). Note that several individuals can be connected to the same monitoring station, and several phone numbers can connect to the same Gauge Reader, Observer or Meteorologists.

2.4.2. Performance monitoring and support

BlueIQ is built to **enable close monitoring of the performance** of each station. For manual stations, the WMO standard is that observations should be submitted 80% of the observation frequency (e.g., twice daily for river and lake observations, once daily for rainfall). Administrators of the BlueIQ software can at any time view the station performance across the software's apps for Stations, Observers, Studio etc. This makes it easy to quickly send a message in the Chat app or call the individual directly to understand why observations are below performance thresholds or have stopped.

3. The BlueIQ Website: User Guide

3.1. Log in

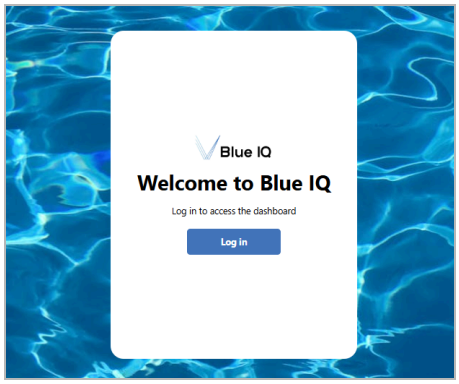
Go to the BlueIQ website and log in with your credentials.

Website: **https://app.blueiq.africa**

For credentials, please contact:

DCCMS
DWR
NWRA

Support: tech@waterinsight.se



3.2. Landing page

3.2.1. Website components

When you enter the BlueIQ website, the key elements you first see are:

1) A list of **Apps** that are shown vertically on the far left-hand side of the page.
2) The **Studio App** is selected by default, showing you an interactive map with hydrological and meteorological monitoring stations, as well as the **Filter** - a cross-platform tool to tailor use.
3) **User icon** and **preference icon** for updating your user profile, read the disclaimer and log out in the far upper-right hand corner.

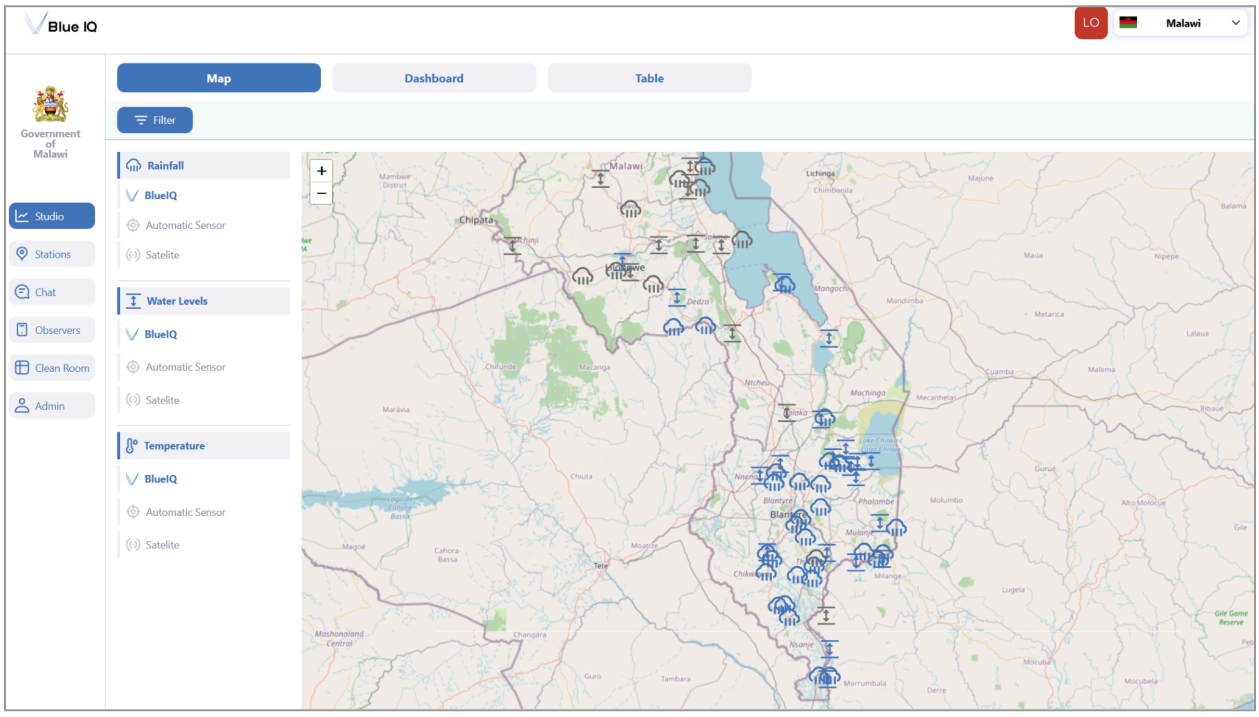


Figure 8. BlueIQ website landing page

3.2.2. The Filter

The **Filter** is a selection and search tool for narrowing and tailor what you use and see on the website.

Once you have set your filter preferences, it works across all apps and data presented within the website, and is easily changed or cleared.

You can filter by:

- **Region**: by region or province.
- **District**: by district(s).
- **Basin**: by river and lake basin(s).
- **Station:** by individual or multiple stations of interest.
- **Variable:** by variables monitored by the stations connected to the website, with pre-set variables for water levels (lake and river), rainfall, temperature (maximum, minimum), relative humidity, wind speed, and wind direction.

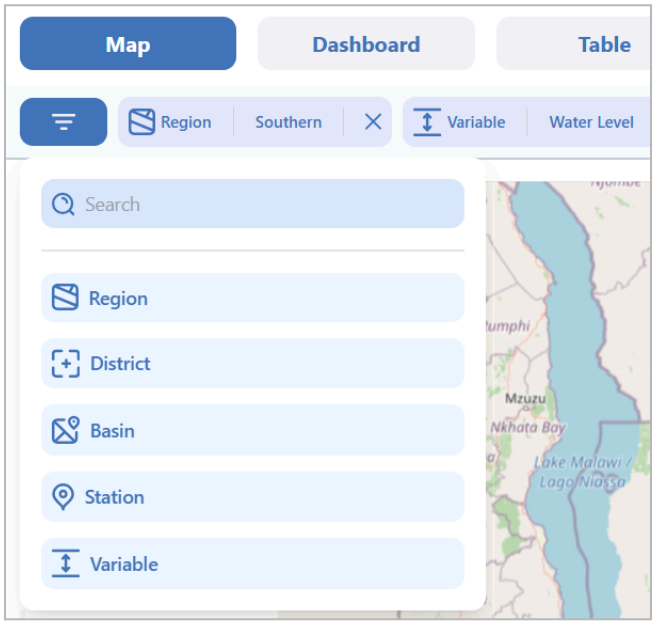


Figure 9. Filter function

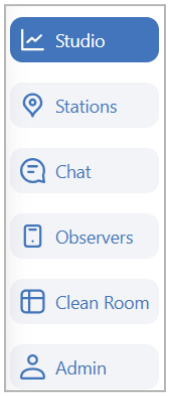
You can search across all filter options, and within each category of filter groups.

Once you have marked your selection, you can press anywhere on the page, and the filter is applied.

To remove the filter, simply press "x" and the platform is updated automatically.

3.3. The Apps

On the left-hand side, you will see icons for the six apps that make up the website:



- **STUDIO**

  Map with interactive stations, generating a pop-out view of the individual station and shortcut to more information on that station within the Stations app.

  Dashboard for generating graphs which are adjustable by preferred dates.

  Tables for viewing and exporting data, adjustable by preferred dates.

- **STATIONS**

  Station management tool with station metadata, photos, performance metrics, maintenance log, graph of observations, and location on a small map.

Figure 10. List of Apps in the left-hand navigation bar

- **CHAT**

  Chat function for communicating two-way with individual Gauge Readers and Observers (regardless if s/he is using free SMS or WhatsApp on her/his end), with details on the performance of the station s/he works at, along with contact details.

  Broadcasting function for group messages based on preferred filters or selection of Gauge Readers and Observers (e.g., for flood alerts, maintenance reminders, surveys, etc.).

- **OBSERVERS**

  Personnel management tool to register and manage Observers and Gauge Readers' details (gender, age, location, community role etc.).

- **CLEAN ROOM**

  Data quality control tool for authorised government staff to address and fix data outliers.

- **ADMIN**

  Access profile management tool to manage different users' level of access and ability to use tools across the website.

3.4. The Studio

3.4.1. Purpose

The **Studio** allows you to investigate and understand the monitoring of rivers, lakes, rainfall and other variables through different viewpoints: on a map, as data plotted in graphs, and in a data table format.

To the left of the map, the manual observation stations for rainfall, water levels and temperature are pre-selected based on the UNEP CTCN project, BlueIQ.

As databases for historical or automatic sensor observations are connected by DWR, NWRA, and DCCMS through APIs (Application Programming Interface, pending), these can form complementary sources and provide access to additional stations and data.

To facilitate access to satellite observations, the website is also built to generate such observations with NASA SWOT being one promising forthcoming data source

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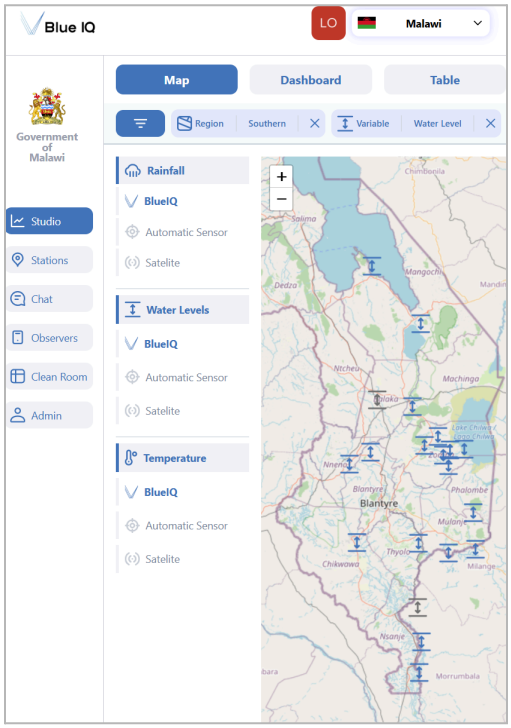


Figure 11. The Studio filtered by water level stations in the southern region of Malawi

3.4.2. The Map

When clicking on a station on the map, a pop-out appears showing the observations for the past 30 days, the station meta-data, performance, and a shortcut to the Station app.

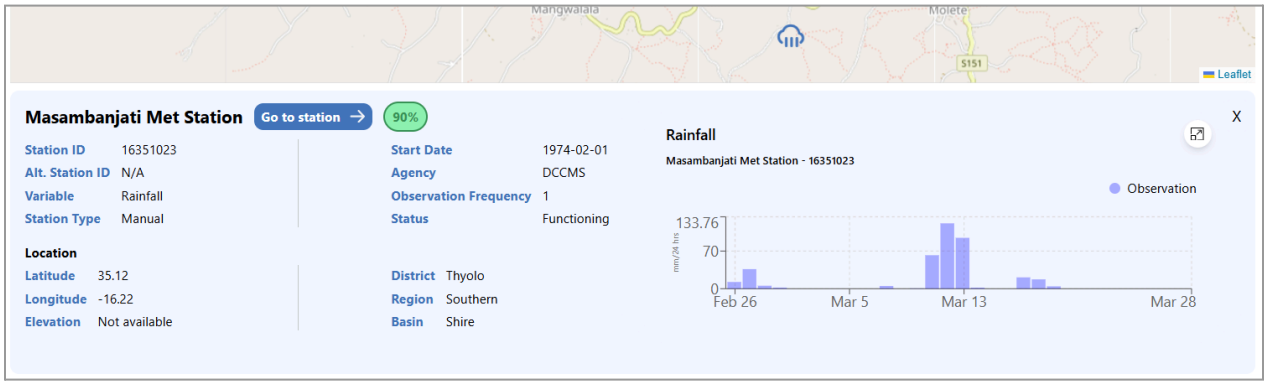


Figure 12. Station 'pop-out' for the Masambanjati Meteorological Station in Thyolo, Malawi.

3.4.3. Dashboard

The **Dashboard** makes it easy for you to generate graphs and analysis from the water, weather and climate observation data.

You set your preferred date range in the right-hand upper icon (purple).

You select your station by either:

1) searching by station name or station ID number; or

2) setting a filter based on the filter function (i.e., region, district, basin, station, variable) as explained in section 3.2.2.

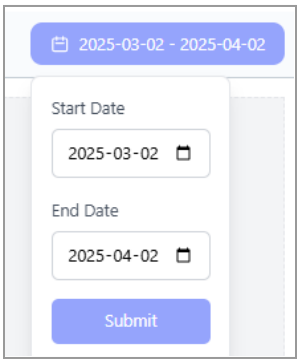


Figure 13. Date filter

Actions you can take:

- To generate the graph, **drag the variable icon and drop across**, under the station name (figure 14).
- **Expand the graph** by clicking the expand icon in the upper right hand corner of the graph (figure 16).
- Scroll over the graph to **see the individual observation data** for that date.
- **Remove the graph** by clicking "x" in the upper right hand corner of the graph.
- Remove the graph by **dragging another station variable** to the graph area.

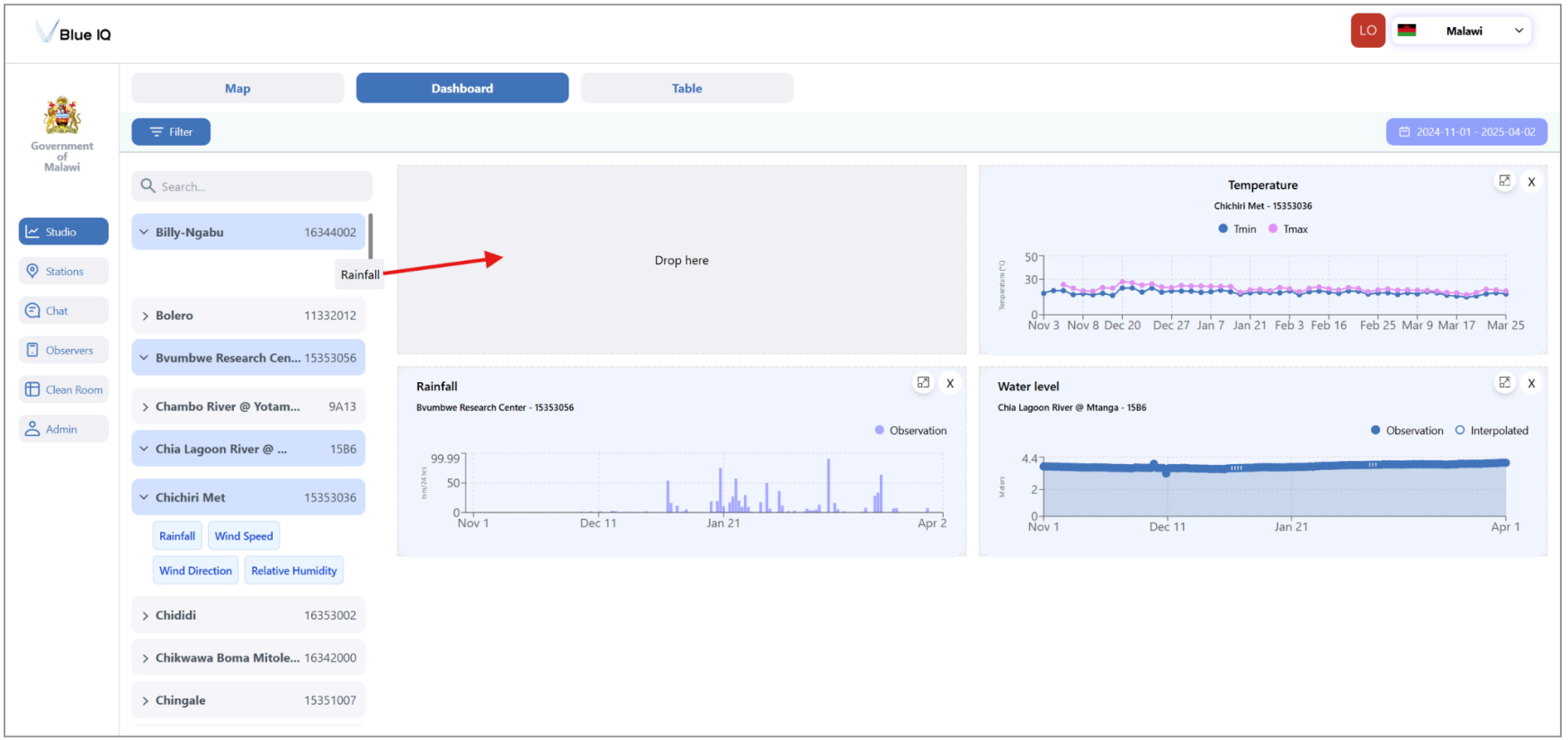


Figure 14. Generating a graph in the Dashboard by dragging the variable icon across

