

User Guide v1

Mobile GIS Survey Instrument for In-Situ Assessment of Coastal Protection Structures

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Veeravalli, S. G. (2026). Mobile GIS XLSForm for In-Situ Assessment of Coastal Protection Structures. Zenodo. <https://doi.org/10.5281/zenodo.18457880>

Introduction

This user guide describes the steps required to deploy and use the XLSForm-based mobile GIS survey instrument developed for the in-situ assessment of coastal protection structures. The guide is intended to support reproducibility and reuse of the framework by researchers and coastal management agencies using the Kobo Toolbox platform. The survey logic, including conditional branching, validation rules, mandatory fields, GPS capture, and multimedia requirements, is fully embedded within the XLSForm provided in the zenodo repository (<https://doi.org/10.5281/zenodo.18457880>). No programming or platform-specific customization is required beyond the steps described below.

(This guide documents deployment and use of the survey instrument and does not cover post-processing or analytical workflows beyond data export.)

1. Platform Access and Account Setup

To use the survey instrument, a Kobo Toolbox account is required. Users can create a free account by visiting the Kobo Toolbox website (<https://www.kobotoolbox.org/>) and registering with an email address. Once registered, users can log in to the Kobo Toolbox user portal (Figure 1) using a standard web browser.

The platform supports data collection through web browsers as well as mobile devices and tablets, and is compatible with common operating systems. For field deployment, mobile phones or tablets are recommended to enable GPS-based location capture and multimedia recording.

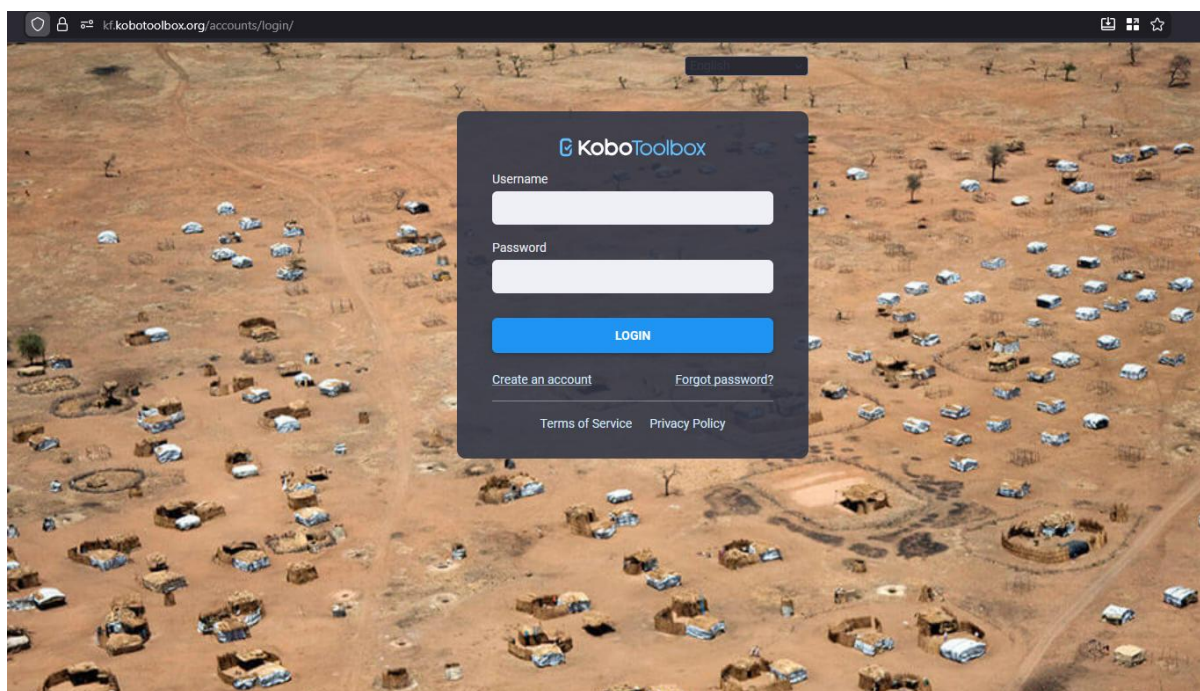


Figure 1: Kobo Toolbox user portal for logging in

2. Importing the XLSForm Survey Instrument

After logging into the Kobo Toolbox user portal, a new survey project can be created by selecting the option to create a new form (Figure 2).

