

BUILDING A RESILIENT BENGALURU

Reading the City's Drains: Citizen-led Audit

BSF Small Grants Programme 2025 | Stormwater & the City



BENGALURU
SUSTAINABILITY
FORUM



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1 Bengaluru's Stormwater System

A stormwater system is an essential infrastructure made of connected stormwater drains or SWDs that help manage rainwater and prevent flooding in a city.

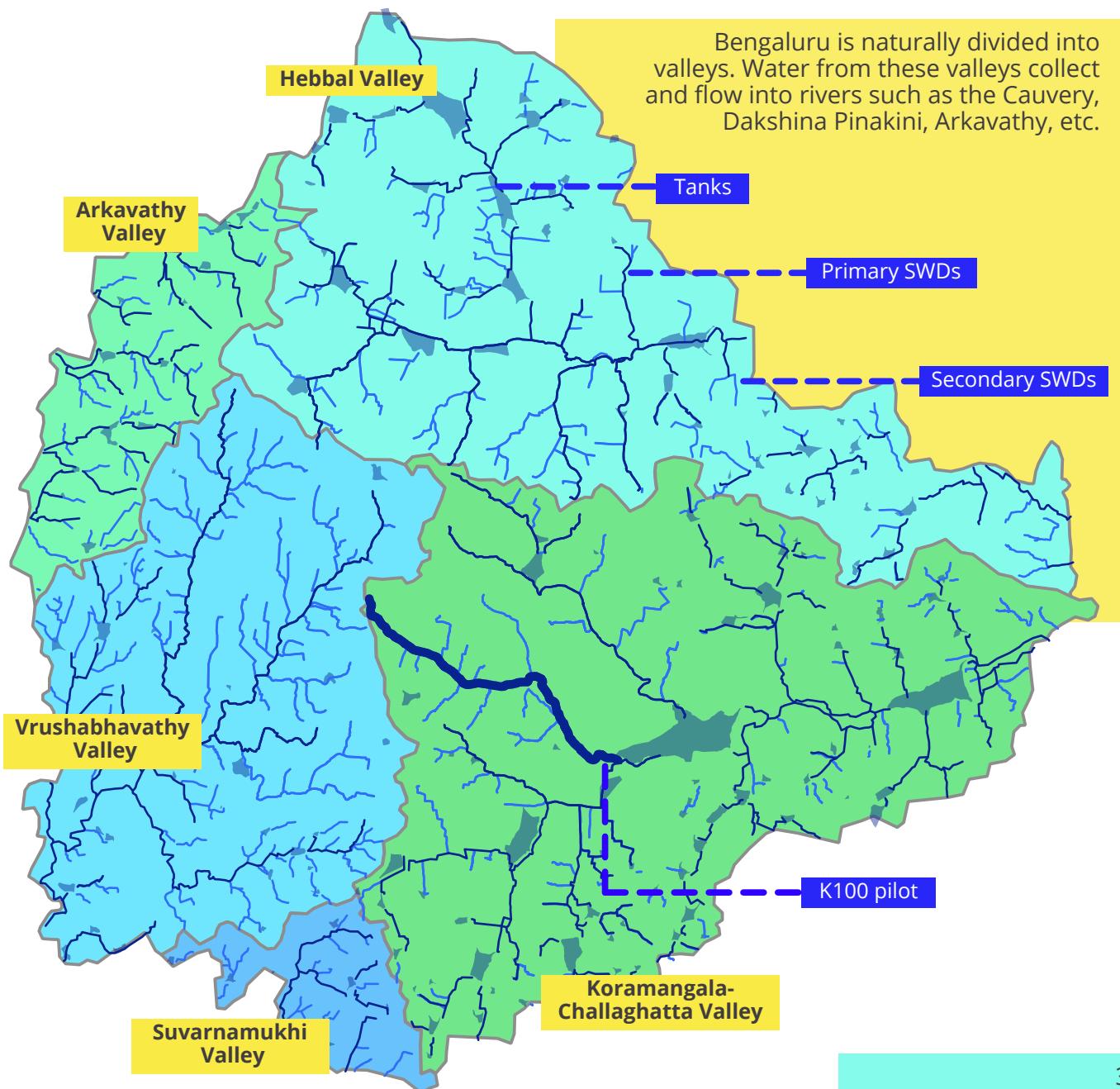
In Bengaluru, the primary and secondary stormwater drains/ SWDs, also called rajakalubes span over 842 kilometres, forming the city's largest public water infrastructure system.