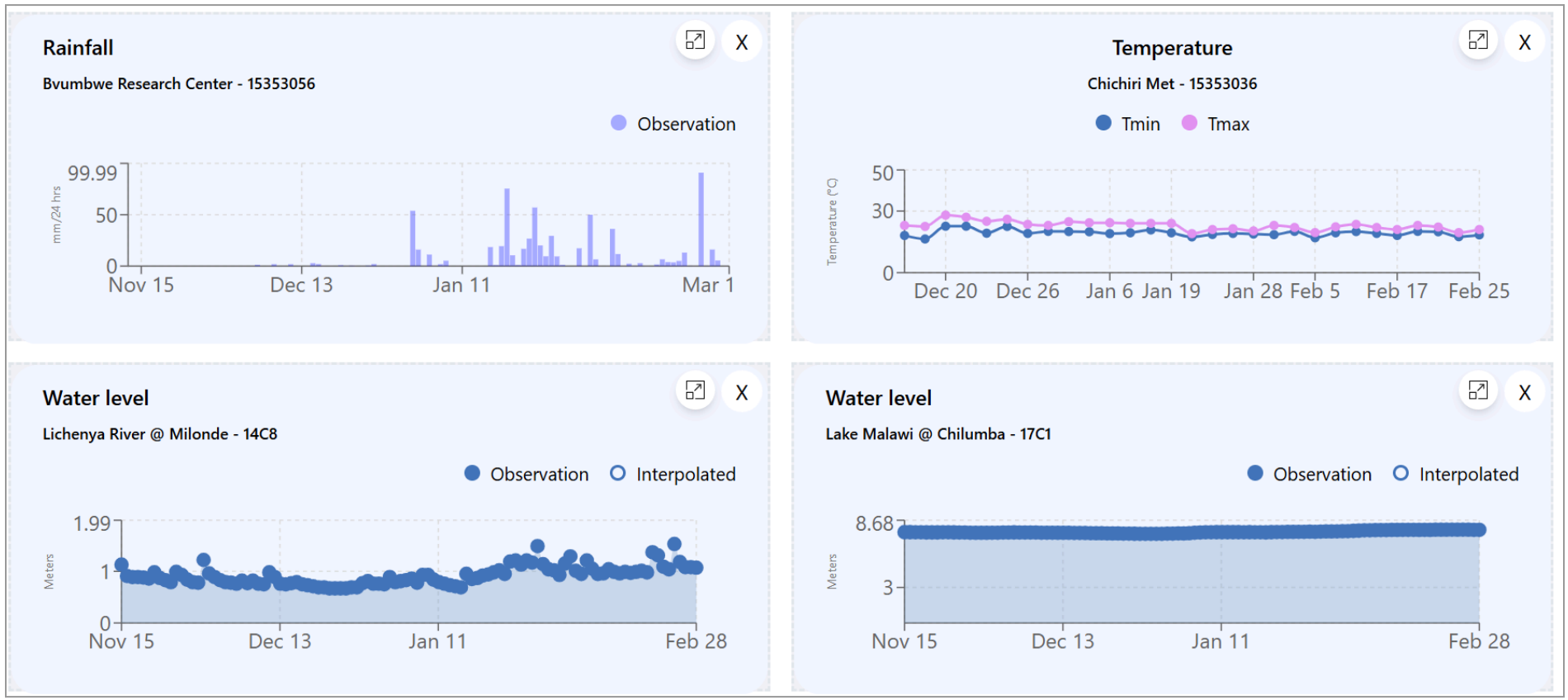


Figure 15. The Studio Dashboard where graphs can be generated based on station, variable, and date preferences.

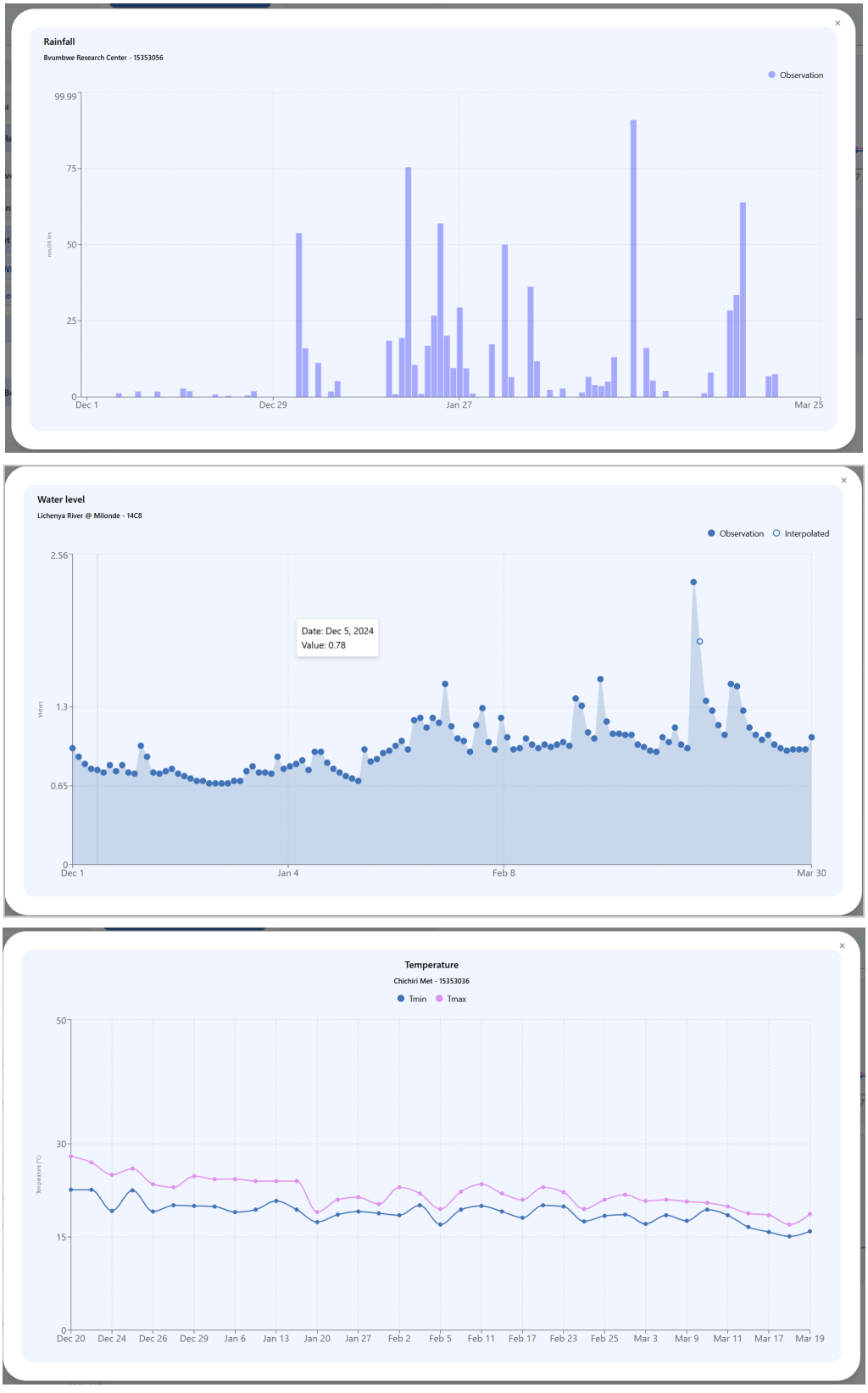


Figure 16. Examples of graphs generated for rainfall, water level, and temperature.

3.4.4. Table

The **Table** option in the Studio allows you to see and scroll through the observation data. The table will adjust to any filter you add (i.e., region, district, basin, station and/or variable), and the date range you prefer (upper right-hand date icon in purple).

The table will show you raw data, as sent by the Gauge Reader or Observer, as well as the reported data that has been processed through the Clean Room app and AI, for quality and format consistency.

To adjust the table to your preferred station or variable, use the filter.

You can also sort the table by clicking on the column headings.

Use the right-hand green icon to download the data.

For administrators that want the observation data accessible through API, see section 4.2.

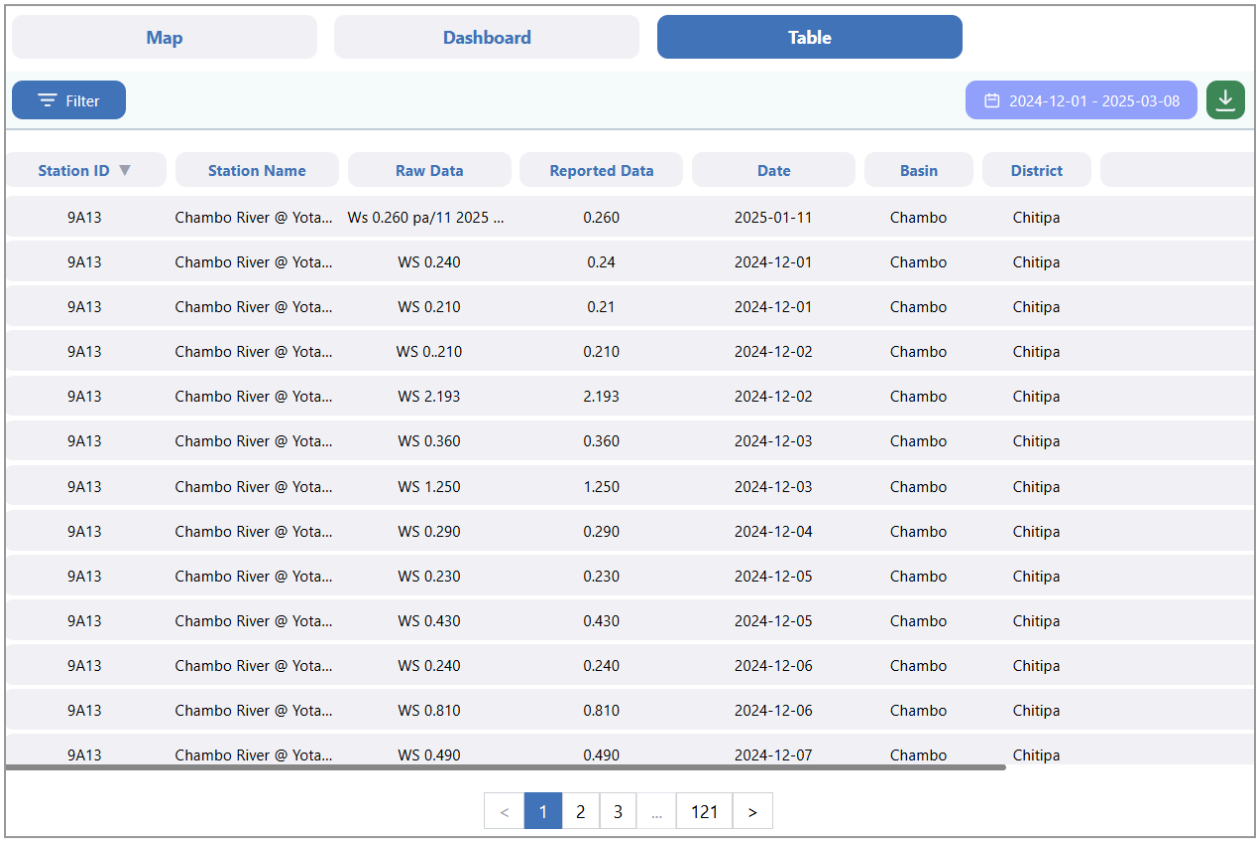
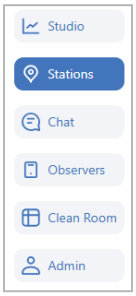


Figure 17. Observation data table.

3.5. Stations

3.5.1. Purpose



The **Station** app is a one-stop inventory management tool for the river, lake, rainfall and synoptic weather monitoring stations.

The app also gives you a snapshot of the latest observation data collected (adjusted by preferred date range), the station map location, and a shortcut to chat to the Gauge Readers, Observers or Meteorologists working at the monitoring station.

3.5.2. Overview: Station management

In the **list of stations**, on the left-hand side, you can search for a station by its name or station ID number. You can also narrow down all stations into smaller groups using the Filter function above.

When you **click on a station**, the middle field of the webpage shows you the station metadata, images, and maintenance log in three tabs.

On the right hand side, you see an expandable **graph** of station observations for the past 30 days, the **map** of the station, and icons for the Gauge Reader, Observer or Meteorologists responsible for monitoring at the station - with whom you can **start an instant Chat** (a shortcut to the Chat App).

To **edit the station metadata,** select the edit icon next to the station name in the middle field.

To **add a new station** to the registry, press the plus icon on the right hand-side next to the date filter.

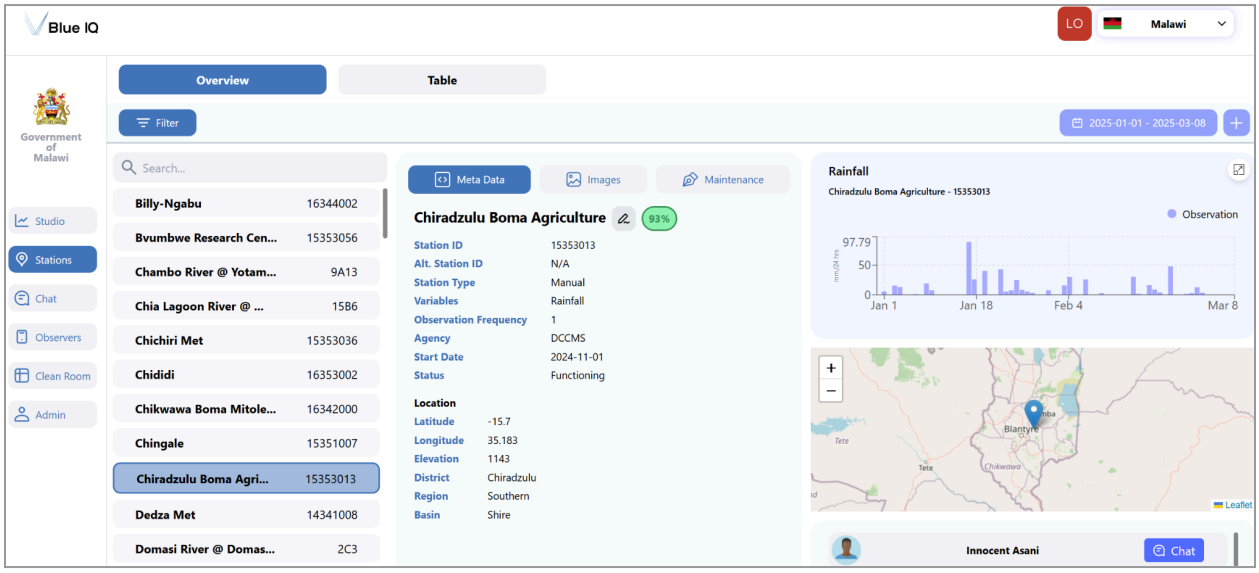


Figure 18. Station App interface (searchable list of stations, station metadata/photos/log, graph, map and contacts)