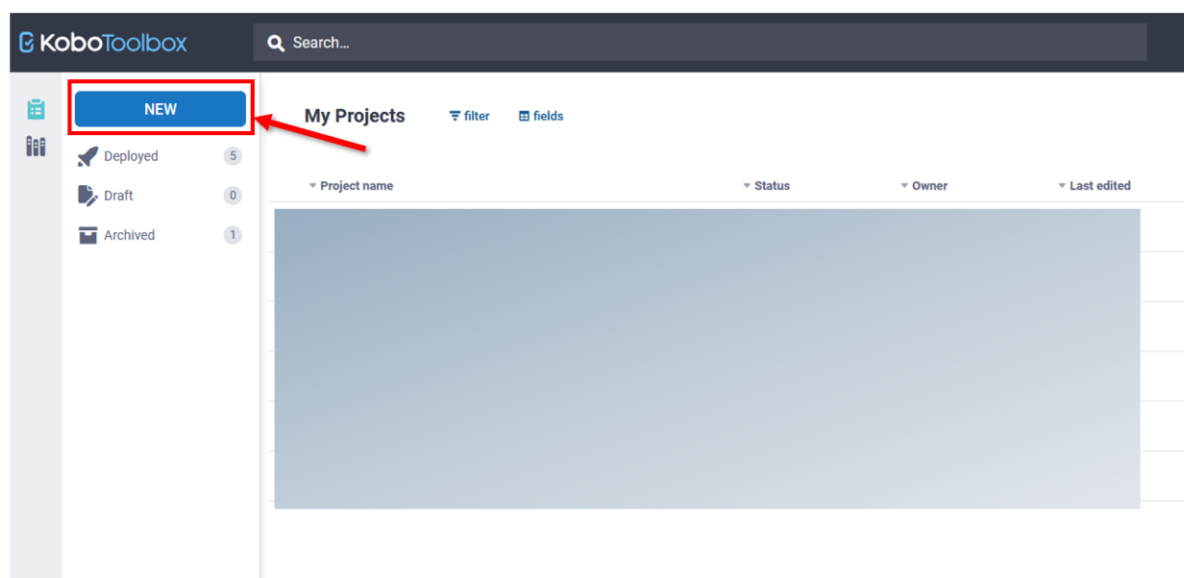


Figure 2: Create a new form by selecting the 'New' button

The XLSForm file provided in the zenodo repository should be uploaded directly (Figure 3). Details such as project name, description, sector and country have

to be filled to successfully finish creating the project (Figure 4). Upon uploading and creating the project, the form is automatically parsed and loaded into the Kobo Toolbox interface. All survey structure, including hierarchical question flow, skip logic, validation rules, mandatory fields, and geospatial inputs, are defined within the XLSForm.