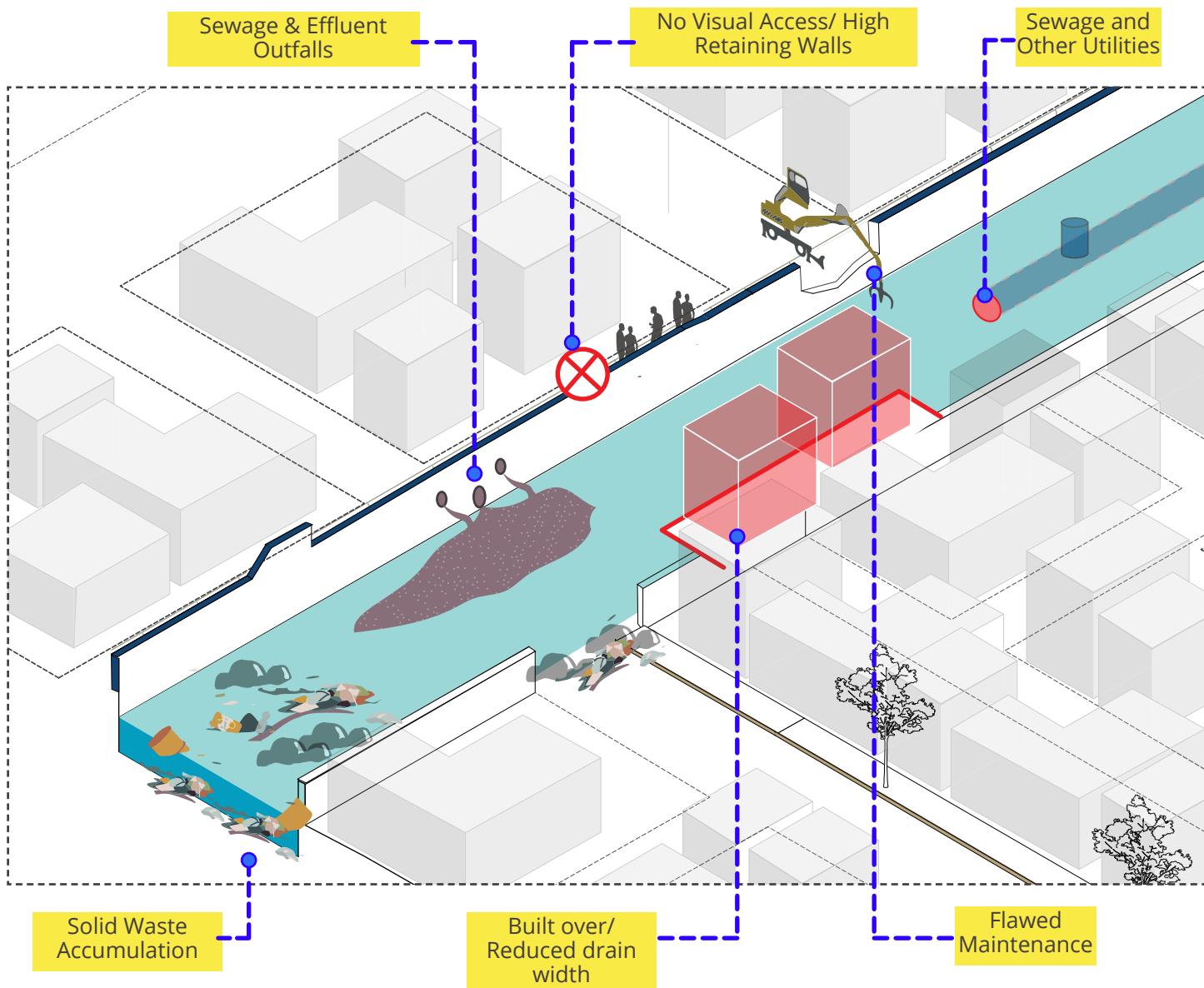
Historically, these rajakalubes were designed, harnessing the natural terrain of the city, to

connect a series of tanks through an overflow mechanism. Thus enabling water storage, retention, and conveyance across the city.

However, despite their critical role in flood management, water quality, and public health, this system has been dramatically altered, built over and misused.

With erratic and intense rainfall patterns on the rise, the city's stormwater system is under considerable stress leading to urban challenges we see today.





Way Forward

The city's stormwater system holds untapped potential as shared urban spaces that support ecology, public health, and community resilience.

The K100 Citizens' Waterway pilot, conceptualised by Mod Foundation in partnership with the BBMP and other civic stakeholders demonstrated that understanding stormwater drains as both hydrological assets and urban public spaces can guide flood mitigation and urban design in Bengaluru.