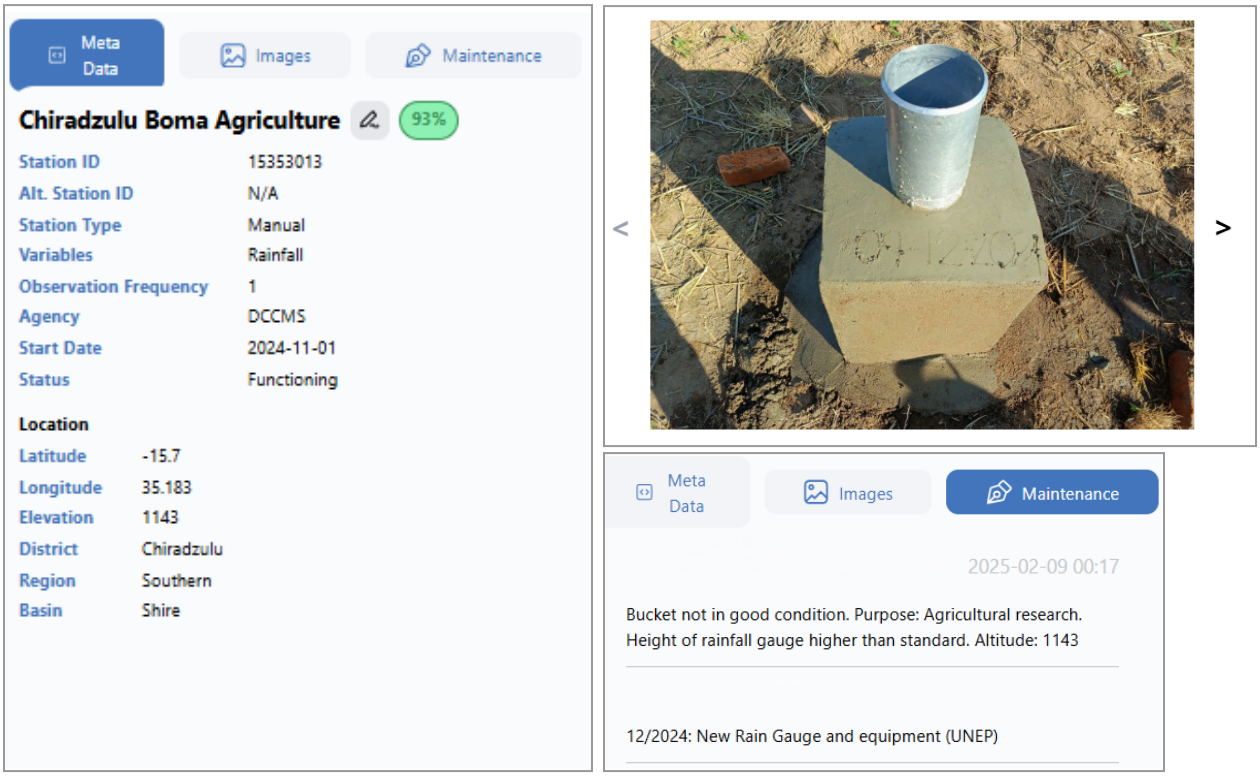


Figure 19. Examples of station information tabs

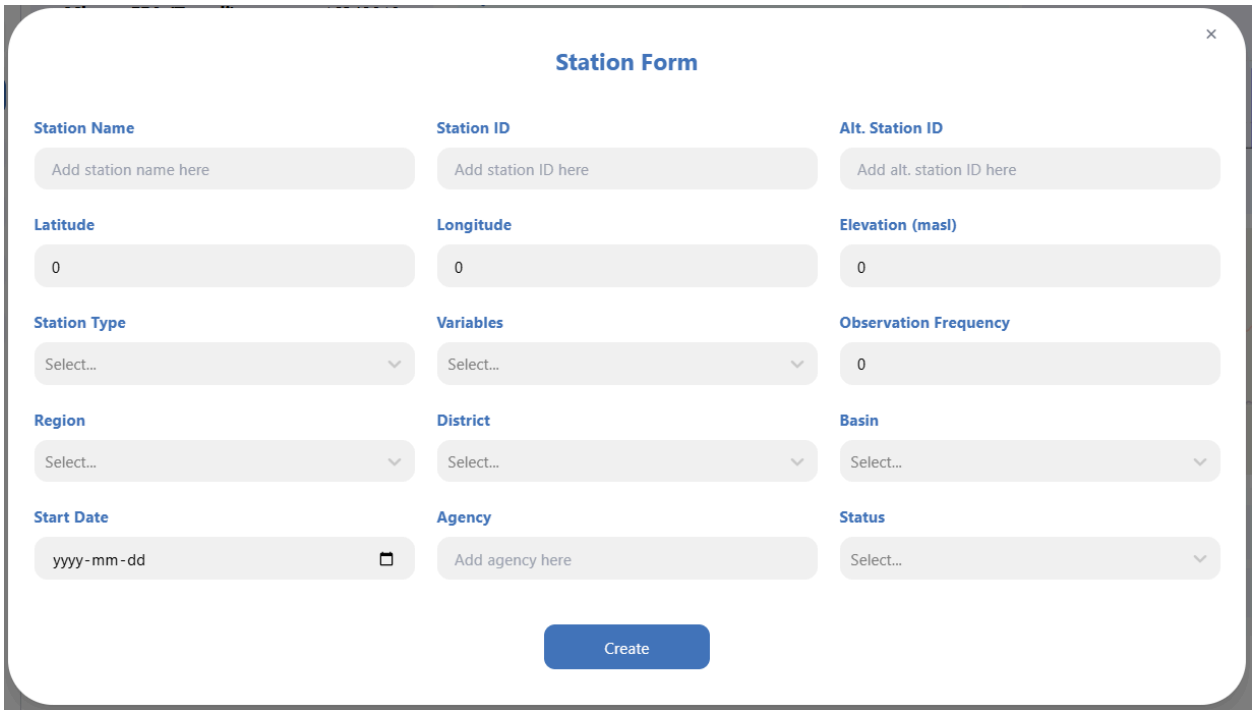


Figure 20. Add Station Form

3.5.3. Table: Station

The second tab, **Table**, allows you to see all stations in the inventory in table format.

You can use the **Filter** to adapt the stations shown (region, district, basin, station(s), and variable).

By clicking the column heading, you can **Sort** the table. Sorting can be useful for:

- View stations that are performing or not.
- View stations that are functioning, need repair, or are not functioning.
- Organise alphabetically in different columns.

To **Download** all station data, press the download button on the right-hand side.

To **edit the station metadata,** select the edit icon in the far right column.

To **add a new station** to the registry, press the plus icon on the right hand-side, next to the download button.

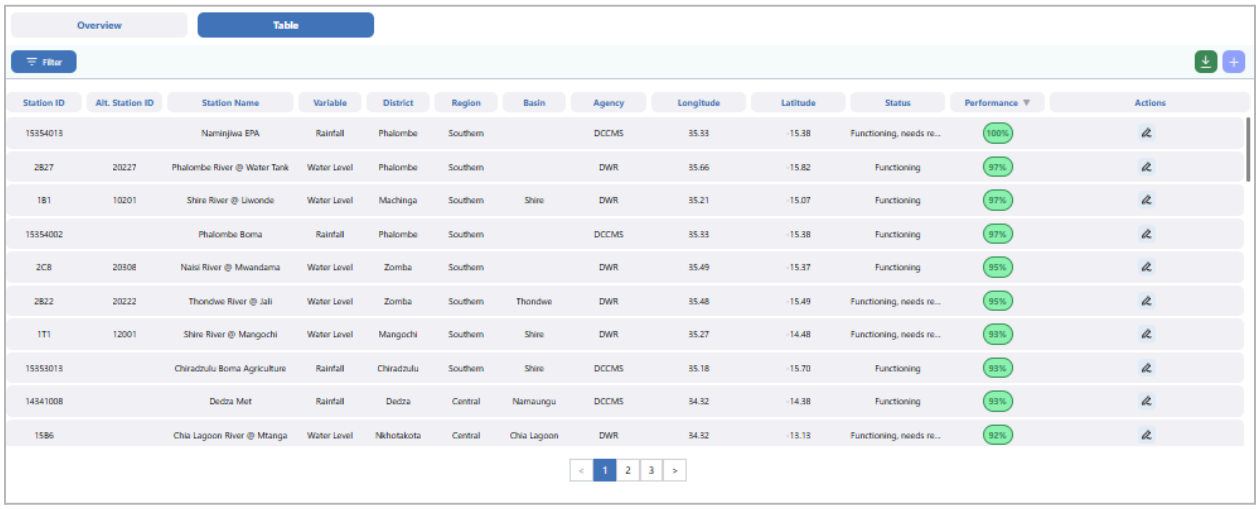
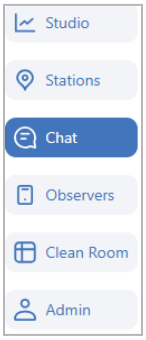


Figure 21. Station table

3.6. Chat

3.6.1. Purpose

The **Chat** app is your **communication portal.** Its core function is to allow government staff, software users and administrators (from central to district levels) to communicate with the manual Gauge Readers and Observers, as well as synoptic Meteorologists who are collecting observation data, as well as managing the monitoring stations.



Because the software allows any user to connect by sending a free SMS to 3067 (SMS starting “WS”), or WhatsApp message, you can also establish roles for people that are central to hydromet operations - such as district officers.

The **value of the Chat App** is that you can:

- See the original, unedited observation data sent by Observers.
- See and correspond to any message from Observers.
- See the Observer performance and go directly to the station view.
- Send individual and bulk messages - which is useful when, for example:
    - There are cyclones or imminent weather extremes which can be unsafe or important to monitor.
    - Sending code words for different flooding conditions that cannot be measured numerically.
    - Do surveys of station equipment or similar.
    - Following up with Gauge Readers and Observers who may not be sending observations as the station monitoring performance drops below WMO standards.
    - Send reminders about clearing vegetation and sediment as part of maintaining monitoring standards.

3.6.2. Direct Messages

On the left-hand side, the list of users connected to the system are shown by order of the latest message received. You can **search** for a name, station name and station ID number.

When you click on a user, the communication with that person will appear in the center. Here you can **send and receive messages directly**.

On the right-hand side, you will see **station performance** where the Gauge Reader/Observer works. You can also **edit her/his profile** (edit icon) or go directly to the **station data** in the Station app.

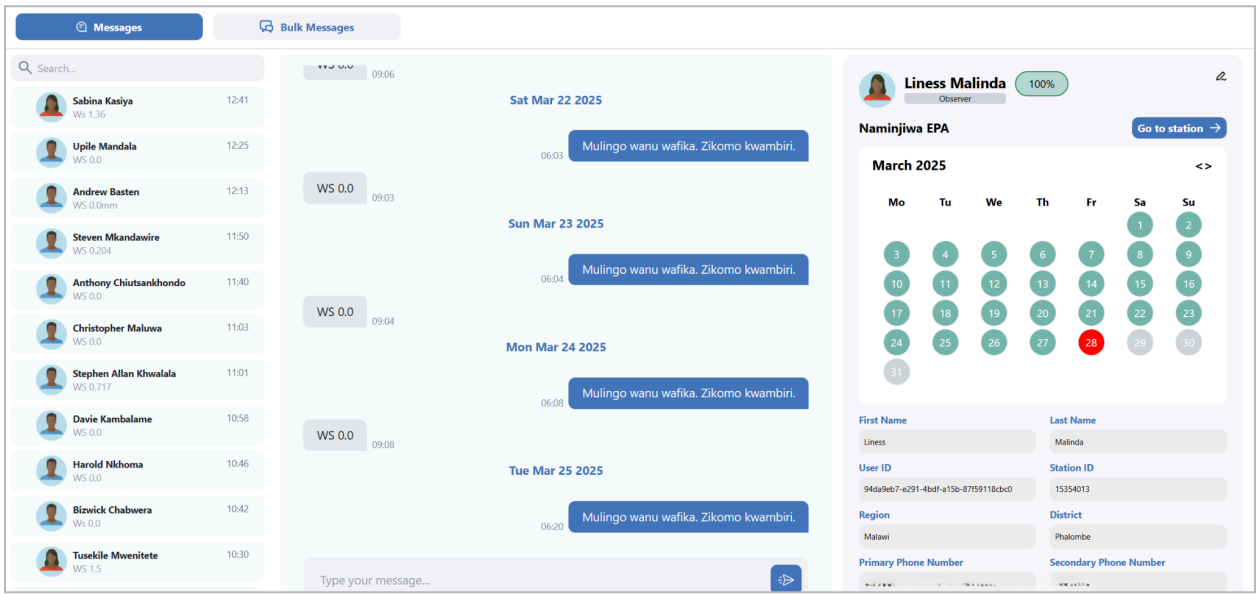


Figure 22. Chat App with searchable users, direct communication and user performance profile

3.6.3. Bulk Messages

The second tab in the Chat app is for **bulk messages**. This allows you to communicate, **one-way,** to a group of Gauge Readers, Observers or users in the system.

Figure 23 below illustrates an example of a bulk message, one containing a **warning** and one requesting feedback through a **survey** sent out before and after Cyclone Jude in March 2025.

The layout is similar to direct messages, but with **message groups** created shown on the left-hand side, the **message history** shown in the center, and list of **group members** shown on the right.

In list of group members, you can:

- **Chat directly** with a member.
- **Remove a member** from the group (edit icon).
- **Delete** the message group.

To **create a Message Group**, press the icon on the top right hand corner.

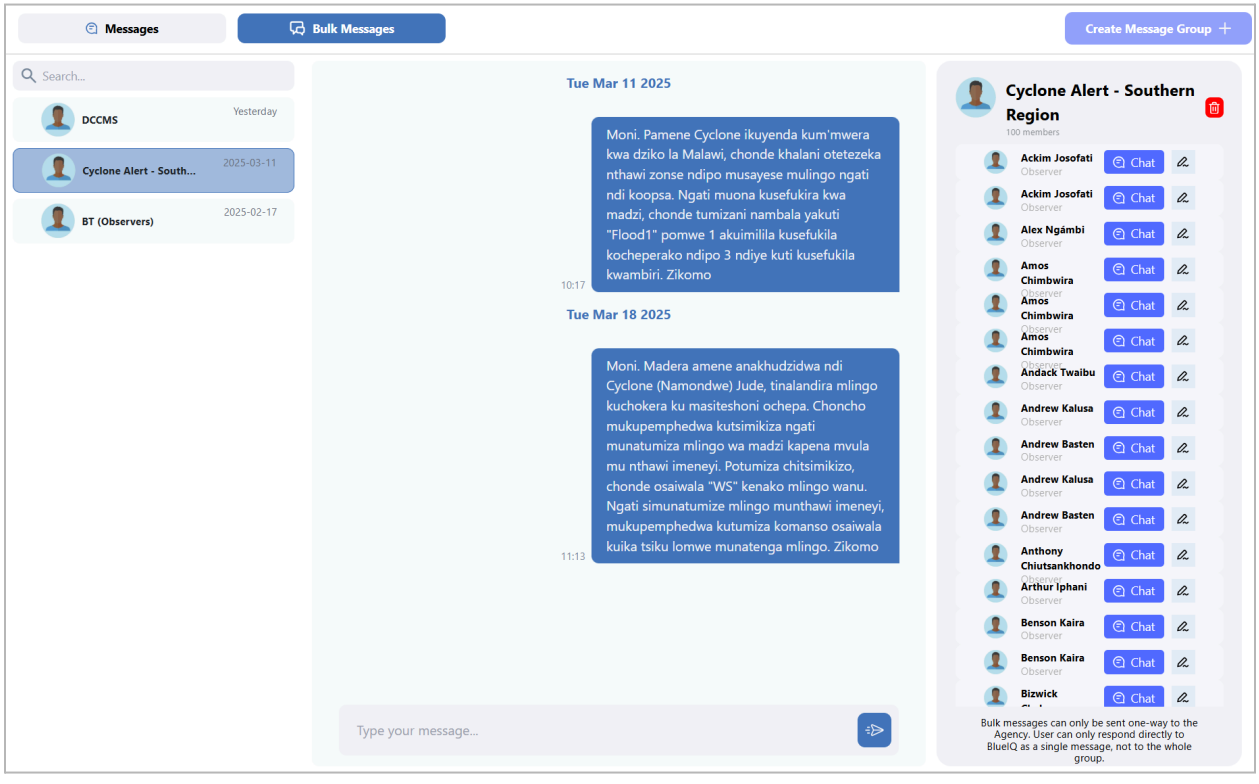


Figure 23. Bulk message interface for sending a broadcast to tailored group

In the **Create Message Group** form, you need to give the group a name and you can filter it by district, basin, and role. To tailor the group for certain individuals, you can remove the users.

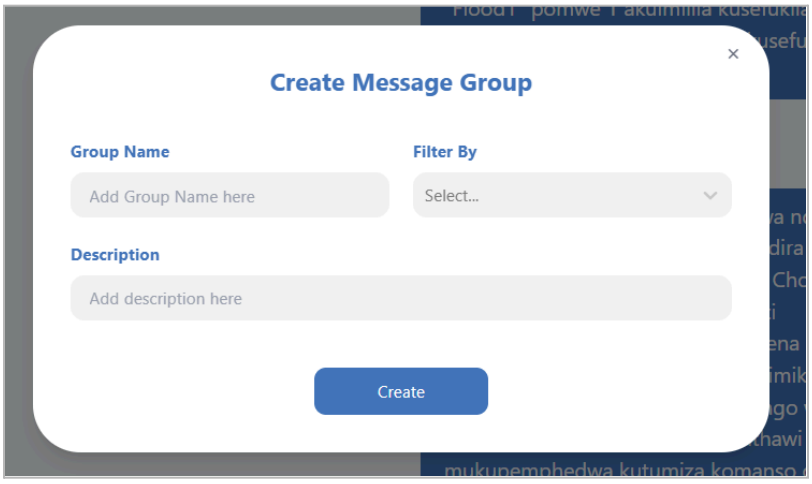
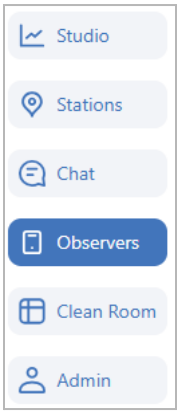


Figure 24. Creating a Message Group form

3.7. Observers

3.7.1. Purpose



The **Observers** app is the place where you get an overview and can individually **manage, edit, delete and download information** on Gauge Readers, Observers and Meteorologists, see and sort their **performance,** and go directly to **Chat**. This includes past and current Observers sending observations.

In the UNEP CTCN project, and in pilots done by DWR and DCCMS with Water in Sight Ltd of Sweden (supported by the Swedish Innovation Agency, Vinnova), management and protection of personal information has been **GDPR compliant** (see Annex E).

Figure 25. Observer overview

3.7.2. Managing Observer Information

A person is connected to the system **only when s/he sends a free SMS or WhatsApp message**.

The new person appears as an **"Unknown Observer".**

At the stage of training and deployment, it is therefore important to a) take note of the Gauge Reader/Observer's phone number, name, station ID, and station name; or b) communicate back using the Chat app to confirm who the unknown observer is and which station s/he is responsible for.

Figure 26 shows the Observer information that can be recorded, and is a way to **provide aggregate system insights** on all Observers - such as gender, age, travel time to stations etc.

Connecting the Observer to a station name is the most important part of recording an Observer. This depends, however, on the station being added to the system first (section 3.5.2). This ensures that the observation data from the Observer is representative of the correct station.