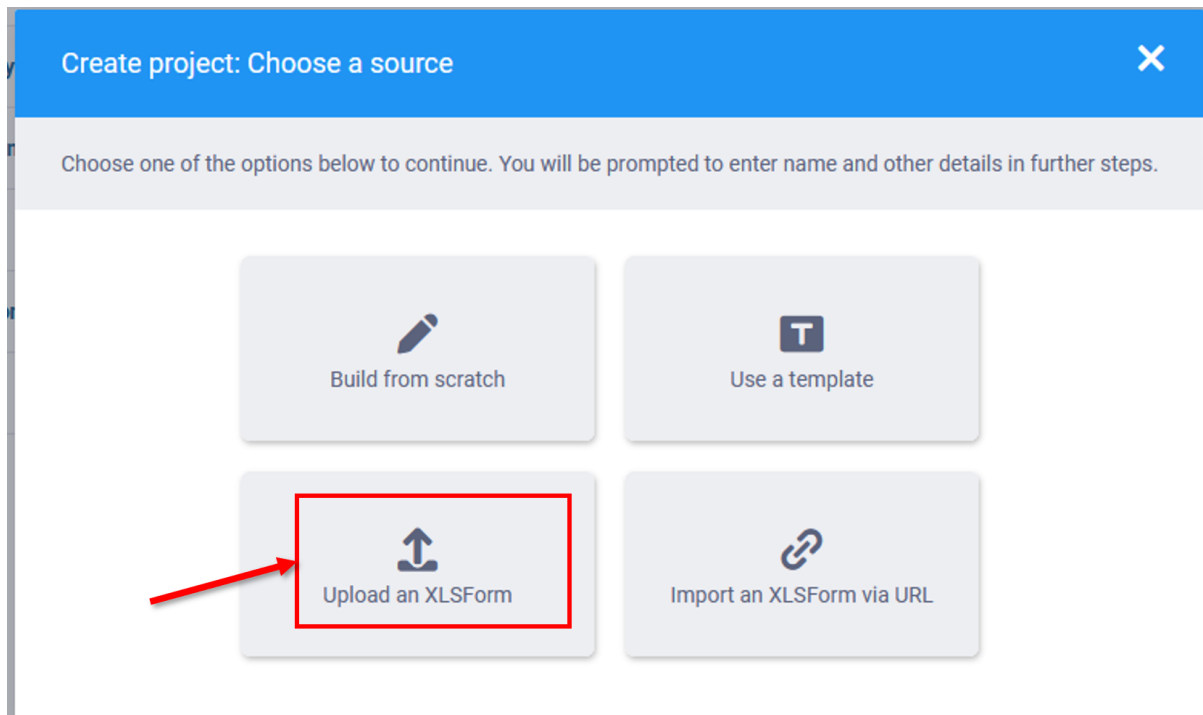


Figure 3: Select the 'Upload an XLSForm' option

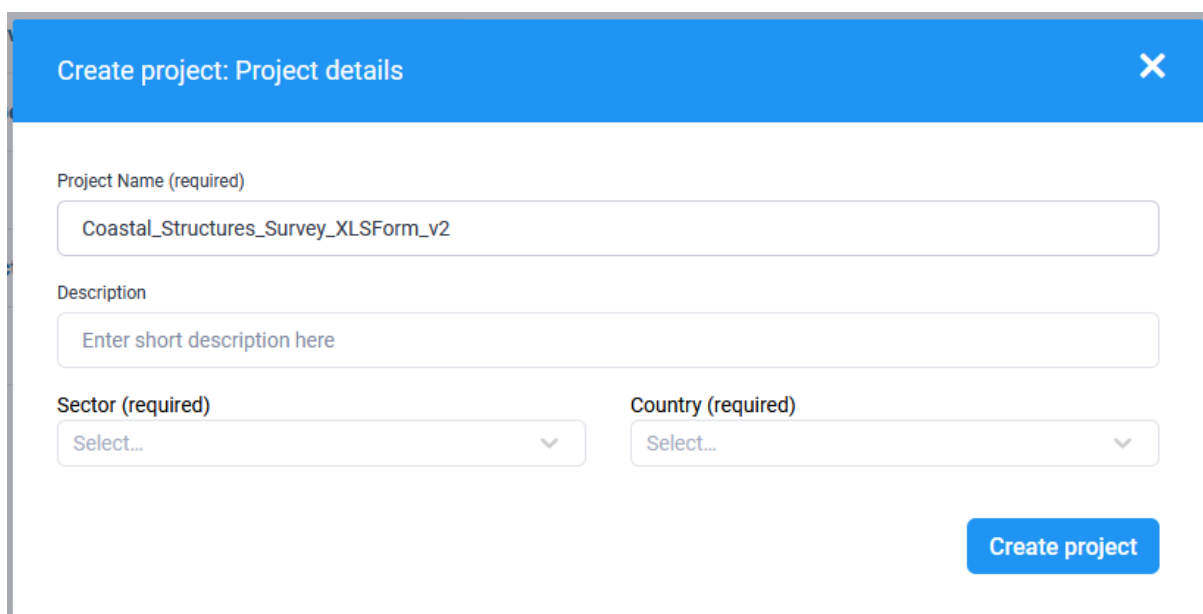


Figure 4: Name your project, description, sector and country to finish setting up the project.

Once the project is created, the project is saved as a draft (Figure 5) where you can perform different actions. Any errors in the form logic or formatting will be flagged by the platform at this stage. If the form loads successfully without errors, no further configuration is required before previewing or deploying the survey.

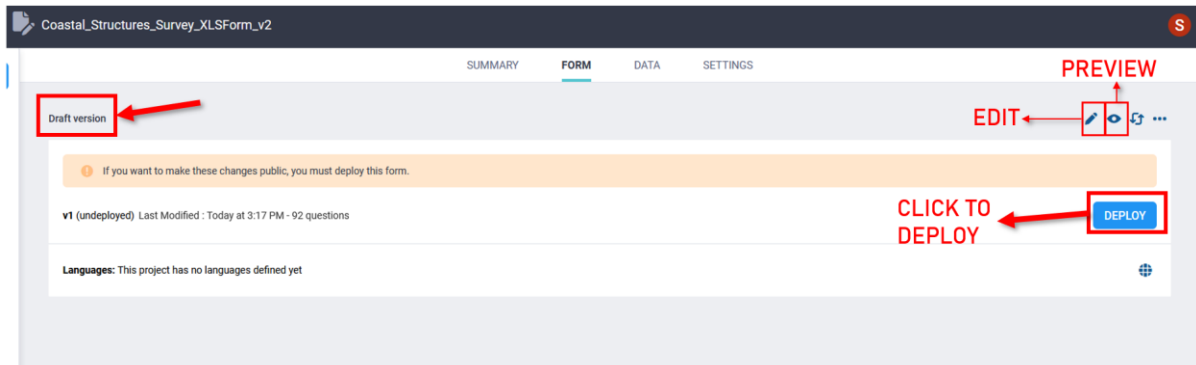


Figure 5: Screen after successful creation of project

3. Previewing and Deploying the Survey

Once the XLSForm has been successfully uploaded, the survey can be previewed within the Kobo Toolbox portal before deployment. The preview function allows users to view the form exactly as it will appear to field surveyors and provides an opportunity to check question sequencing, conditional logic, spelling, and overall usability (Figure 6).

During preview, users can navigate through the survey to verify that mandatory fields, conditional questions, and validation constraints behave as expected. If any errors or inconsistencies are identified, the XLSForm should be corrected externally and re-uploaded (this is the preferred way). Direct modifications of complex forms as this using the in-platform form editor is not recommended, as the embedding logic of this survey exceeds the capabilities of the default editor.

Form Preview

Coastal_Structures_Survey_XLSForm_v2

RESEARCHER & LOCATION DETAILS

What is your team number?
Team 1: A, B; Team 2: C, D; Team 3: E, F; Team 4: G, H

☐ Team 1
☐ Team 2
☐ Team 3
☐ Team 4

Date and Time
Record the current date and time

yyyy-mm-dd hh:mm

Name of the area:
Name of the beach / place / local name

Record your current location
This will record your current GPS location. Wait at the location you want to record for a few seconds and press the location button twice or thrice for improved accuracy

latitude (x,y °) search for place or address

longitude (x,y °)

Figure 6: Previewing the form

After successful preview, the survey must be deployed in order to make it available for data collection. Deployment activates the survey as a web-based application and generates a sharable link. Users can configure access permissions at this stage, choosing whether the survey is open to all respondents or restricted to authenticated or named users, depending on the project requirements (Figure 7).

Once deployed, the survey link can be distributed to field teams for immediate use on mobile devices, tablets on their web browsers. Any subsequent updates to the survey logic require redeployment; users accessing the survey can refresh the web application to load the updated version.