With the World Bank's INR 3600 Crore investment in transforming Bengaluru's stormwater systems, now is a critical moment to ground this transformation in data, public participation, and design thinking. However, successful transformation must begin with the right information.

Together, we can reshape Bengaluru into a resilient, climate-ready city—one where water networks are protected, celebrated, and sustained for generations to come.

2 Information Before Action

Information is the first crucial step towards action. The information about the city's stormwater system is currently dated, unreliable and insufficient for meaningful transformation.

It is also crucial to make information on the city's stormwater system observable by communities and the public at large to drive any positive change.

A database of stormwater drains ensures visibility and accountability. It allows for context-sensitive interventions rather than quick engineering fixes.

The GIS data currently available to the public about the condition of stormwater drains and their paths on-ground is inaccurate or non-existent.

By reviewing on-ground alignments and identifying urban adjacencies through typology workshops, we have arrived at a reliable database for the next step: Collecting hyperlocal on-ground information.

Through the Citizen-led audits, the stormwater drains (SWDs) are made visible and observable to the public and build awareness about Bengaluru's stormwater system.

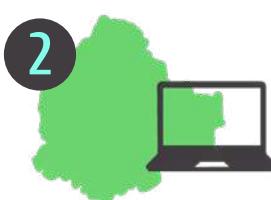
The database created through the audits will feed into a city-wide dashboard showcasing information about stormwater infrastructure, vulnerability to waste accumulation, water quality and challenges in upkeep of the SWDs.