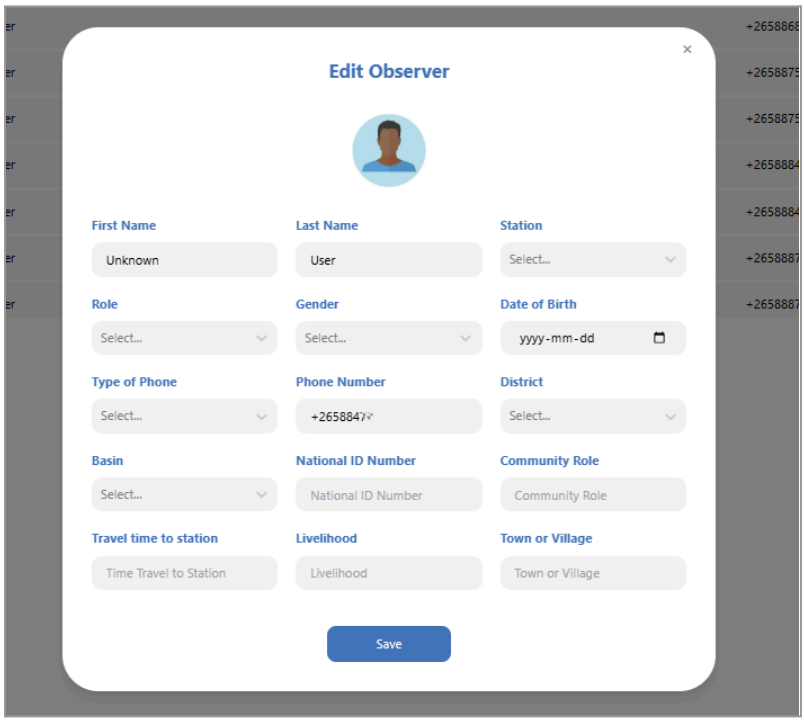
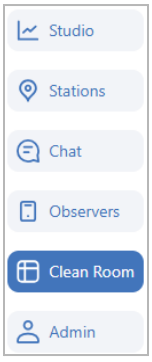


Figure 26. Edit Observer form

3.8. Clean Room



3.8.1. Purpose

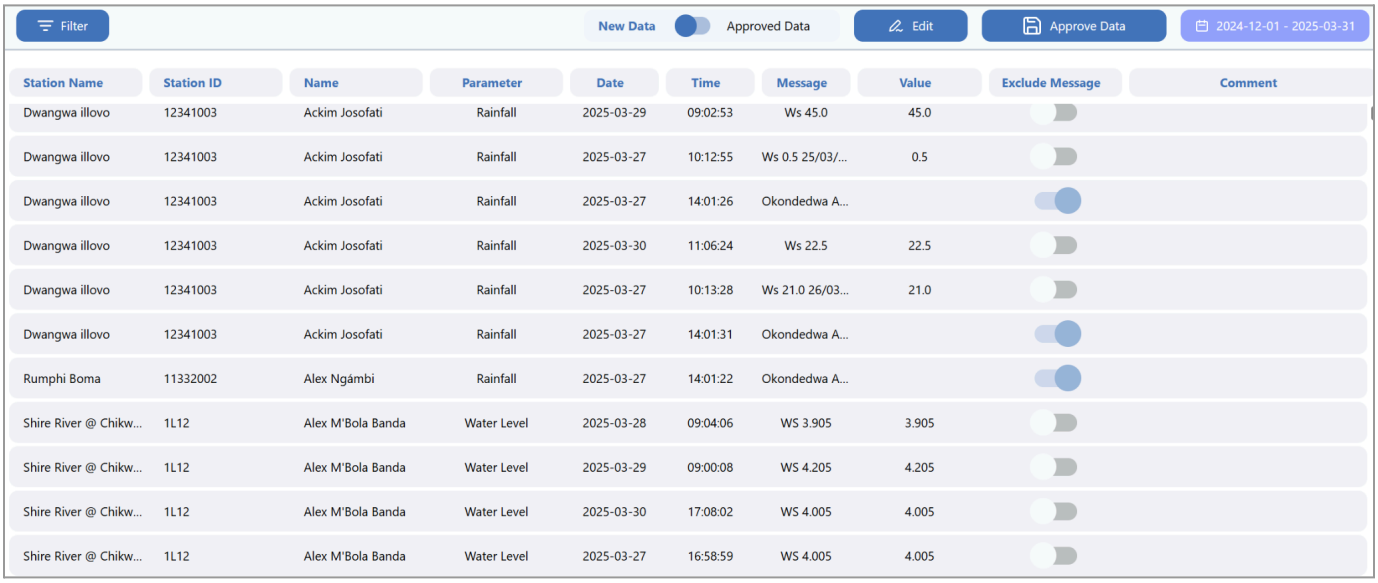
The **Clean Room** is an app built for system owners, administrators, and editors to manage observation **outlier data**.

Managing the outlier data improves the quality of the time-series, allows old observations to be recorded (e.g., when there are network outages), and captures observation data that otherwise could be lost.

3.8.2. How to clean outlier data

The steps to edit and clean outlier data are:

1. Press the toggle to show "**new data**" (as shown in figure 27, upper bar). Please note:
    a. The table automatically excludes outlier data or text communication (AI-generated).
    b. The value transferred from the raw message is automatically cleaned (AI-generated).
2. Press the **Edit button** to change directly in the table on the screen:
    a. Edit the variable, date and time stamp.
    b. Edit the value.
    c. Enter a note as a comment on the change needed.
3. The Edit button now shows "**Save**". Press save to change your edits.
4. When you are done, press the "**Approve Data**" button on the right-hand side once the data is corrected and outliers manually excluded.



Station Name	Station ID	Name	Parameter	Date	Time	Message	Value	Exclude Message	Comment
Dwangwa illovo	12341003	Ackim Josofati	Rainfall	2025-03-29	09:02:53	Ws 45.0	45.0		
Dwangwa illovo	12341003	Ackim Josofati	Rainfall	2025-03-27	10:12:55	Ws 0.5 25/03/...	0.5		
Dwangwa illovo	12341003	Ackim Josofati	Rainfall	2025-03-27	14:01:26	Okondedwa A...			
Dwangwa illovo	12341003	Ackim Josofati	Rainfall	2025-03-30	11:06:24	Ws 22.5	22.5		
Dwangwa illovo	12341003	Ackim Josofati	Rainfall	2025-03-27	10:13:28	Ws 21.0 26/03...	21.0		
Dwangwa illovo	12341003	Ackim Josofati	Rainfall	2025-03-27	14:01:31	Okondedwa A...			
Rumphi Boma	11332002	Alex Ngámbi	Rainfall	2025-03-27	14:01:22	Okondedwa A...			
Shire River @ Chikw...	1L12	Alex M'Bola Banda	Water Level	2025-03-28	09:04:06	WS 3.905	3.905		
Shire River @ Chikw...	1L12	Alex M'Bola Banda	Water Level	2025-03-29	09:00:08	WS 4.205	4.205		
Shire River @ Chikw...	1L12	Alex M'Bola Banda	Water Level	2025-03-30	17:08:02	WS 4.005	4.005		
Shire River @ Chikw...	1L12	Alex M'Bola Banda	Water Level	2025-03-27	16:58:59	WS 4.005	4.005		

Figure 27. Clean Room dashboard

3.8.3. Example of editing data

Below you can see an example of editing data points for 1) register a late observation data entry (figure 28) and 2) remove repeated observation data submissions (figure 29).

Registering late entry of observation

Step 1. Press the toggle to "**New Data**"

Step 2. Press the "**Edit**" button (the edit button changes to "Save" as shown in the second image).

Step 3. From the message received, the observation data "21.0" is automatically shown as the Value. Edit the dates from "2025-03-27" to "2025-03-26", and time from "10:13:28" to "09:00:00" (the WMO standard for rainfall observation); as well as enter a comment "Late entry" (third and fourth image).

Step 4. The edits will automatically save, but when edits are completed, press the "**Save**" button.

Step 5. When your edits are complete and the data shall move to the system, press "**Approve Data**".

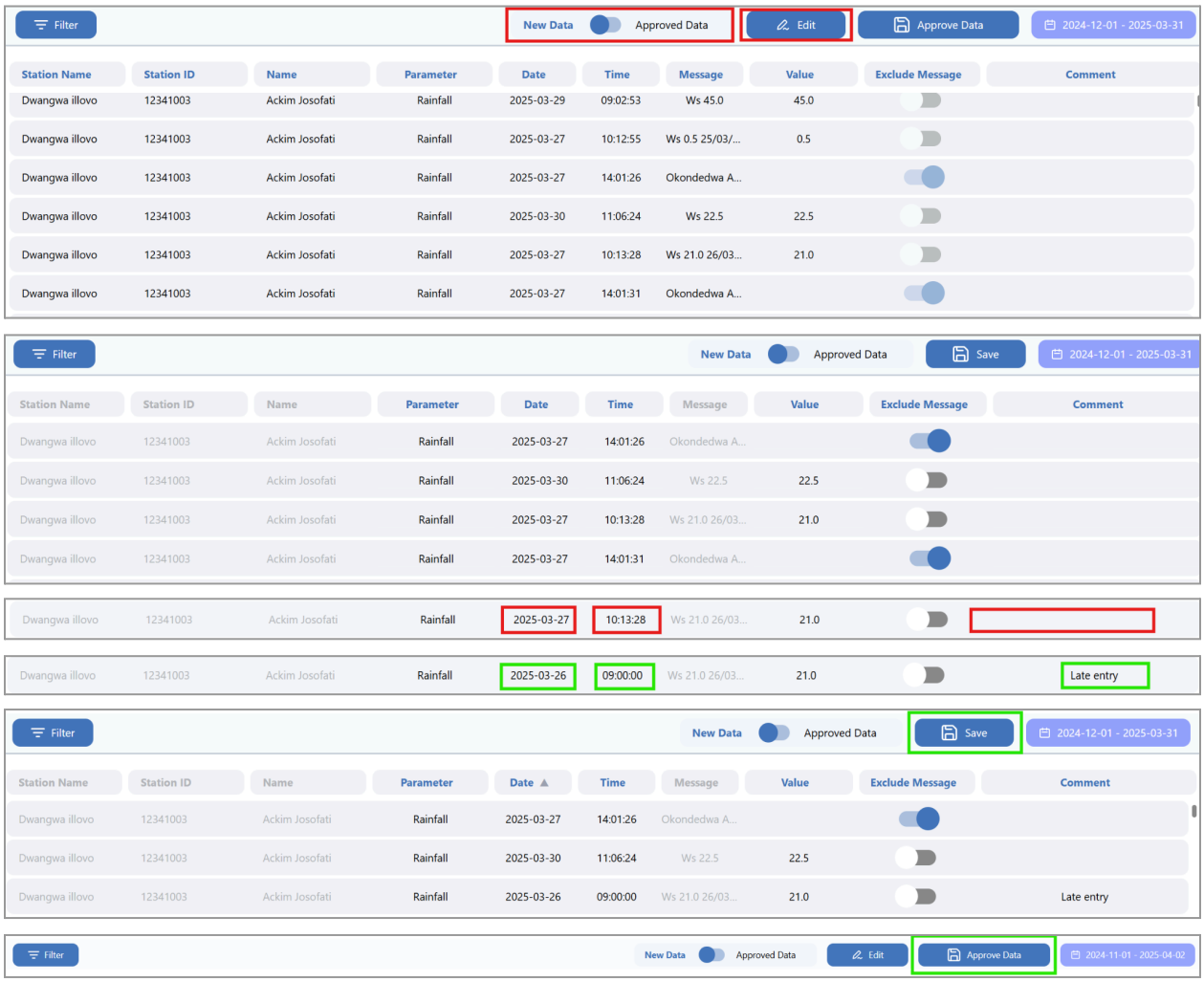


Figure 28. Example: Registering late submissions of observation data

Removing repeated observation data

Step 1. Press the toggle to "**New Data**"

Step 2. Press the "**Edit**" button (the edit button changes to "Save" as shown in the second image).

Step 3. With the repeated data received, toggle the data to be excluded, enter a comment "Repeat" (image below).

Step 4. The edits will automatically save, but to move to the next step, press the "**Save**" button.

Step 5. When your edits are complete and the data shall move to the system, press "**Approve Data**".

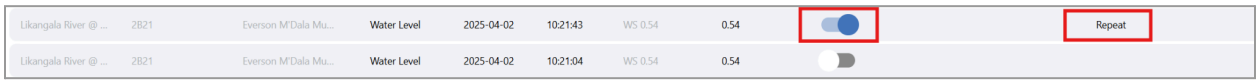
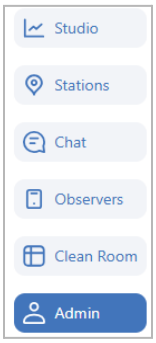


Figure 29. Example: Removing repeated observation

3.9. Admin

3.9.1. Purpose



The **Admin** app is the tool that allows hydro-met organisations to implement an account and access administration and management system.

The user **account and access system** is important for managing who can access the observation data and what they can do with it. It helps protect sensitive information by ensuring only authorised users have the appropriate permissions and access to the different parts of the software.

This strengthens **data security** but also supports compliance with regulations like GDPR helps maintain control and accountability within the platform.

3.9.2. System Access Management Profiles

A user can be assigned three different roles:

- **Owners** have full control over all aspects of the platform.
- **Editors** can use the clean room to fix data outliers, edit information on stations and Observers, but cannot delete any information.
- **Viewers** can only view data and download observation and station data, but not edit or delete any information nor download information on Observers.

To **change a user's access profile**, press the edit icon to the right hand of the row for each user to allocate a new role or delete the user.

To **add a user**, press the add user button in the upper right-hand corner and fill the form.

Figure 30. Admin page

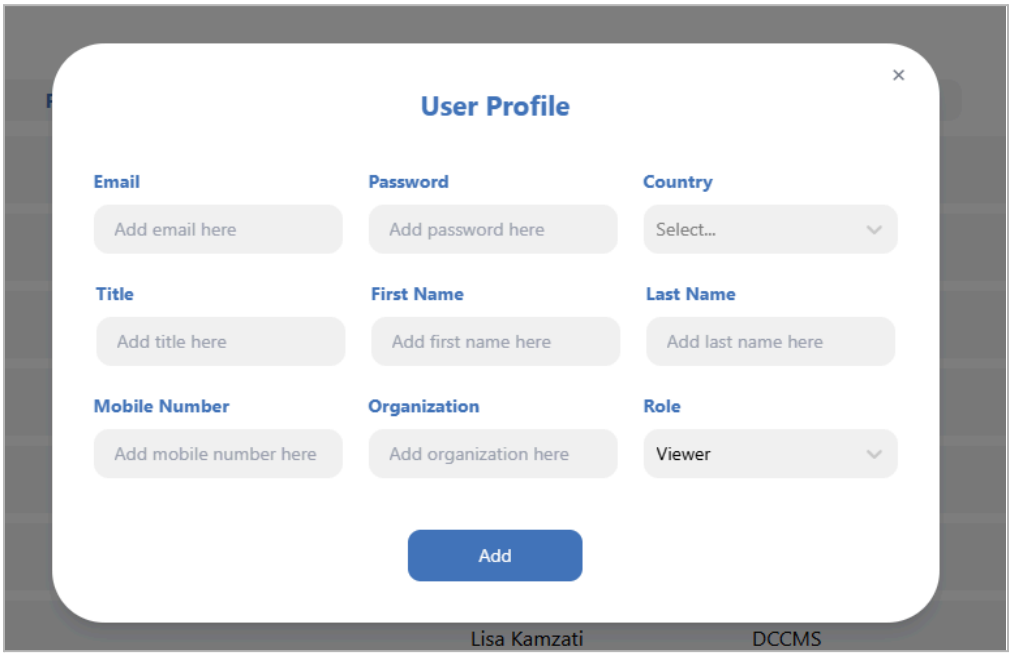


Figure 31. Add platform user form

4. BlueIQ Software: Administrator Guide

4.1. Software Design and Cloud Computing

4.1.1. Design logic

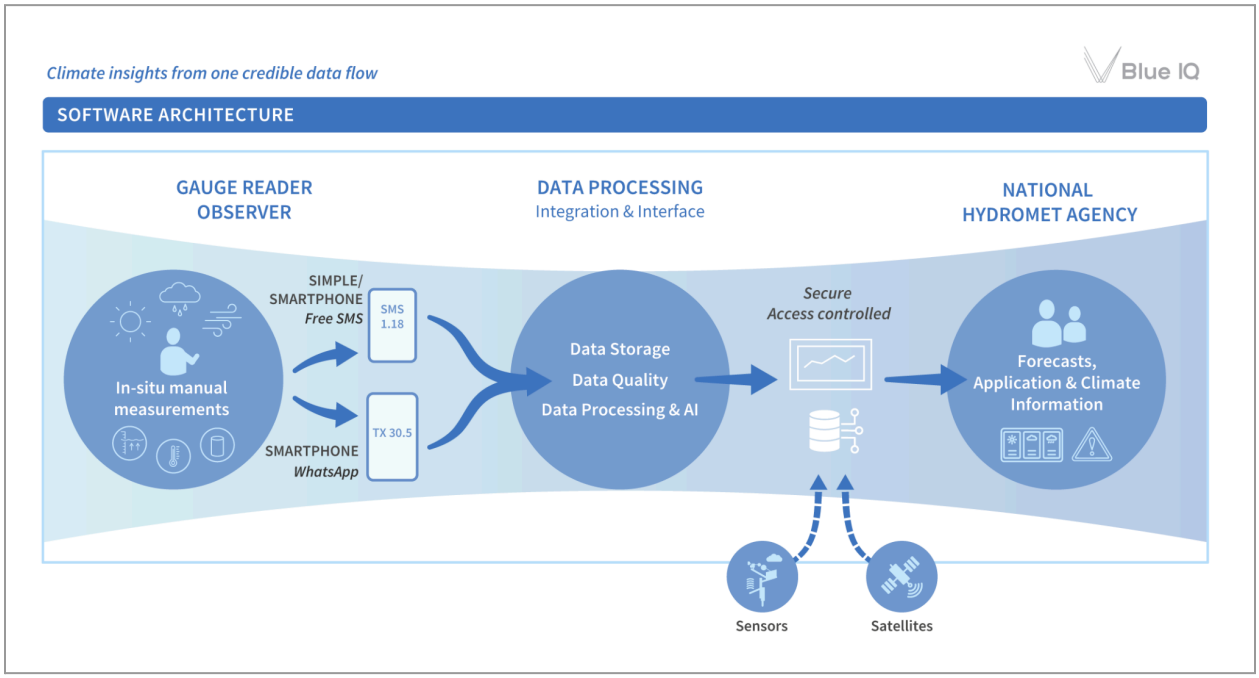


Figure 32. UNEP CTCN Technology design logic and architecture

4.1.2. Mobile communication technologies

Mobile aggregator services

Gauge Readers and Observers send, at no cost to them individually, SMS with their observation measurement to the phone number "3067".