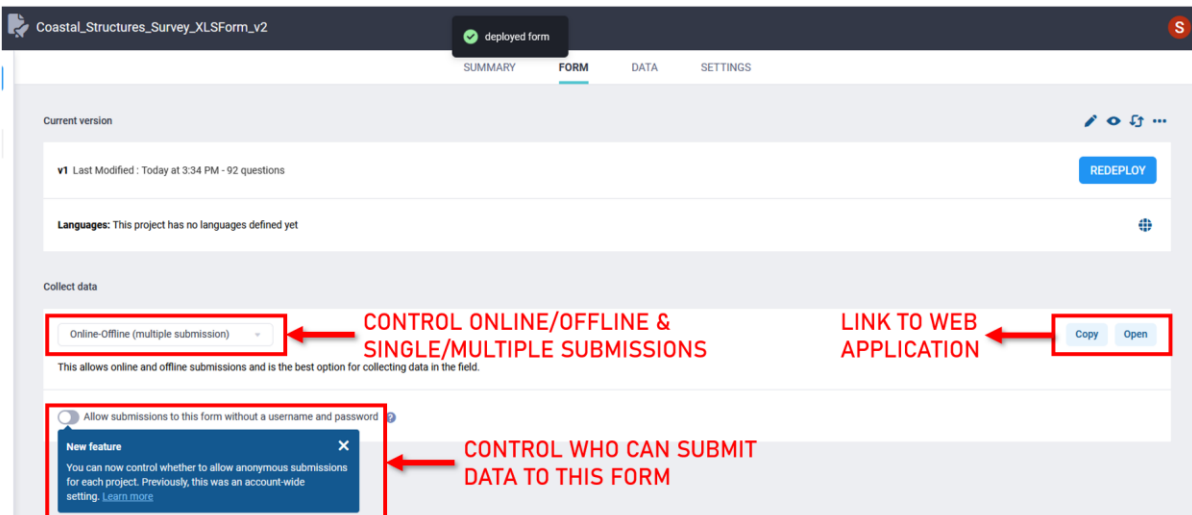


Figure 7: Options after deploying the web application

4. Field Data Collection Workflow

The survey instrument is designed primarily for use on mobile phones or tablets to support georeferenced data collection. While the form can be accessed through desktop browsers, mobile devices are recommended to enable integrated GPS capture and multimedia recording under field conditions.

When opening the deployed survey link on a mobile device, users should allow a brief stabilization period for the device's GPS sensor before capturing location coordinates. Waiting a few seconds improves positional accuracy prior to selecting the location capture option within the form (Figure 8). *It is important to keep in mind that these accuracies varies from device to device and on other parameters as well.*

The survey workflow follows a structured, stepwise sequence defined in the XLSForm. Certain questions are mandatory and must be completed before submission (Figure 8), while others appear conditionally based on prior responses. These skip patterns, validation rules, and required fields are enforced automatically by the form logic and ensure consistent data entry across survey teams.

3:49 99

☐ Team 2
☐ Team 3
☐ Team 4

Date and Time
Record the current date and time

Name of the area:
Name of the beach / place / local name

Record your current location ★
This will record your current GPS location. Wait at the location you want to record for a few seconds and press the location button twice or thrice for improved accuracy

latitude (x,y °)
 longitude (x,y °)
 altitude (m)
 accuracy (m)

ee.kobotoolbox.org

INDICATES MANDATORY

WAIT FEW SECONDS BEFORE PRESSING LOCATION CAPTURE BUTTON

Figure 8: Preview of the web application on a mobile

Photographs and additional media are recommended for key assessment steps and are captured directly through the device camera. Each submission is automatically associated with GPS coordinates, timestamps, and a unique record identifier.

In areas with limited or no internet connectivity, the survey supports offline data collection. Responses are temporarily stored within the device's browser and are automatically synchronized with the central database once an internet connection is restored (Figure 9). This allows uninterrupted field operations in remote or infrastructure-limited coastal areas.