1



Collating all GIS data available on SWD

2



Reviewing the data and identifying the SWD typologies

3



Collecting ground level information through CITIZEN-LED AUDITS



3 Citizen Audit

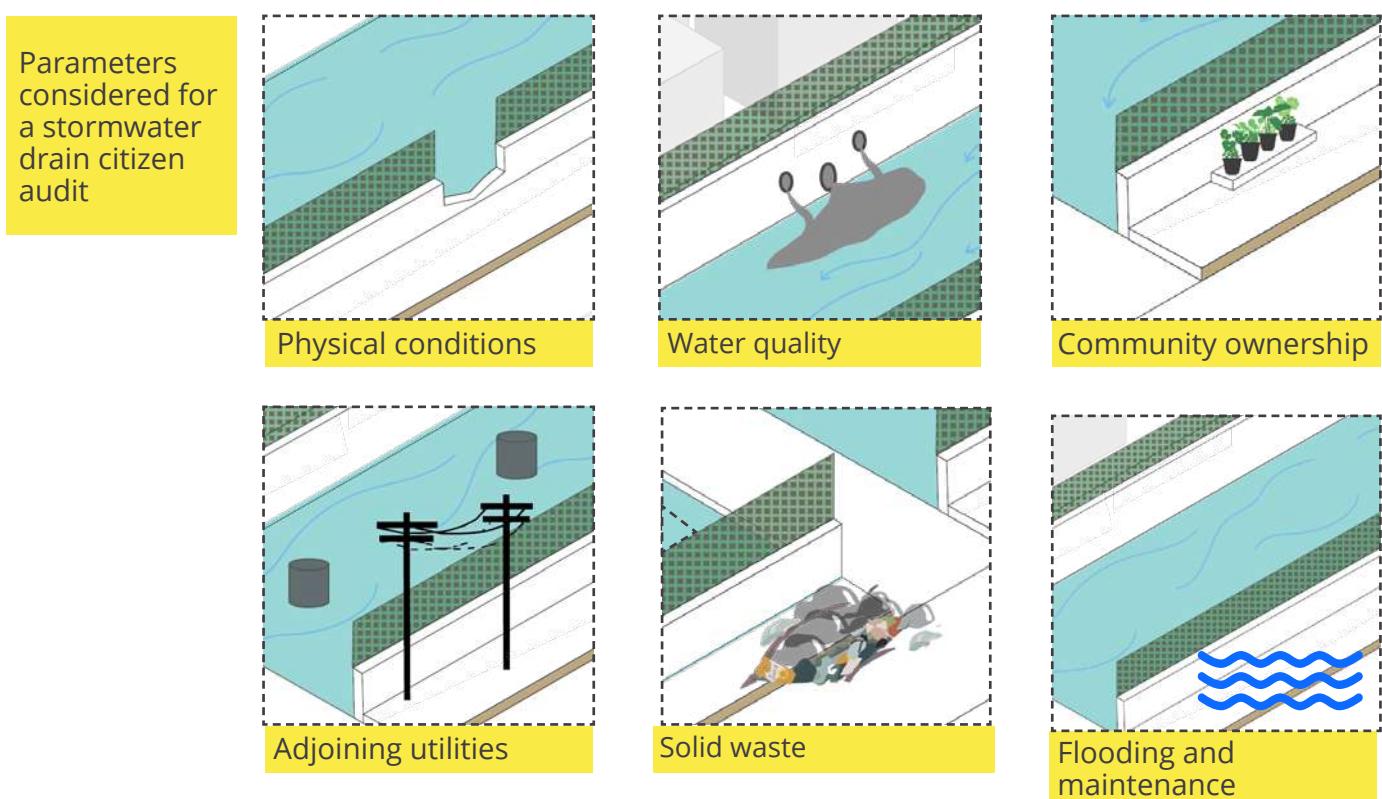
About Citizen Audit

The citizen-led audit is a participatory and civic awareness activity intended to build awareness and visibility of Bengaluru's stormwater system amongst the public, facilitate citizen engagement, enable the public to contribute reliable and accessible information about the stormwater drains in the city, and inform future local action.

Using audit tools, the participants will step out to see and record the stormwater drains (SWDs) through observations and visual data collection of physical conditions,

flood resilience, water quality, solid waste, community ownership and maintenance of SWDs. For every audit the participants will observe one given segment of a stormwater drain and submit geo-tagged photos and observations.

The objective of this workshop is to build a database of verified on ground information about the physical condition of Bengaluru's stormwater system. This data will feed into a publicly accessible interactive stormwater dashboard for the city.



Tools

The participants will be using accessible and easy to use phone applications for the citizen audit. These applications/ apps will be either built-in to the phone or free to download. However, keep in mind to use an android phone as the audit tool is only android-compatible. Listed below are the apps to keep ready-to-use in your phone before the audit day:



ODK Collect App

To input observations using the audit forms



Google Maps

To check locations and observation points



Phone Camera

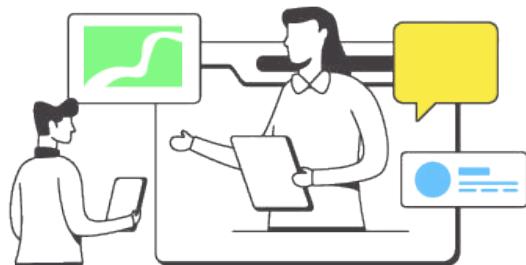
To collect visual information

Methodology

Pre-Audit

A masterclass to build knowledge and capacity to conduct audits

- Understand Bengaluru's stormwater system
- Identify stormwater drains to audit
- Form teams & divide roles
- Set up apps and download audit forms



Audit Day

A day in the field to see, observe and record the stormwater drain (SWD)

- Physical condition and adjoining utilities
- SWD connections, water quality, solid waste and clean up efforts
- History of flooding and maintenance



Post-Audit

- Submit all forms and upload additional data
- Audit feedback



4 Step-by-Step Guide

Pre-audit Prep

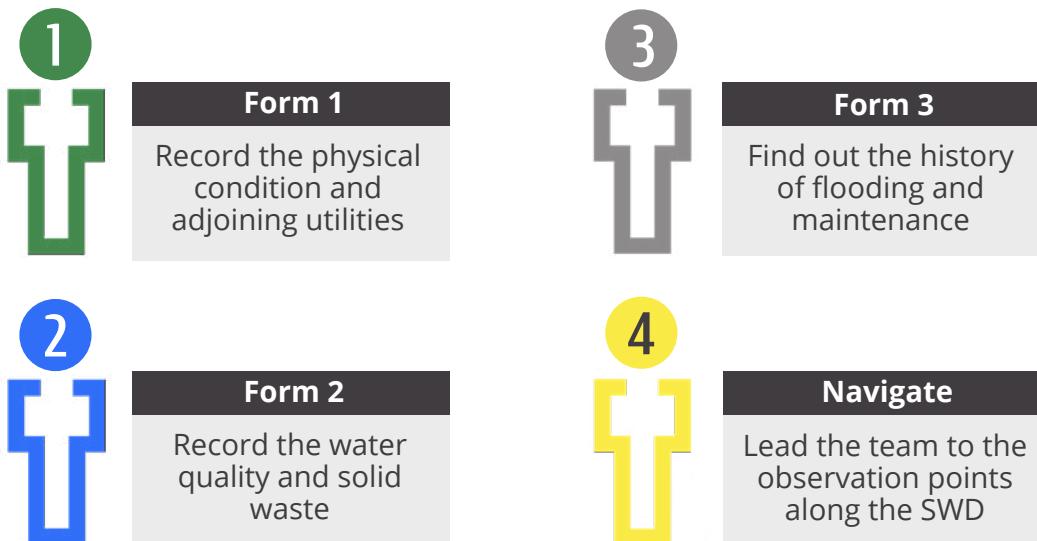
- All the participants will **learn about Bengaluru's stormwater system**, going over its history, current problems in design, management and governance, climate adaptation and good practices through the masterclass.