They receive an automated confirmation SMS response.

This mobile communication technology is made possible with a "shared shortcode service" (also called "2-way SMS"). In the BlueIQ software and the UNEP CTCN project, the shortcode is provided by the supplier Africa's Talking (Kenya).

The shared shortcode service consists of two functions, one is monthly maintenance and the second is a SMS-wallet from which the cost of the SMS are drawn down from.

The API gateways from SMS and WhatsAPP have been built to ensure encrypted, secure and real time transmission of the data into the data management system.

WhatsApp gateway API is set up to receive observation data from users who prefer and can use WhatsApp, images and geolocations.

Mobile payment services

Supporting and sustaining the engagement of hydrological Gauge Readers working for DWR/NWRA required monthly financial remuneration for the work performed - compared to rainfall Observers and Meteorologists who are on government salary.

Gauge Readers are, on the other hand, not employed by the government but rather act as "volunteer" with the right to financial honorariums (although this may change in the future).

To mimic the government honorarium policy, the UNEP CTCN project used mobile payment services to provide timely and transparent compensation to Gauge Readers on a monthly basis and at the agreed government amount (i.e., MWK 60,000 or approximately USD 35.per month).

Payments to Gauge Readers, in the UNEP CTCN project, were made through Airtel Money and Mpamba (TNM). These bulk payment services ensured that Gauge Readers received their allowances regardless of location, including those in remote rural areas. Payments covered the daily observation submissions and maintenance of the station environment (sedimentation and vegetation).

The use of mobile money services reduced administrative burdens, improved efficiency, and enhanced accountability—particularly when paired with signed Terms of Reference, identity verification, and monthly performance tracking through the BlueIQ system.

The Airtel Money and Mpamba services fall under the "bulk payment" services category and carry additional pay-out fees (adjusted by amount) and administration fees (approximately 3%).

4.1.3. Cloud Computing

The following cloud computing services from Microsoft are among the input services applied to enable the UNEP CTCN supported software technology:

- Azure Buckets for images.
- Static Hosting for Front End (FE) website.
- ACR for storing runnable images.
- Azure Keyvault for storing credentials.
- Azure Functions to run some routines.
- Github actions for CICD.
- FastAPI for the Back End (BE).
- ACA to run the BE.
- Azure Postgres as database.
- Azure load balancer to handle the load across instances.
- Azure monitor for logs.

- Azure AI Studio.
- Azure OpenAI for chatGPT.
- Terraform for IAC.
- Azure Active Directory.
- Mongo for raw observation messages.

4.2. APIs

4.2.1. Purpose

The BlueIQ cloud-based software has been developed to support data sharing and interoperability between government systems as per the UNEP CTCN project response plan. APIs (Application Programming Interfaces) are a key function enabling this. APIs allow other authorised systems - such as databases or software platforms of the Department of Climate Change and Meteorological Services (DCCMS), the Department of Water Resources (DWR, and the National Water Resources Authority (NWRA) - to connect, access and retrieve observation data automatically.

This makes data integration more efficient and less reliant on manual downloads and uploads, and can be particularly relevant in Malawi for a forthcoming National Water Information Management System, and/or the national Flood and Drought Forecasting system, ODSS.

The APIs built into BlueIQ can be used to:

- Access station observation data (e.g., rainfall, water level, temperature, wind, humidity).
- Access station metadata (e.g., station name, location, performance, type of equipment).
- Retrieve datasets based on filter selections (e.g., region, variable, date range).
- Automate uploads to existing forecasting or climate information systems.

4.2.2. API keys

To protect the integrity and security of the government's data, access via APIs is controlled through API keys and authentication tokens.

An API key is a unique code, similar to a password, that identifies who is making a request to the BlueIQ system. It allows the system to track, limit, or restrict access depending on the assigned permissions.

An authentication token is a time-bound digital token that verifies the identity of the user or system making the request. Tokens are often generated after a user logs in or authenticates using an API key, and they expire after a set period of time (e.g., 1 hour).

API keys and tokens serve four critical functions: Identify the system or user making the request, authenticate the request as coming from a trusted source; authorise access to specific types of data based on user roles (e.g., rainfall data only, or access to station metadata); log and monitor API usage to track system health, detect unusual access, or enforce usage limits.

This ensures only approved users or applications can interact with the BlueIQ system and helps maintain compliance with data governance and privacy standards (e.g., GDPR).

To implement the API keys and authentication tokens:

- **Request an API key** from the system administrator or service provider (either government agency contact or tech@waterinsight.se)
- **Assign role-based access** to the API key, determining what level of data can be accessed (e.g., Viewer, Editor, Owner—see Admin app section 3.9).
- **Distribute the key** securely to the intended user or software system. Never share API keys over insecure channels.
- **Use the API key** in your HTTP request headers when accessing BlueIQ's API endpoints, for example:

```
Authorization: Bearer <your_api_token>
```

- **For systems requiring tokens**, users may first call an authentication endpoint (e.g., /auth/login) with their credentials and API key to receive a time-limited token. This token is then used for all subsequent API requests.
- **Rotate or deactivate keys** regularly for security, especially if access is no longer needed or if credentials are compromised.
- **Monitor API usage using** BlueIQ's admin tools or API logs to ensure compliance and troubleshoot issues.

For more technical documentation, API structure, and endpoints, please contact designated technical administrator or tech@waterinsight.se.

4.3. Maintenance

4.3.1. Purpose

The BlueIQ software is hosted in the cloud to ensure high performance, scalability, security, and ease of access for users across Malawi. Cloud computing enables DCCMS, DWR and NWRA to run its software and ensure it functions reliably 24/7, handle large volumes of data, and provide real-time insights from across the country.

The system architecture is built on Microsoft Azure using a modular backend that integrates data collection, database management, security, and machine learning capabilities (e.g., ChatGPT). The backend includes mobile message services (free SMS and WhatsApp), data pipelines, and a fast API server for handling requests.

Regular backend maintenance is essential to:

- Ensure uptime and smooth performance.
- Apply software updates and patches.
- Secure data and user access credentials.
- Monitor logs for system health.
- Manage storage (databases, images, raw data).
- Optimise services used in the platform (API speed, dashboard responses, data processing routines).

4.3.2. Maintenance scope

To maintain the cloud and backend services effectively, administrators and technical partners should perform the following routine steps:

- System health and monitoring
    - Use Azure Monitor to track logs, error messages, and usage patterns.
    - Review service uptime metrics and ensure critical services (API, database, frontend) are active.
    - Check alerts for failed deployments, connection issues, or security breaches.
- Data and storage management
    - Monitor Azure Postgres database for size limits and performance.
    - Clean up unused entries or old logs from MongoDB (used for raw observation messages).
    - Backup all critical data on a weekly or monthly basis.
- Software and API deployment
    - Use GitHub Actions for automated deployments (CI/CD) when updates are pushed.
    - Manage and test Azure Functions and Terraform infrastructure-as-code (IaC) for consistency.

    - Update container images via Azure Container Registry (ACR) and deploy via Azure Container Apps (ACA).
    - Restart backend services using Azure tools when needed for performance or after updates.
- Credential and access security
    - Use Azure Key Vault to store secrets, credentials, and API keys securely.
    - Review who has admin or developer access via Azure Active Directory.
    - Rotate credentials regularly to prevent unauthorised access.
- Routine maintenance
    - Check that SMS and WhatsApp gateway services are active and have enough credit or operational balance (e.g., via Africa's Talking).
    - Review integration with third-party systems and data ingestion from DWR and DCCMS databases.
    - Test frontend performance and fix bugs reported by users.
- AI and analytics support (Optional)
    - Monitor usage of Azure AI Studio and OpenAI APIs used in the Chat app and advanced data analysis tools.
    - Ensure GPT models are working efficiently and within budget constraints if applicable.

4.4. Modelling, Forecasting & Climate Information for Resilience

This section outlines how BlueIQ can support national and regional resilience by linking monitoring data with tools for modelling, forecasting, and climate services.

BlueIQ enables integration with climate models, hydrological forecasting tools, and national alert systems by:

- Making manual observation data (collected via SMS or WhatsApp) available in formats compatible with DCCMS, DWR, and NWRA modelling systems.
- Enabling export of validated time-series data for use in flood forecasting, drought monitoring, and seasonal outlooks.
- Allowing APIs to feed real-time or near real-time data into data assimilation systems for improved accuracy.
- Creating a shared platform for Meteorologists, hydrologists, and data analysts to access and visualise trends that inform early warning systems and community resilience planning.

In the future, satellite data integration (e.g., NASA SWOT) and automation of station data uploads will further improve the richness of modelling inputs.

Administrators should ensure API access is configured correctly, the Clean Room data quality is maintained, and filters are well understood—so that data exports into models are consistent and reliable.[2]

[2] Note: during the UNEP CTCN project, API keys and authentication tokens were provided to the government to assist in the integration of observations into respective agencies' modelling and forecasting processes and data management systems. Equally, the project sought to integrate data from sensors through their respective APIs.

5. Countrywide Implementation and Partners

As part of the UNEP CTCN project, a business model for countrywide adoption over 15 years was identified. Through a partnership model (figure 33), the Government of Malawi takes on the role of regulator, policy setter and enabler, ensuring the technology system aligns with national development priorities and the public service delivery standards of DWR, NWRA, and DCCMS.

Specific government roles include ensuring data governance, overseeing compliance with regulatory standards, and managing stakeholder engagement to align the system with broader hydro-meteorological and environmental goals. Using the technology, the government expands its capacity to deploy, train and maintain the system - made possible through agile software solutions such as BluelQ.

Private sector partners and suppliers assume responsibilities for externally maintaining the software technology system, fixing bugs and ensuring that the government access forefront solutions that are otherwise difficult and expensive to procure (e.g., AI capabilities). This includes providing technical expertise and ensuring the system's operational efficiency. Private partners can handle user support, training, offer ongoing technical support and upgrade the system in response to changing needs and technological advancements. Suppliers play a key role in ensuring that the equipment and other physical assets are durable, meet industry standards and are cost-effectively priced.

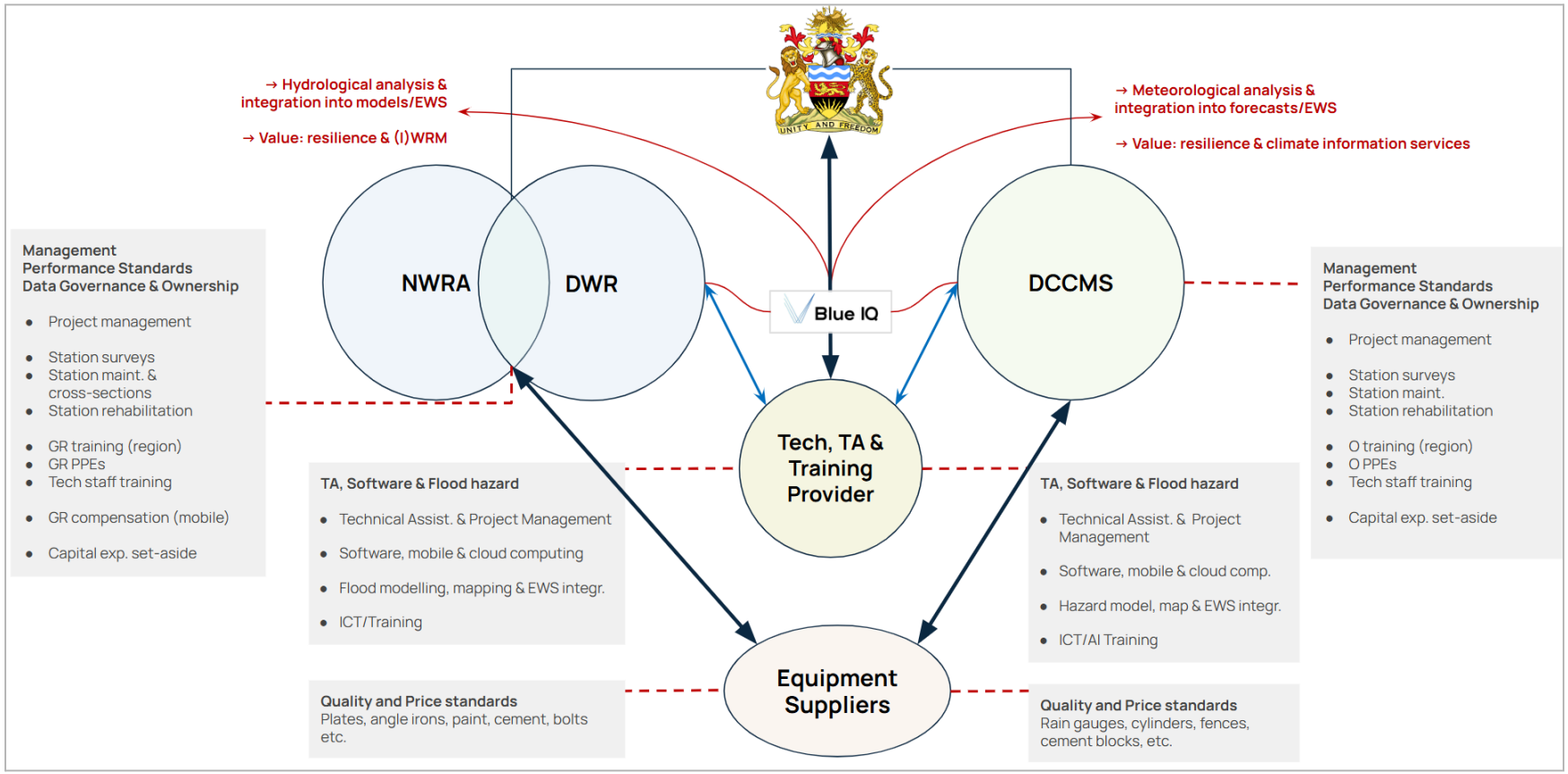


Figure 33. Countrywide implementation model

6. Project Context

6.1. Project brief

Using simple mobile technologies to scale up digital collection & processing of climate observations for adaptation actions in Malawi Project

On January 31, 2024, the Climate Technology Center and Network (CTCN) of the United Nations Environment Programme (UNEP) granted funding for the Technical Assistance request by the UNFCCC National Designated Entity of Malawi, the National Commission for Science and Technology, on behalf of the Department of Water Resources and the Department of Climate Change and Meteorological Services.

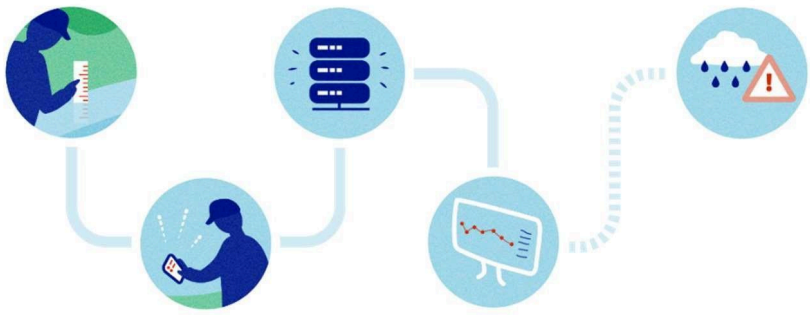
Through a competitive process, UNEP CTCN awarded the TA contract to an association of Water in Sight Ltd of Sweden and T-Notch Consulting Ltd of Malawi. Project implementation was 15 months (February 2024 to April 2025), and the contract was financed by the Adaptation Fund for Climate Innovation Acceleration (AFCIA) administered by UNEP.