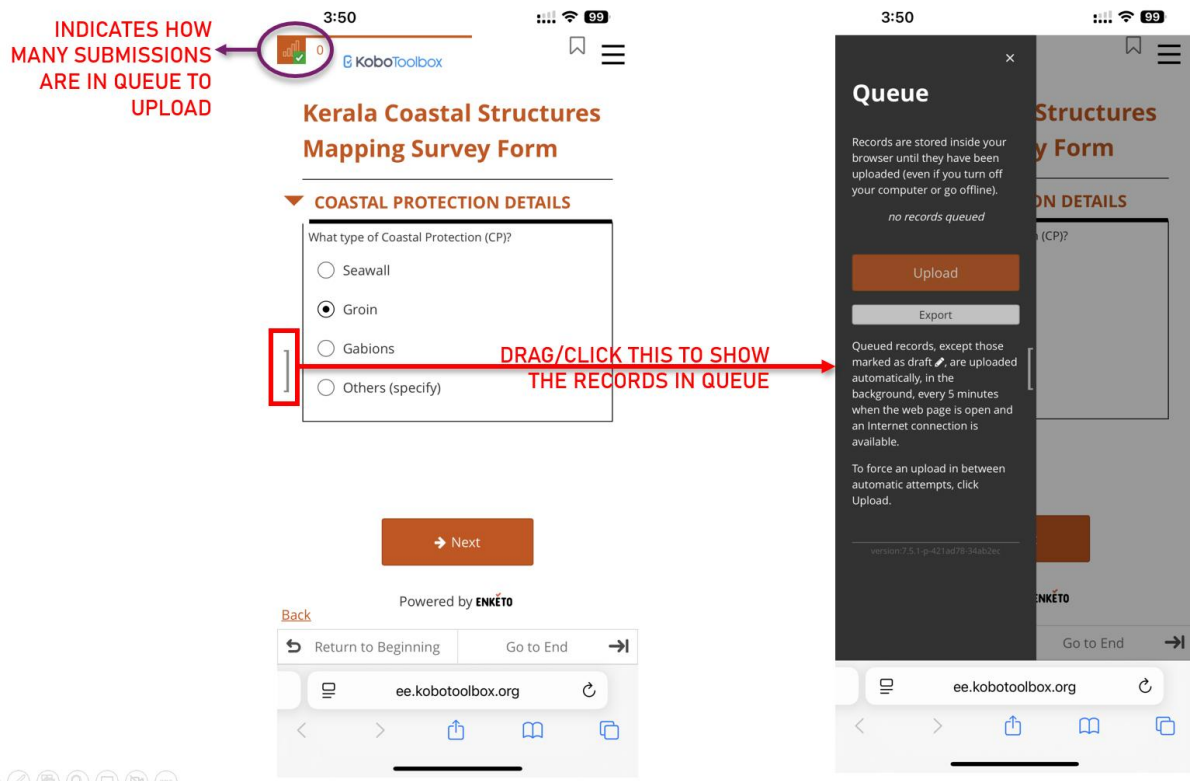


Figure 9: Checking queued records

5. Monitoring and Downloading Survey Data

Once the survey is deployed and data collection has begun, incoming submissions can be monitored in near real time through the Kobo Toolbox user portal. The platform provides multiple interfaces for tracking survey progress and reviewing collected data (Figure 10).

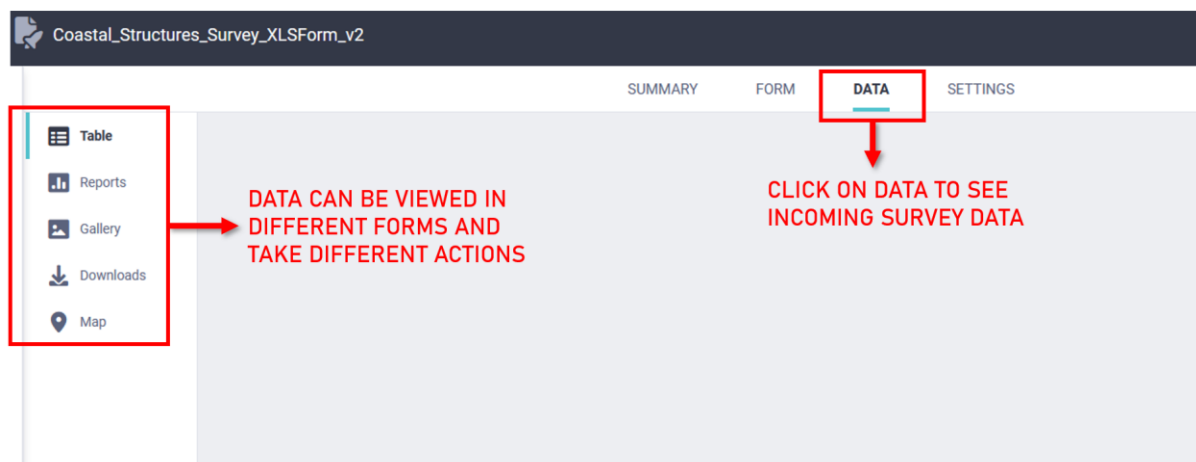
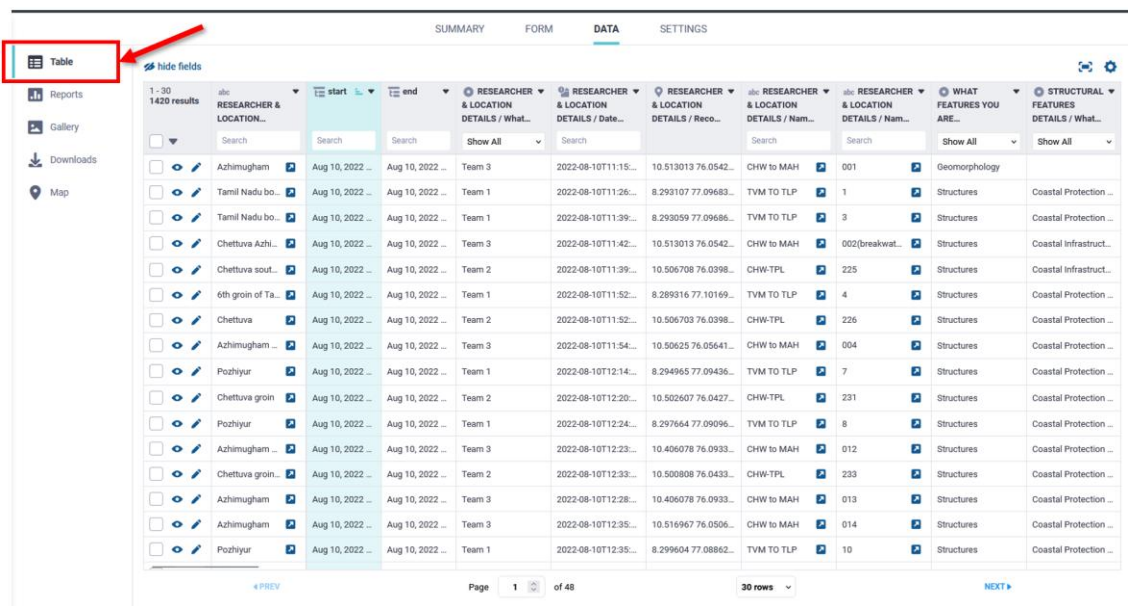