The Project objective was to strengthen DCCMS and DWR's capacity and confidence in using simple mobile technologies and integrating these and the related data not only in core forecasting and warning functions but also in impact modelling and adaptation by synergistically relating the data to critical time series of climate projections.

The Project consisted of six outputs/components:

1. Development of Communication Documents
2. Steering Committee/Working Group, Stakeholder mapping, Inception Meeting
3. Diagnosis and pre-feasibility of using simple mobile technologies to comprehensively collect and digitise weather and climate observations for impact modelling, adaptation, and disaster risk management.
4. Piloting the use of mobile phone technologies to comprehensively collect and digitise observations.
5. Designing a financial mechanism to make technology concepts sustainable in the context of Malawi.
6. Train future users, administrators, and beneficiaries of the system.

The Project was a unique opportunity to build on past prototyping and testing done by DWR and DCCMS with Water in Sight Ltd countrywide with the support of the Swedish Innovation Agency, Vinnova 2021-2023. At the heart of the TA, however, was the committed engagement with department staff through a Working Group, regular workshops and training, integration of observation data across platforms and into analytical tools, as well as identification of long-term sustainable business model and financing strategy.



6.2. Deliverable

As part of the project "Using simple mobile technologies to scale up digital collection & processing of climate observation for adaptation actions in Malawi", supported by UNEP CTCN, this Manual presents the results from Activity 6.1 Redact a detailed manual on the use and maintenance of the technology (Output 6. Detailed manual digital & printed).

The associated deliverables in Output 6 are:

- **Deliverable 6.1 Detailed Manual**
- Deliverable 6.2.a Minutes: capacity building workshop with future users
- Deliverable 6.2.b Minutes: capacity building workshop with future administrators
- Deliverable 6.2.c Minutes: capacity building workshop with civil society

Annex A. Deployment Materials: Water level monitoring stations

A.1 Instructions & Illustrations for Gauge Readers using SMS (water level)

SMS Instructions: Daily Water Level Observation

Please follow this protocol for daily observations at 09h00 and 16h00

Submission of river level observations using free SMS:

- Record the river/lake level measurement at 09h00 and 16h00.
- Send the SMS with the measurement in this order:
    - Type these letters into the SMS: WS
    - Type the reading/measurement after the letters WS
    - Send your SMS to this number: 3067

Example:

- Your measurement is 240 cm
- Send the SMS with this content:
    - WS 2.40
    - Send to: 3067

Please take note of these things:

- Sending the messages (SMS) is for free.
- You will receive a confirmation SMS.
- You must at all times stay safe, and do NOT take measurements if there is a risk to your health or life, and it is too dangerous to go near the gauge plate river.

Katumizidwe ka tsiku ndi tsiku ka Mulingo wa madzi a Mtsinje pa SMS

Chonde tsatirani ndondomekoyi tsiku

lililonse nthawi ya 09h00 mmawa ndi 16h00 madzulo

Kutumiza mulingo wa madzi amtsinje pogwiritsa ntchito ma SMS:

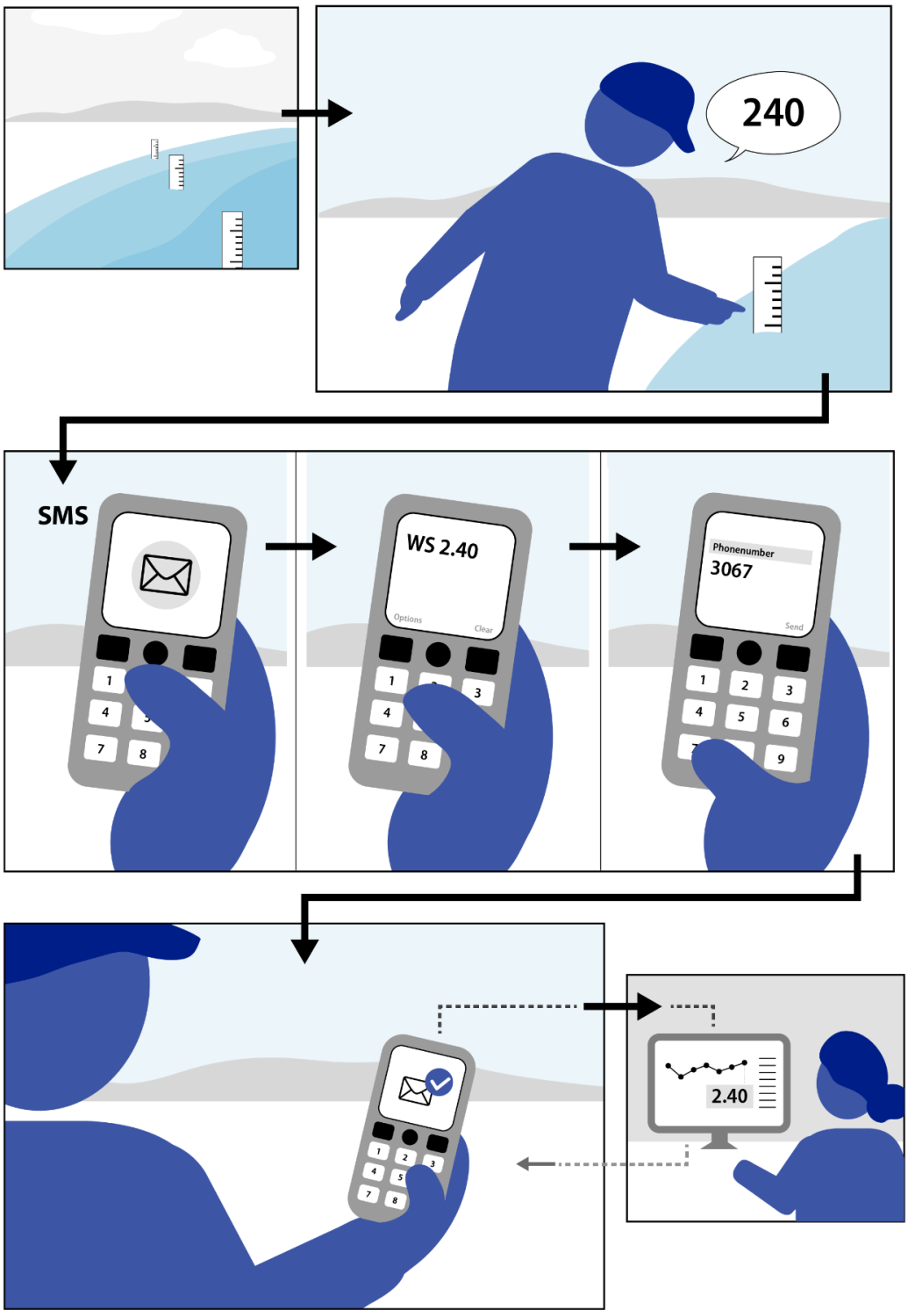
- Lembani kuchuluka kwa mitsinje tsiku lililonse nthawi ya 09h00 mmawa ndi 16h00 madzulo.
- Tumizani SMS ya mulingo wa mtsinje motere:
    - Lembani mawu awa mu SMS yanu: WS
    - Kenaka lembani mulingo wanu motsatizana ndi mau a WS aja
    - Tumizani SMS yanu ku nambala iyi: 3067

Chitsanzo:

- Ngati mulingo wa mtsinje wanu ndi 240 cm.
- Tumizani SMS motere:
    - WS 2.40
    - Tumizani ku: 3067

Chonde dziwani zinthu izi:

- Kutumiza ma SMS wa ndi kwaulere.
- Mudzalandira SMS yotsimikizira kuti mulingo wanu wafika.
- Mukuyenera kukhala otetezeka nthawi zonse, choncho musatenge mulingo uliwonse ngati pali chiopsezo chapamoyowanu mutati mwapita pafupi ndi mtsinje wa geji, monga chiopsezo chakuvulazidwa ngakhale infa imene.
- Chiongola dzanja chidzapelekedwa molingana ndi ntchito imene mwagwira pa mwezi.


240
SMS
WS 2.40
Options
Clear
Phonenumber
3067
Send
2.40

A.2 Instructions & Illustrations for Gauge Readers using WhatsApp (water level)

WhatsApp Instructions: Daily Water Level Observation

Please follow this protocol for daily observations.

Submission of river/lake level measurement using WhatsApp:

- Record the river/lake level measurement at 09h00 and 16h00.
- Use WhatsApp to send the measurement in this order:
    - Open WhatsApp and contact: +265 994 47 82 15
    - Share your location:
        - press the + or 📎 sign
        - press the location option
        - press share location
    - Enter the measurement as a message and press send.

Example:

- Your measurement is 240 cm.
- Use WhatsApp to send:
    - Your location
    - 2.40

Please take note of these things:

- Using WhatsApp uses very little data for which you will be compensated.
- You will receive a confirmation message in WhatsApp.
- You must at all times stay safe, and do NOT take measurements if there is a risk to your health or life, and it is too dangerous to go near the river.

Katumizidwe ka tsiku ndi tsiku ka mulingo wa mtsinje pa WhatsApp

Chonde tsatirani ndondomekoyi kuti mutumize mulingo wanu tsiku ndi tsiku.

Kutumiza mulingo wa mtsinje pogwiritsa ntchito WhatsApp:

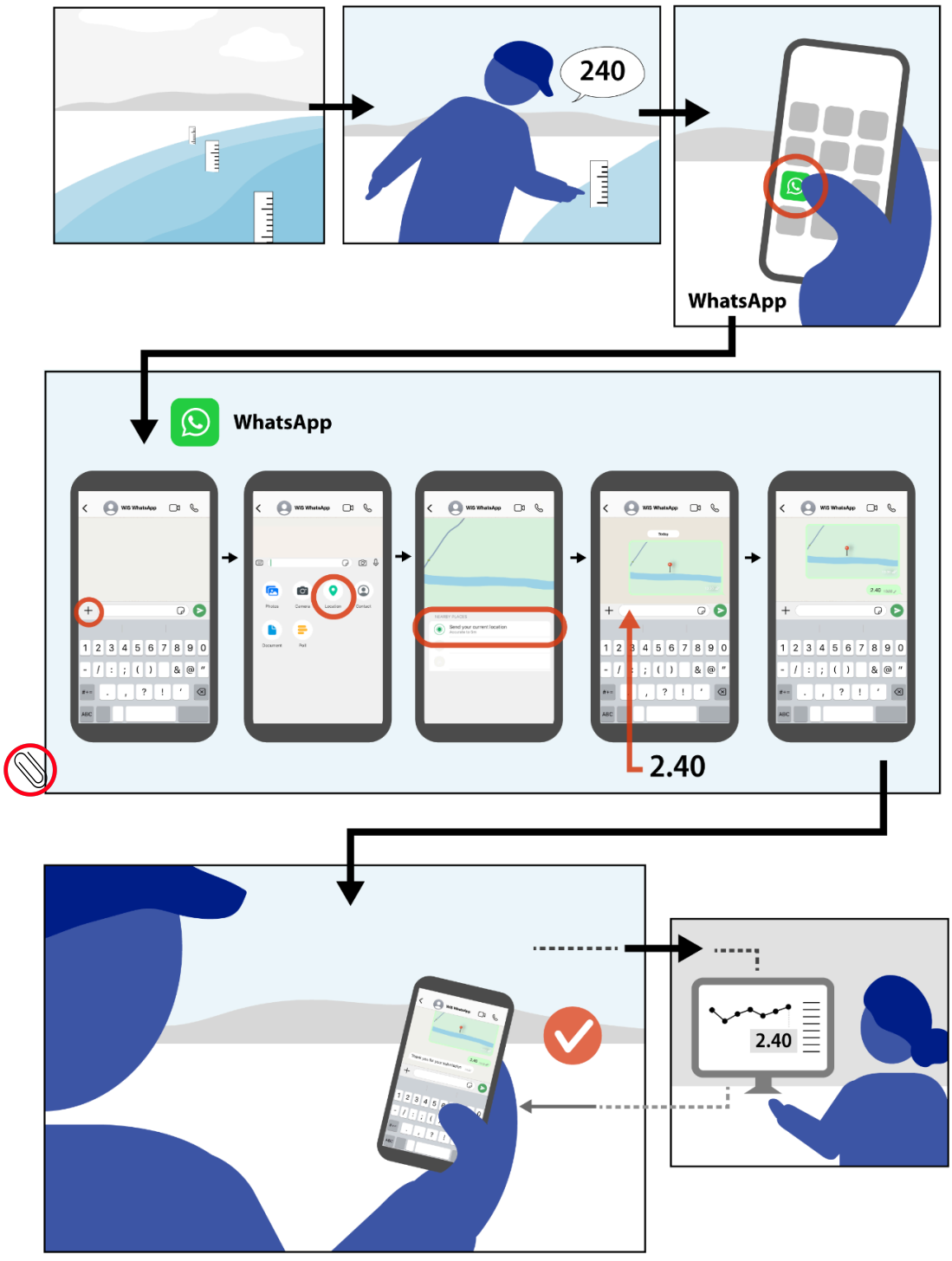
- Lembani kuchuluka kwa mitsinje nthawi ya 09h00 mmawa ndi 16h00 madzulo.
- Gwiritsani ntchito WhatsApp kutumiza muyeso motere:
    - Tsegulani mauthenga a WhatsApp ndikulumikizana ndi nambala iyi: +265 994 47 82 15
    - Tumizani malo omwe muli motere:
        - Sankhani chizindikiro chai + kapena 📎
        - Sankhani mawu olemba location
        - Sindikizani potumizila
    - Mukatero, lembani mulingo ngati meseji ndikusindikiza potumizila.

Chitsanzo:

- Ngati pa geji yanu madzi ali pa 240 cm.
- Gwiritsani ntchito WhatsApp kutumiza mulingowu motere:
    - Malo anu
    - 2.40
    - Sindikizani potumizila

Chonde dziwani zinthu izi:

- Mukatumiza mulingo, mudzalandira uthenga wotsimikizira pa WhatsApp.
- Kugwiritsa ntchito WhatsApp kumagwiritsa ntchito data yocheperako yomwe mudzabwenzeredwa.
- Muyenera kukhala otetezeka nthawi zonse, ndipo musayeze mulingo ngati pali chiopsezo pa moyo wanu, ndipo ngati ndikowopsa kwambiri kuyandikira mtsinje wanu.


240
WhatsApp
WhatsApp
2.40
2.40

A.3 Terms of Reference for Gauge Readers

Gauge Readers

Taking river/lake levels observation measurements for the Government of Malawi

The following are the ToRs agreed upon by the Gauge Reader and the Government of Malawi:

A. The Gauge Reader shall be required to do the following:

- Record the river/lake level observation and send in SMS to 3067 or WhatsApp to +265 994 47 82 15 twice per day for 6 months, DATE to DATE(note: it is very important that you take the measurement at the same times each day, at 09h00 in the morning, and 16h00 in the afternoon every day).
- Work hand in hand with the government for any queries.
- Send messages in times of rapidly rising river levels (floods) or as agreed with government. But ONLY if it is safe to do so for the Gauge Reader.
- If you change your phone number, send a message to 3067 or WhatsApp (+265 994 47 82 15) to inform us of your name and station name.
- Ensure his or her safety and proper keeping of the mobile phone.
- To carry out routine maintenance of the station including clearing the station site as well as the access route, removal of silt and debris around the staff gauges.
- To report any incidents, or concerns that may affect the functioning of the gauges or the integrity of the data being collected there, or any other information in free SMS to 3067.
- To record in the log books the maximum flood gauge heights with approximate time of occurrence. For example, “9.21m at 12.00” or “7.27 m at 10.00pm” or “3.87 m at dawn”.
- Mark the maximum water levels (flood marks by pegging or painting) to facilitate the indirect calculation of peak discharge.
- Play a role in sensitisation of the local communities on the importance of the station.
- Receive payment in accordance with work done in the month and per government policy.
- Render support and/or guidance on any gender sensitive related issues including gender based violence (GBV), please note support from the NGO YONECO (toll free line 5600).

B. The Government / supporting Consulting team shall be required to:

- Render support when needed by the Gauge Reader.
- Clarify and/or respond to queries, and protect any anonymous information shared.

- Make timely mobile payments to the Gauge Readers in accordance with the work done in the month, using the government policy (you will be paid based on the data you send).
- Make timely communications for any updates and other arising matters requiring the Gauge Reader's attention.
- Safely store personal information in accordance with EU GDPR policy.

C. I have received from Government (please mark):

Item	Yes	No
Gum boots		
Rain coat		
Slasher		
Spade		
Simple phone		

Do you agree to work under these conditions? Tick the appropriate box

Yes ☐ No ☐

Gauge Reader's name and signature

_____

(Name written)

_____

(signature)

Government representative name and signature

_____

(Name written)

_____

(signature)

Date:_____

Station ID:_____

Mgwirizano wandondomeko yakagwiridwe ntchito ka Geji Rida

Kutenga mulingo wa mtsinje m'boma la Malawi

Mgwirizano wakagwiridwe ka ntchito kapakati pa Geji Rida (Oyeza madzi kumtsinje) ndi Department ya Water Resources (Ku Boma):

A. Geji Rida adzayenera kuchita zinthu izi:

- Kulemba ndi kutumiza data ya madzi a mu mntsinje kugwiwritsa ntchito njira yama SMS potumiza ku 3067 kapena pa WhatsApp ku +265 994 47 82 15 mmawa ndi madzuzlo a tsiku lililonse kwa miyezi isanu ndi umodzi (6) kumabila mu Septembala (September) 2024 mpaka mu Feburuwale (February) 2025. Chonde dziwani kuti: ndikofunikila kwambiri kuti muzitumiza mulingo wanu tsiku lililonse pa nthawi ya 9.00 koloko mmawa ndi 4.00 koloko madzulo.
- Kugwira ntchito mogwirizana ndi TNotch consulting patakhala zofunikila kufunsa kapena kudziwa.
- Kutumiza milingo munyengo imene mazdi amumtsinje akukwera kwambiri kapena mwadzidzi kapena nthawi ya Ngozi monga kusefukila kwa madzi, pamene mwapepmphedwa kutero ndi ndi Department ya Water Resources, pogwigiritsa ntchito ndondomeko yakatumizidwe ka data panthawi imene kuli chigumula. Koma izi azachita POKHAPOKHA palibe chiopsezo chilichoznse cha moyo wao.
- Mukasintha nambala yanu ya foni, tumizani uthenga ku 3067 kapena WhatsApp (+265 994 47 82 15) kutidziwitsa dzina lanu ndi dzina la siteshoni (station) yanu.
- Onetsetsani chitetezo cha moyo wanu ndikusunga bwino foni yanu yam'manja.
- Kukhala ndi ndondomeko yokonza siteshoni kuphatikizapo malo otengera mulingo komanso njira yofikila ku geji yamadzi (gauging station) komanso, kuchotsa matope ndi zinyalala kuzungulira ma geji ogwira ntchito.
- Kufotokozera zochitika zilizonse, kapena zodetsa nkhawa zomwe zingakhudze kagwiridwe ntchito ka geji kapena umngwiro wa ndondomeko ya data yomwe ikutengedwa pamalopo..
- Kulemba m'mabuku a kaundula wa madzi (log book) muyeso wa kusefukira kwa madzi ndi nthawi yomwe zachitika. Mwachitsanzo, "9.21m pa 12.00" kapena "7.27 m pa 10.00pm" kapena "3.87 m mbandakucha".
- Kuika zizindikiro zakuchuluka kwa madzi (zizindikiro za kusefukira pogoba kapena kupenta) kuti muwonetse kachulukidwe kamadzi osefukilawa.
- Kutenga gawo kapena udindo wodziwitsa anthu za kufunikira kwa malo otengera mulingo wamadzi (gauging station).
- Kulandira malipiro pa ntchito yomwe agwira pa mwezi uliwonse, molingana ndi ndondomeko ya Boma.
- Kupeleka sapoti kapena upangili pa nkhani za jenda (gender) ndi nkhannza zochiltilidwa kwa a Mayi kapena a Bambo. Chonde dziwani kuti mukhoza kupezaso thandizo ku ma bungwe la YONECO poimba nambala yaulere iyi 5600

B. Gulu la Government lidzayenera kutsatila izi:

- Kupeleka chithandizo choyenera chakagwiridwe ka ntchito chomwe chingafunikile ndi a Geji Rida.
- Kutambasulira zofunikila ndikuyankha mafunso kwa Geji Rida.

- Kupeleka malipiro pa ntchito yomwe yagwiridwa pa mwezi uliwonse, munthawi yake ndinso molingana ndi ndondomeko ya Boma. (mudzalipidwa molingana ndi zomwe mwatumiza pa mwezi).
- Kupereka uthenga ofotokozera zinthu zoyenera komaso zofunikila kudziwa mu nthawi yake kwa Geji Rida.
- Kusuunga mosamala mbiri ya Geji Rida molingana ndi mfundo za EU GDPR.

C. Ndalandira kuchokera ku T-Notch ndi Water in Sight zinthu izi (chonde chongani malo oyenera):

Chipangizo	Inde	Ayi
Gambusi		
Chovala chamvula/Rain coat		
Silasha		
Fosholo		
Foni		

Kodi mukuvomera kugwira ntchito mndondomeko imeneyi? Chongani m'bokosi loyenera

Inde ☐ Ayi ☐

Dzina la Gauge Reader ndi siginecha

_____

(Dzina lilembedwe apa)

_____

(siginecha)

Government siginecha

_____

(Dzina lilembedwe apa)

_____

(siginecha)

Tsiku:_____

Station ID:_____

A.4 User registration form: Gauge Readers

First Name			
Last Name			
Phone Number #1			
Phone Number #2			
Phone Number #3			
Type of Phone (circle)	Simple	Feature	Smartphone
Condition of Phone (circle)	Bad	Ok	Good
Operator	Airtel	TNM	
Mobile money	Airtel Money	Mpamba	
Role in Community			
Year of birth or estimate			
Gender (circle)	Male	Female	

District	
Town/Village	
Station ID	
Station name	
Time and method to travel to station	
River basin	
National ID number	
Livelihood/Employment	
Number of members in your household	
Income	

A.5 Station inventory & assessment form: manual water level gauge

Station name and ID number			
Date			
Type of Station			
Condition of Station (circle)	Non-functioning	Functioning but needs repair	Functioning
Station : Open comment & What needs to be done to improve station			
Condition of Gauge Plates (circle)	Non-functioning	Functioning but needs repair	Functioning
How many gauge plates			
Which gauge plates are missing			
Any specific purpose of the station (e.g., flood monitoring)			
Geo-location	Long:	Lat:	
Elevation (m)			
Discharge channel control?	Yes	No	
Does the rating curve need updating?	Yes	No	
Is there an automatic station?	Yes	No	
What kind of automatic station?			
Is it vandalised?	Yes	No	
Is it working?	Yes	No	
Any other comments?			

Annex B. Deployment Materials: Rainfall level monitoring stations

B.1 Instructions & Illustrations for Observers using SMS (rainfall)

SMS Instructions: Daily Rainfall Level Observation

Please follow this protocol for daily observations at 08h00

Submission of Observed rainfall reading:

- Read the rainfall observation measurement at 08h00 am.
- Send an SMS with measurement in this order.
    - Type these letters: WS
    - Type the reading/measurement following the letters WS.
    - Send your SMS to this number: 3067

Example:

If your measurement is 23.4 mm:

- Send the SMS with this content:
    - WS 23.4
    - Send to: 3067

Please take note of these things:

- Sending the messages (SMS) is for free.
- You will receive a confirmation SMS.
- You must at all times stay safe, and do NOT take measurements if there is a risk to your health or life, and it is too dangerous to go near the gauge.

Ndondomeko yakatumizidwe ka mulingo wamvula kugwiritsa ntchito SMS

Chonde tsatirani ndondomeko lyi potumiza mulingo tsiku ndi tsiku nthawi ya 0´8h00 mmawa

Katumizidwe ka mlingo wamvula:

- Werengani mlingo wa mvula pa geji yanu pa 08h00 mmawa.
- Tumizani SMS yamulingo wanu motere.
    - Lembani mau awa: WS
    - Kenako lembani mulingo wanu potsatira mawu aa WS aja.
    - Tumizani SMS yanu ku nambala iyi: 3067

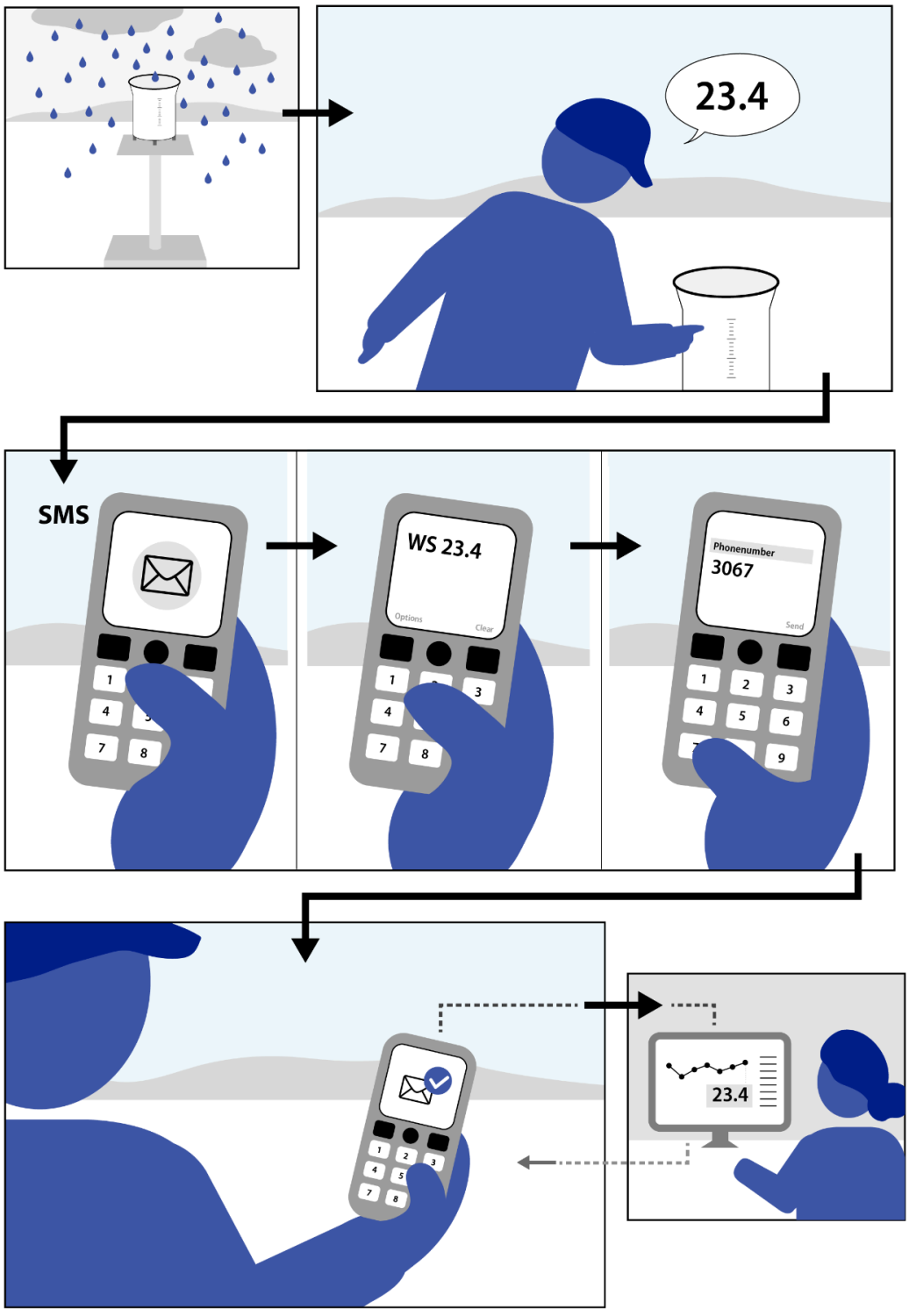
Chitsanzo:

Ngati mlingo wa mvula ndi 23.4 mm:

- Tumizani SMS mu ndondomeko iyi:
    - WS 23.4
    - Tumizani ku: 3067

Chonde dziwani zinthu izi:

- Kutumiza mauthenga (SMS) ndi kwaulere.
- Mudzalandira SMS yotsimikizira kuti sms yanu yafika.
- Muyenera kukhala otetezeka nthawi zonse, ndikupewa kuika moyo wanu pachipsezo posatumiza mulingo ngati nyengo ili yovutitsitsa ndiyoopseza moyo wanu


23.4
SMS
WS 23.4
Options
Clear
Phonenumber
3067
Send
23.4

WhatsApp Instructions: Daily Rainfall Level Observation

Please follow this protocol for daily measurements

Submission of meteorological observations using WhatsApp:

- Record the observations per protocol:
  - Rainfall at 09h00 Local time
- Use WhatsApp to send the measurement in this order:
  - Open WhatsApp and DCCMS contact:+265 994 47 82 15
  - Share your location:
    - press the + or 📎sign
    - press the location option
    - press share location
  - Enter the measurement as a message and press send.

Example:

- If your rainfall measurement is 5 mm:
- Use WhatsApp to send, as separate messages:
  - Your location
  - R 5.0

Please take note of these things:

- Using WhatsApp uses little data for which you will be compensated.
- You will receive a confirmation message in WhatsApp.
- You must at all times stay safe, and do NOT take measurements if there is a risk to your health or life, and it is too dangerous to go near your station.

B.2 Instructions & Illustrations for Observers using WhatsApp (rainfall)

Ndondomeko ya tsiku ndi tsiku yakatumizidwe ka Mvula pa WhatsApp

Chonde tsatirani ndondomekoyi potumiza miyezo yatsiku ndi tsiku

Kutumiza mulingo wa mvula pogwiritsa ntchito WhatsApp:

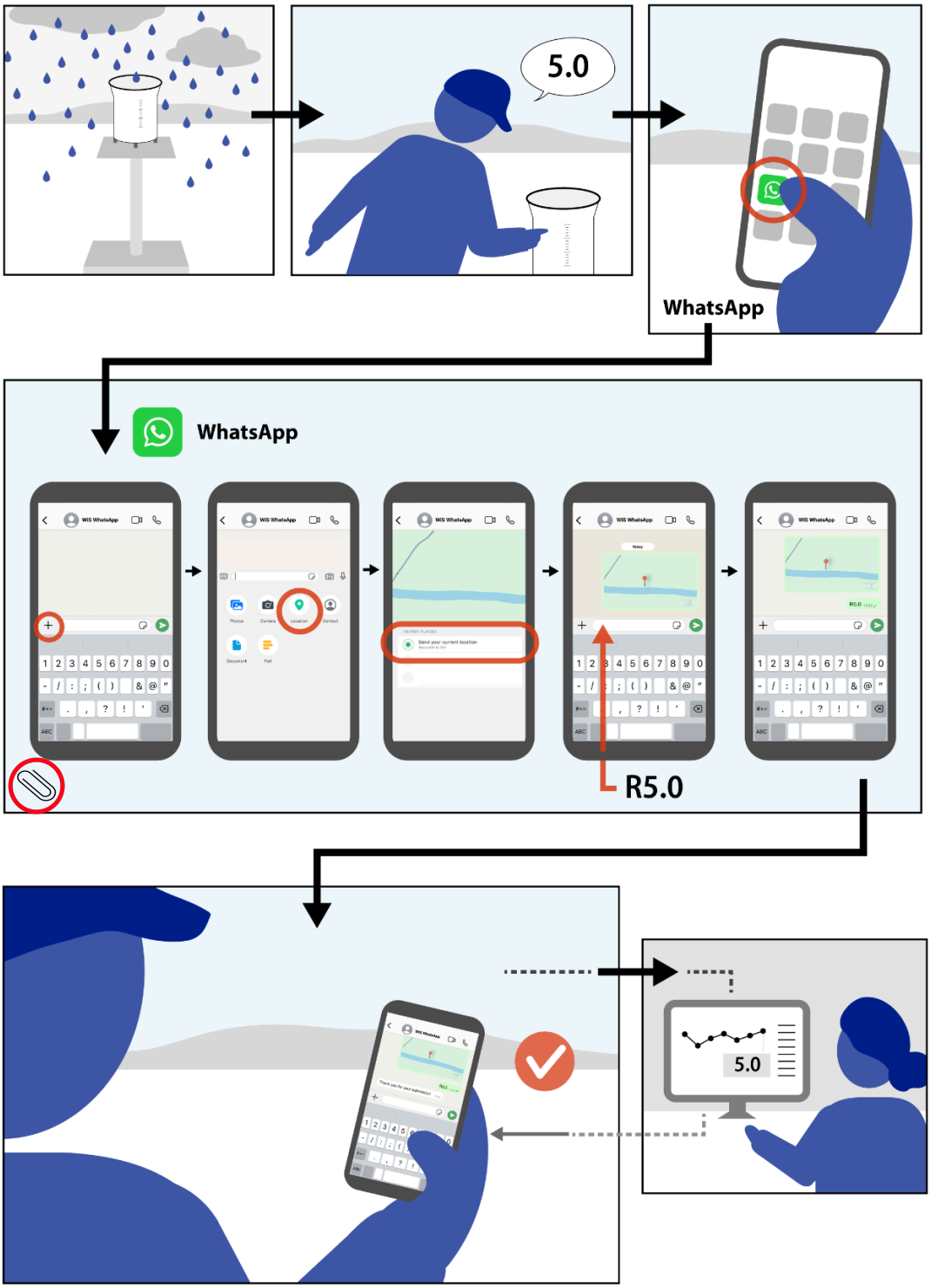
- Lembani mulingo monga mwa ndondomeko:
    - Mulingo wa mvula pa nthawi ya 09h00 mmawa
- Gwiritsani ntchito WhatsApp kutumiza muyeso motere:
    - Tsegulani mauthenga a WhatsApp ndi nambala ya DCCMS iyi: +265 994 47 82 15
    - Tumizani malo omwe muli motere:
        - Sankhani chizindikiro cha + kapena 📎
        - Sankhani mawu olemba location
        - Tumizani malo anu
    - Lowetsani mulingo ngati meseji ndikusindikiza potumizila.