Figure 10: Monitoring incoming survey data

Survey responses can be viewed in a data table, where individual records, timestamps, and attribute values are displayed in tabular form (Figure 11). Map view allows users to visualize submissions spatially based on their GPS coordinates, enabling inspection of spatial coverage and identification of gaps or anomalies (Figure 12). In addition, automated summary reports provide aggregated views of responses and basic statistics (Figure 13). Uploaded photographs can also be browsed directly through the portal (Figure 14).



RESEARCHER & LOCATION	start	end	RESEARCHER & LOCATION DETAILS / What...	RESEARCHER & LOCATION DETAILS / Date...	RESEARCHER & LOCATION DETAILS / Reco...	RESEARCHER & LOCATION DETAILS / Nam...	RESEARCHER & LOCATION DETAILS / Nam...	WHAT FEATURES YOU ARE...	STRUCTURAL FEATURES DETAILS / What...
Azhimugham	Aug 10, 2022	Aug 10, 2022	Team 3	2022-08-10T11:15...	10.513013 76.0542...	CHW to MAH	001	Geomorphology	
Tamil Nadu bo...	Aug 10, 2022	Aug 10, 2022	Team 1	2022-08-10T11:26...	8.293107 77.09683...	TVM TO TLP	1	Structures	Coastal Protection ...
Tamil Nadu bo...	Aug 10, 2022	Aug 10, 2022	Team 1	2022-08-10T11:39...	8.293059 77.09686...	TVM TO TLP	3	Structures	Coastal Protection ...
Chettuva Azh...	Aug 10, 2022	Aug 10, 2022	Team 3	2022-08-10T11:42...	10.513013 76.0542...	CHW to MAH	002(breakwat...	Structures	Coastal Infrastruct...
Chettuva sout...	Aug 10, 2022	Aug 10, 2022	Team 2	2022-08-10T11:39...	10.506708 76.0398...	CHW-TPL	225	Structures	Coastal Infrastruct...
6th groin of Ta...	Aug 10, 2022	Aug 10, 2022	Team 1	2022-08-10T11:52...	8.289316 77.10169...	TVM TO TLP	4	Structures	Coastal Protection ...
Chettuva	Aug 10, 2022	Aug 10, 2022	Team 2	2022-08-10T11:52...	10.506703 76.0398...	CHW-TPL	226	Structures	Coastal Protection ...
Azhimugham	Aug 10, 2022	Aug 10, 2022	Team 3	2022-08-10T11:54...	10.50625 76.05641...	CHW to MAH	004	Structures	Coastal Protection ...
Pozhiyur	Aug 10, 2022	Aug 10, 2022	Team 1	2022-08-10T12:14...	8.294965 77.09436...	TVM TO TLP	7	Structures	Coastal Protection ...
Chettuva groin	Aug 10, 2022	Aug 10, 2022	Team 2	2022-08-10T12:20...	10.502607 76.0427...	CHW-TPL	231	Structures	Coastal Protection ...
Pozhiyur	Aug 10, 2022	Aug 10, 2022	Team 1	2022-08-10T12:24...	8.297664 77.09096...	TVM TO TLP	8	Structures	Coastal Protection ...
Azhimugham	Aug 10, 2022	Aug 10, 2022	Team 3	2022-08-10T12:23...	10.406078 76.0933...	CHW to MAH	012	Structures	Coastal Protection ...
Chettuva groin	Aug 10, 2022	Aug 10, 2022	Team 2	2022-08-10T12:33...	10.500808 76.0433...	CHW-TPL	233	Structures	Coastal Protection ...
Azhimugham	Aug 10, 2022	Aug 10, 2022	Team 3	2022-08-10T12:28...	10.406078 76.0933...	CHW to MAH	013	Structures	Coastal Protection ...
Azhimugham	Aug 10, 2022	Aug 10, 2022	Team 3	2022-08-10T12:35...	10.516967 76.0506...	CHW to MAH	014	Structures	Coastal Protection ...
Pozhiyur	Aug 10, 2022	Aug 10, 2022	Team 1	2022-08-10T12:35...	8.299604 77.08862...	TVM TO TLP	10	Structures	Coastal Protection ...