Chitsanzo:

- Ngati muyeso wa mvula ndi 5 mm:
- Gwiritsani ntchito WhatsApp kutumiza izi ngati mauthenga awiri osiyana:
    - Malo anu
    - R 5.0

Chonde dziwani zinthu izi:

- Mukatumiza mulingo, mudzalandira uthenga wotsimikizira pa WhatsApp
- Kutumiza meseji pa WhatsApp kumagwiritsa ntchito data yochepa yomwe mudzabwenzeredwa.
- Muyenera kukhala otetezeka nthawi zonse, ndipo OSATI kuyeza ngati pali chiwopsezo pa moyo wanu, ndipo ngati kuli koopsa kuyandikira pafupi ndi siteshoni yanu.


5.0
WhatsApp
WhatsApp
R5.0
5.0

B.3 Instructions & Illustrations using WhatsApp (meteorological parameters)

WhatsApp Instructions: Daily Meteorological Observations

Please follow this protocol for daily measurements

Submission of meteorological observations using WhatsApp:

- Record the observations per protocol and as applies to your station:
  - Rainfall (R) at 08h00
  - Minimum temperature (TM) at 08h00
  - Maximum temperature (TX)) at 14h00
  - Relative humidity (RH) at 08h00, 11h00, 14h00 and 17h00
  - Wind speed (FF) at 08h00, 11h00, 14h00 and 17h00
  - Wind direction (DD) at 08h00, 11h00, 14h00 and 17h00
- Use WhatsApp to send the measurement in this order:
  - Open WhatsApp and DCCMS contact: +265 994 47 82 15
  - Share your location:
    - press the + or  sign
    - press the location option
    - press share location
  - Enter each measurement in its separate message using the following codes with respective measurement:
    - Rainfall - R
    - Minimum Temperature - TM
    - Maximum Temperature - TX
    - Relative Humidity - RH
    - Wind Speed - FF
    - Wind Direction - DD

Example:

- Take measurements.
- Use WhatsApp to send, as separate messages:
    - Your location
    - R 5.0
    - TM 13.5
    - TX 27.5
    - RH 60
    - FF 20
    - DD 45

Please take note of these things:

- Using WhatsApp uses little data for which you will be compensated.
- You will receive a confirmation message in WhatsApp.
- You must at all times stay safe, and do NOT take measurements if there is a risk to your health or life, and it is too dangerous to go near your station.

Ndondomeko ya tsiku ndi tsiku yakatumizidwe ka zanyengo pa WhatsApp

Chonde tsatirani ndondomekoyi potumiza milingo yatsiku ndi tsikus

Katumizidwe ka milingo yazanyengo pogwiritsa ntchito WhatsApp:

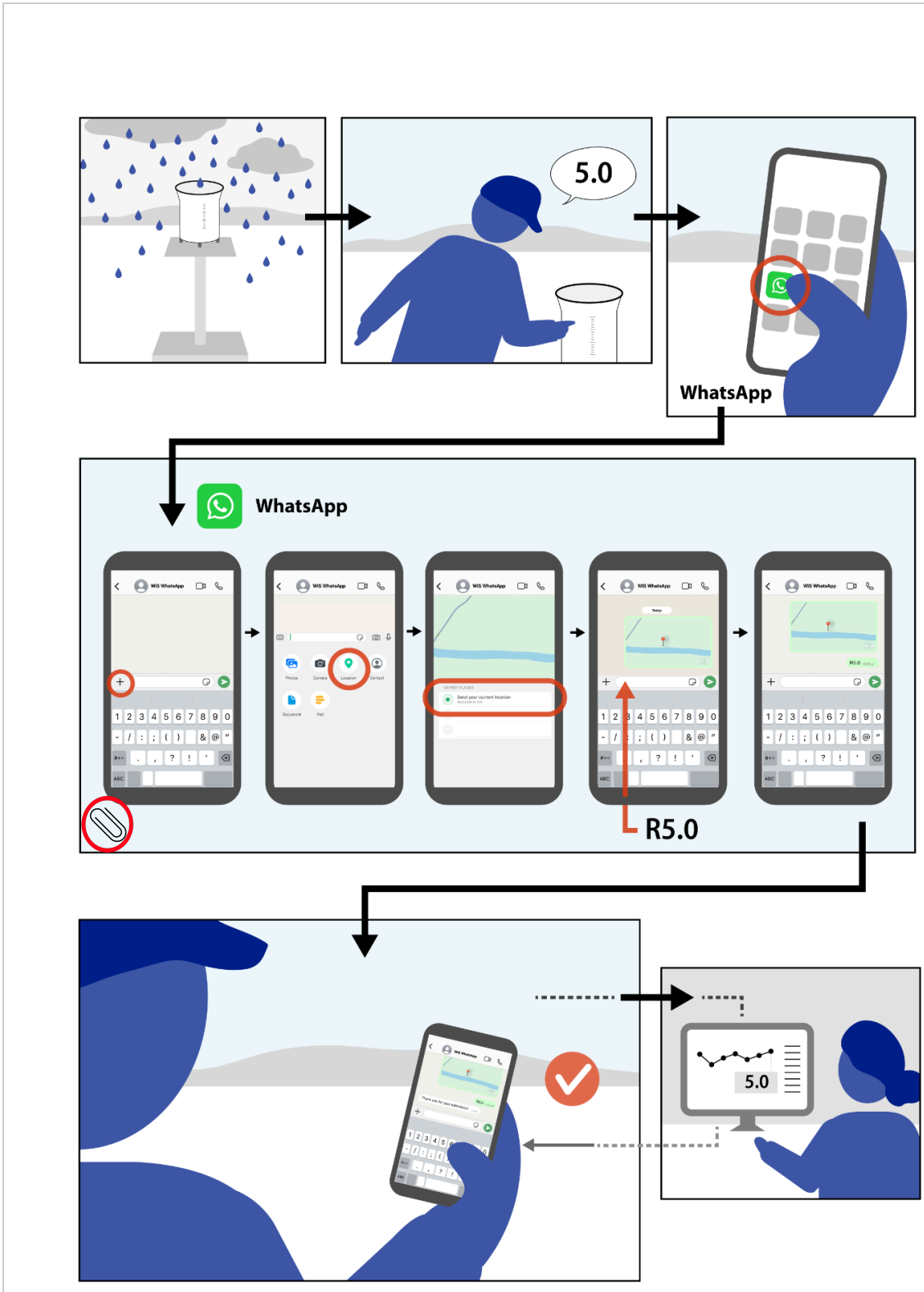
- Lembani ndikusunga milingo monga iyi mumndondomeko yoyenera potengeraso ndi mmene station yanu ilili:
    - Rainfall (R) pa nthawi ya 08h00 mmawa
    - Minimum temperature (TM) pa nthawi ya 08h00 mmawa
    - Maximum temperature (TX)) pa nthawi ya 14h00 masana
    - Relative humidity (RH) panthawi ya 08h00 ndi 11h00 mmawa, komanso 14h00 ndi 17h00 masana.
    - Wind speed (FF) pa nthawi ya 08h00 ndi 11h00 mmawa, komanso 14h00 ndi 17h00 masana
    - Wind direction (DD) pa nthawi ya 08h00 ndi 11h00 mmawa, komanso 14h00ndi 17h00 masana
- Gwiritsani ntchito WhatsApp kuti mutumize miyeso yanu moterer:
    - Tsegulani mauthenga a WhatsApp ndi nambala ya DCCMS iyi: +265 994 47 82 15
    - Tumizani malo omwe muli motere:
        - Sankhani chizindikiro cha + kapena 📎
        - Sankhani mawu olemba kuti location
        - Tumizani malo anu posindikiza potumizila
    - Lowetsani milingo yanu ngati meseji ndikusindikiza potumizila pogwiritsa ntchito ma code awa:
        - Rainfall - R
        - Minimum Temperature - TM
        - Maximum Temperature - TX
        - Relative Humidity - RH
        - Wind Speed - FF
        - Wind Direction - DD

Example:

- Tengani milingo yanu.
- Gwiritsani ntchito WhatsApp potumiza ma code iliyonse payokha payokha ngati mauthenga osiyana monga pansipa:
    - Malo anu
    - R 5.0
    - TM 13.5
    - TX 27.5
    - RH 60
    - FF 20
    - DD 45

Chonde dziwani zinthu izi:

- Mukatumiza mulingo, mudzalandira uthenga wotsimikizira pa WhatsApp
- Kutumiza meseji pa WhatsApp kumagwiritsa ntchito data yochepa yomwe mudzabwenzeredwa.
- Muyenera kukhala otetezeka nthawi zonse, ndipo OSATI kuyeza ngati pali chiwopsezo pa moyo wanu, ndipo ngati kuli koopsa kuyandikira pafupi ndi siteshoni yanu.


5.0
WhatsApp
WhatsApp
R5.0
5.0

B.4 Terms of Reference for rainfall Observers & Meteorologist

Observers & Meteorologists

taking meteorological observation measurements for the Department of Climate Change & Meteorological Services

The following are the ToRs agreed upon by the Observer and the Department of Climate Change and Meteorological Services:

A. The Observer shall be required to do the following:

- Observe, record and submit observed meteorological data of rainfall through sms to 3067 or WhatsApp to 994 47 82 15 on a daily basis DATE to DATE (daily at 08h00 am), and other parameters if applicable and at agreed times per instructions.
- Work hand in hand with DCCMS for any queries.
- Send Codes and measurements to 3067 or WhatsApp to 994 47 82 15 in times of extreme rainfall or as requested by DCCMS. But ONLY if it is safe to do so for the Observer.
- Receive data bundle/airtime in accordance with the data required to send location and observation data.
- To report any incidents, or concerns that may affect the functioning of the gauges or the integrity of the data being collected there, or any other information in free SMS to 3067.
- Render support and/or guidance on any gender sensitive related issues including gender based violence (GBV), please note support from the NGO YONECO (toll free line 5600).

B. DCCMS/supporting Consulting team shall be required to:

- Render support when needed by the Observer.
- Clarify and/or respond to queries.
- Make timely communications for any updates and other arising matters requiring the Observer's attention.
- Safely store personal information in accordance with EU GDPR policy.

C. I have received from T-Notch and Water in Sight (please mark):

Item	Yes	No
Gum boots		

Rain coat		
Slasher		
Spade		
Simple phone		
Allowance (copy of ID)		

Do you agree to work under these conditions? Tick the appropriate box

Yes ☐ No ☐

Observer's name and signature

_____

(Name written)

_____

(Signature)

DCCMS representative name and signature

_____

(Name written)

_____

(Signature)

Date:_____

Station ID:_____

Mgwirizano wandondomeko yakagwiridwe ntchito ka oyeza mvula

Kutenga miyeso yowunika zanyengo ya Dipatimenti Yoona za Kusintha kwa Nyengo & Meteorological Services

Gwirizano wakagwiridwe ka ntchito kapakati pa Oyeza mvula ndi DCCMS:

A. Oyeza mvula ayenera kuchita zinthu izi:

- Kuyeza, kusunga ndi kutumiza data ya nvula ndi milingo ina monga mwa mgwirizano ndi DCCMS. Potumiza milingo ayenera kugwiwritsa ntchito book la DCCMS komanso njira yama sms ku 3067 0r WhatsApp ku 994 47 82 15 mmawa wa tsiku lililonse kwa miyezi isanu ndi itatu (8) pa nthawi ya 8.00am, kuambilamwezi wa DATE mpaka DATE.
- Kugwira ntchito limodzi ndi DCCMS pamafunso aliwonse.
- Kutumizani mulingo ku 3067 kapena WhatsApp ku 994 47 82 15 mu nthawi yamvula yamphamvu kapena monga mwapemphedwa kutero ndi DCCMS. Koma pokhapo ngati kuli kotetezeka kutero kwa Observer.
- Kupereka lipoti potumiza SMS yaulere ku 3067 pa zochitika zilizonse, kapena nkhawa zonse zokhudza magwiridwe ntchito a geji zomwe zingasokoneze kayezedwe koyenera ka milingo ya mvula.
- Kulandira maunits kapena bandulo mufoni pa mwezi uliwonse kuti azikwanitsa kutumiza malo omwe ali (location), kudzera WhatsApp komanso milingo imene akuyenera kutumiza..
- Kupeleka sapoti kapena upangili pa nkhani za jenda (gender) ndi nkhannza zochiltilidwa kwa a Mayi kapena a Bambo. Chonde dziwani kuti mukhoza kupezaso thandizo ku ma bungwe la YONECO poimba nambala yaulere iyi 5600

B. Gulu la DCCMS liyenera ku:

- Kupeleka chithandizo chakagwiridwe ka ntchito chomwe chingafunikile ndi Observer.
- Kutambasulira zofunikila ndikuyankha mafunso kwa oyeza nvula..
- Kupeleka mauthenga mu nthawi yake pazosintha zilizonse ndi zinthu zina zomwe zingafunike kwa Observer.
- Kusunga mosamala mbiri ya oyeza madzi molingana ndi mfundo za EU GDPR.

C. Ndalandira kuchokera ku DCCMS (chonde chongani malo oyenera):

Chipangizo	Inde	Ayi
Gambusi		
Chovala chamvula/Rain coat		
Silasha		
Fosholo		
Foni		
Chiongola dzanja (ID copy)		

Kodi mukuvomera kugwira ntchito mwa ndondomeko imeneyi? Chongani m'bokosi loyenera

Inde ☐ Ayi ☐

Dzina la Observer ndi siginecha

_____

(Dzina lilembedwe apa)

_____

(siginecha)

Dzina la DCCMS dzina ndi siginecha

_____

(Dzina lilembedwe apa)

_____

(siginecha)

Tsiku:_____

Station ID:_____

B.5 User registration form: Observer / Meteorologist

First Name			
Last Name			
Phone Number #1			
Phone Number #2			
Phone Number #3			
Type of Phone (circle)	Simple	Feature	Smartphone
Condition of Phone (circle)	Bad	Ok	Good
Operator	Airtel		TNM
Mobile money	Airtel Money		Mpamba
Role in Community			
Year of birth or estimate			
Gender (circle)	Male		Female

District	
Town/Village	
Station ID	
Station name	
Time and method to travel to station	
River basin	
National ID number	
Livelihood/Employment	
Number of members in your household	
Income	

B.6 Station inventory & assessment form: manual rainfall/met station

Station name and ID number			
District			
EPA			
Date			
Type of Station			
Condition of Station (circle)	Non-functioning	Functioning but needs repair	Functioning
Station : Open comment & What needs to be done to improve station			
Condition of rainfall gauge (circle)	Non-functioning	Functioning but needs repair	Functioning
What is the rainfall gauge missing?			
Other monitoring equipment?	Thermometer	Wind speed/direction	Relative Humidity
Comment on status/missing instruments?	(indicate type)	(indicate type)	(indicate type)
Any specific purpose of the station (e.g., flood monitoring)			
Geo-location	Long:	Lat:	
Elevation (m)			
Is there an automatic station?	Yes	No	
What kind of automatic station?			
Is it vandalised?	Yes	No	
Is it working?	Yes	No	
Any other comments?			

Annex C. Survey Forms: Gauge Readers, Observers & Meteorologists

User (circle)	Gauge Reader	Observer	Meteorologist
Department (circle)	DWR/NWRA	DCCMS	
What do you think about the instructions? e.g Can you easily understand them			
Does the solution make your work easier?	Yes	No	
On a scale from 1-10, how easy is it to use the solution?	1 2 3 4 5 6 7 8 9 10		
What do you like about it?			
What don't you like about it?			
Anything you would like improved?			
What is your greatest concern with the waters in your rivers or weather conditions?			
What information would you like to receive back from the departments that would be interesting and useful?			
What would you like changed about your station?			
What are the safety concerns you have?			
Any open comments/ observations you or GR/O has?			

Annex D. Check List of in-field training, station & user registration

Item	*Tick if done*			
Instructions sheets handed over				
Signed ToR				
GR/O Registration Form				
Station Assessment form				
Survey form				
Allowance sheets signed & copy of ID taken	Consultant	DCCMS	DWR/NRWA	Observers
Photos (circle)	Close up of Gauge Reader or Observers	Close up of Station equipment	The location/ area	Of GR/O using mobile
Interview Gauge Reader/ Observer and government official?	Only at the stations you think it will be useful to do an interview, please film and ask the GR/O (not needed for all stations): 1) State their name and the location they are at 2) What they think of the solution and 3) Why is monitoring important for them individually and for their community? 4) What do they and their community worry about the most with the weather? Crops? How? 5) What information and guidance would they like back? 6) for government: What can you use these manual observations for and why are they important for your hydrometric networks and modelling/forecasting?			

Annex E. GDPR Compliance

The collection of personal information is predicated by the EU General Data Protection Regulation (GDPR). GDPR is a law that protects people's personal data and privacy, and therefore, the software and the deployment with Observers had to ensure: obtaining clear consent (through Terms of REferences); inform Observers the data you collect and why; using data fairly; keeping data safe; let users access and delete data; and report any data breaches. In the tools and forms developed for the UNEP CTCN project (annex A to D), the GDPR compliance is captured.

For the full Privacy Policy of Water in Sight Ltd who developed BluelQ, please see:
https://www.waterinsight.se/privacy-policy