Figure 11: Viewing data in tabular form

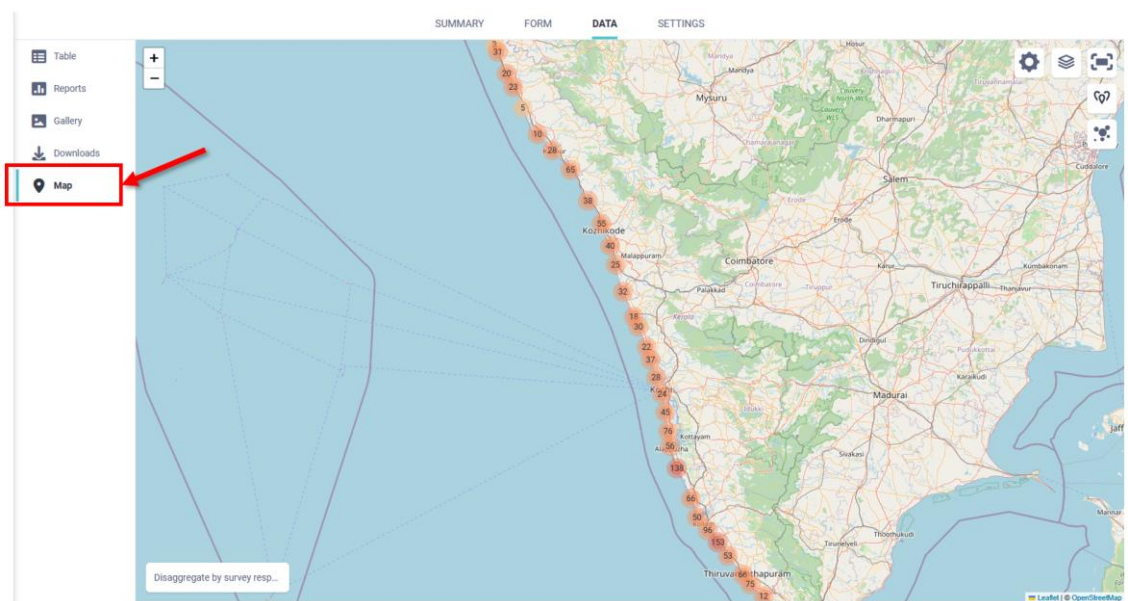


Figure 12: Viewing data on a map

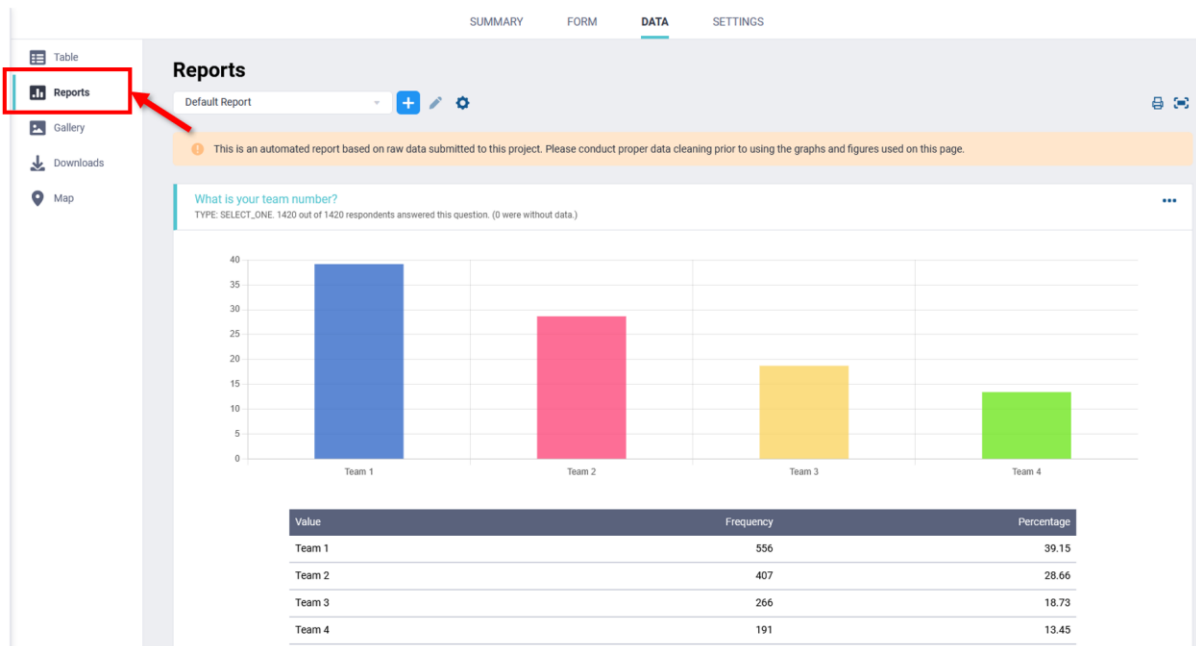


Figure 13: Viewing data in automated summary response form.

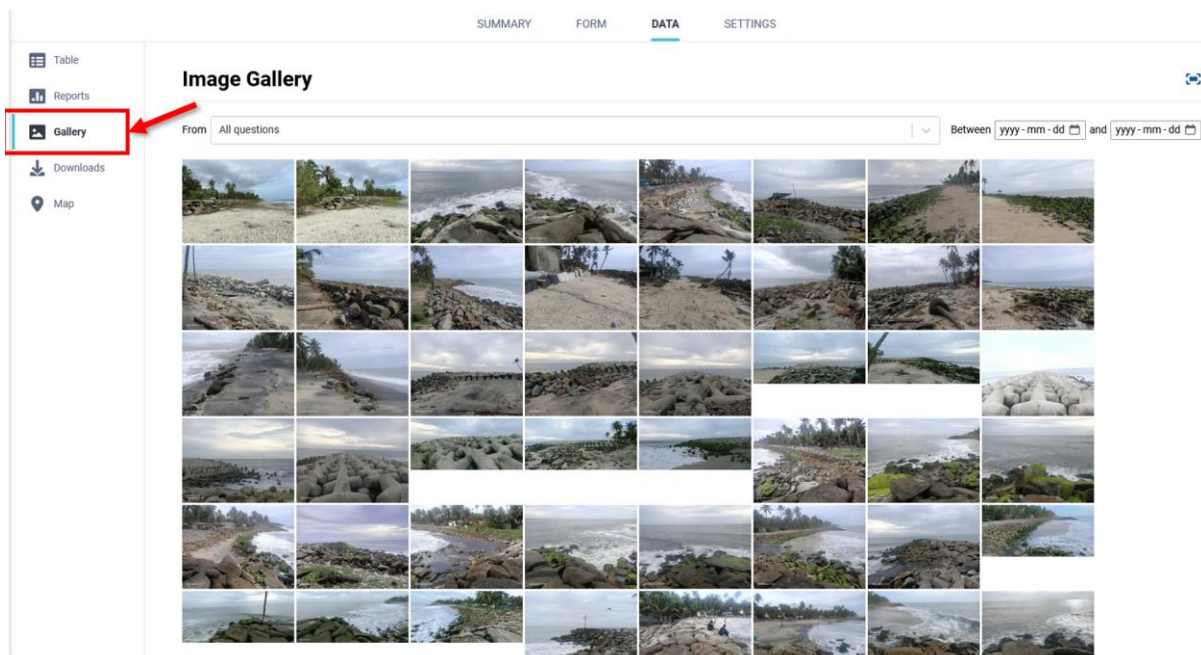


Figure 14: Viewing image gallery

Collected data can be downloaded from the portal in multiple standard formats for further analysis and archiving. Attribute data can be exported as CSV (with latitude and longitude information) or XLS files for tabular processing and integration with GIS software. Spatial data can be exported in KML format, preserving GPS coordinates for direct visualization in mapping platforms (Google Earth Pro, QGIS, ArcGIS). Multimedia files, including photographs and

videos captured during the survey, can be downloaded as a compressed ZIP archive, with filenames linked to unique record identifiers (Figure 15).

These export options enable seamless transfer of field-collected data into GIS and analysis workflows while maintaining traceability between spatial records, attributes, and supporting media.

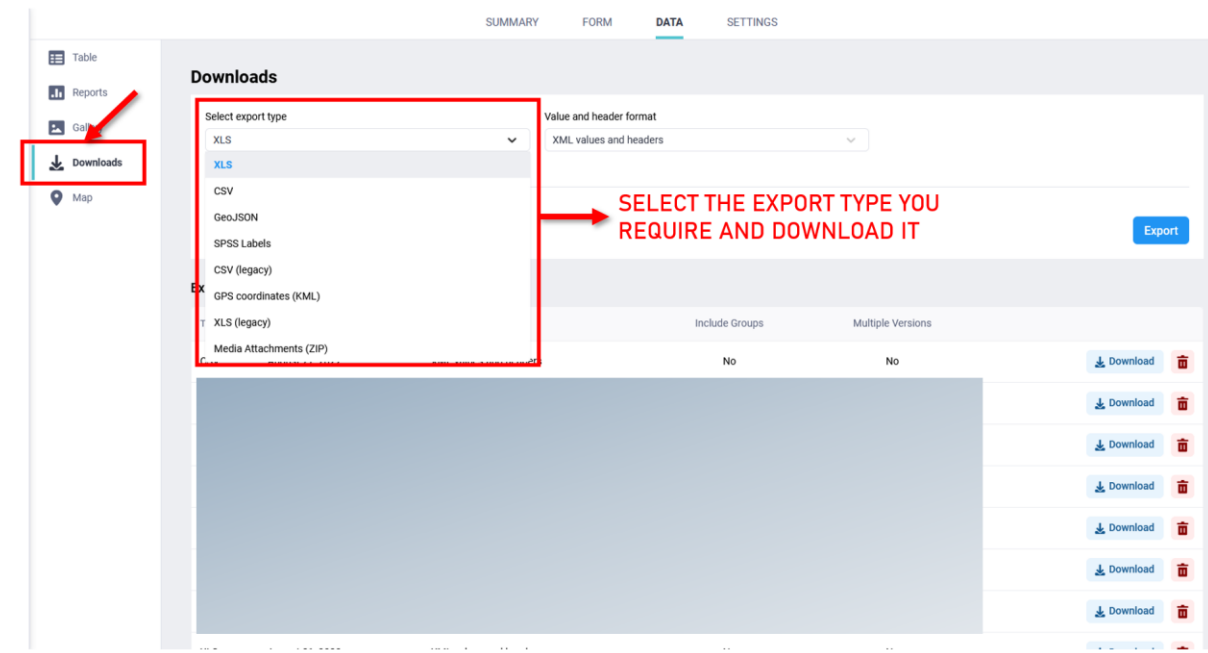


Figure 15: Exporting survey data in different formats and types

Reference

This user guide accompanies the mobile GIS survey instrument developed for the in-situ assessment of coastal protection structures. Users who reuse or adapt the survey instrument or this guide are requested to cite the Zenodo archive listed below.

Zenodo repository:

Veeravalli, S. G. (2026). Mobile GIS XLSForm for In-Situ Assessment of Coastal Protection Structures. Zenodo. <https://doi.org/10.5281/zenodo.18457880>

Associated Methodology paper:

Veeravalli, S. G., Murali, M. G., Alluri, S. K. R., Ramanathan, V., & Murthy, R. M. V. (in review). *A Mobile GIS Framework for In-Situ Measurement of Coastal Defence Conditions: Development and Application in Kerala, India*. *Applied Geomatics*.