[Access the document here.](#)

- Participants will be divided into **teams of four**.
- Each team will be given a **unique code** that will come in handy during the audit.
- Each team will be assigned **one segment of an SWD** to audit.

Team & Roles

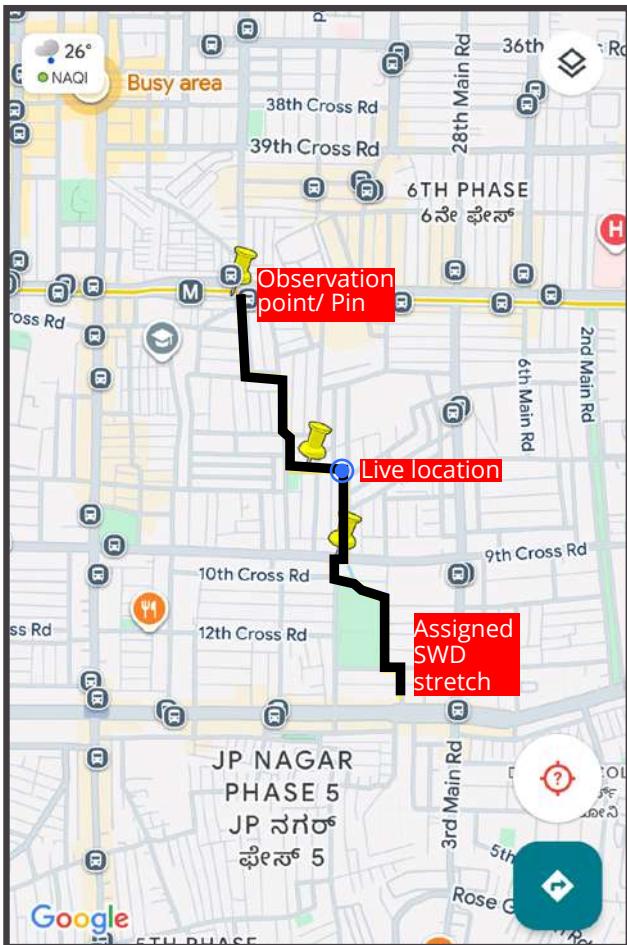
- To conduct the audit, each team has to **fill three audit forms** at several locations. Three participants should be assigned each of the three forms, available on the ODK collect app. One participant should navigate and lead the team to the observation points using Google My Maps.



About the Audit Forms

- Each form is divided into sections. Form 1 and 2 should be filled by participant 1 and 2. Form 3 should only be filled at least once by participant 3.

Form 1	Form 2	Form 3
Record the physical condition and adjoining utilities	Record the water quality and solid waste	Find out the history of flooding and maintenance
General information and safety	General information and safety	General information and safety
Retaining wall	SWD connections and water quality	Flooding and maintenance
Bridge condition	Solid waste and cleanup efforts	
Utility lines and manholes		



SWD Location Map

A Google My Maps link provided to the team for reference will show the assigned SWD as a line feature. The **starting point and multiple observation points** will be marked as points. The LHS and RHS wall also be marked on the points.

Using the provided Google My Maps link, participant 4 will walk along the SWD stretch and stop at every pinned location for observations to be recorded. Each pin is 100 meters apart.

The 'live location' mark (denoted by the blue dot) can be used to navigate and align yourself to the path marked out on the map.

When the 'live location' mark hovers over a pin, the team can stop at a safe location and record their observations.

Note that the **pins are only indicators**, the team can record at places they may find more suitable.

Your Team's My Maps Link:

Your audit team has been assigned a custom My Maps link to guide you during fieldwork. This link is unique to your team. We expect you to enter the team code and RHS/LHS details as given on My Maps.

Your team code is A1.

Google My Maps link link for A1:
<https://www.google.com/maps/d/viewer?mid=105Z-0LHy3e002V4RWoI7KExHF78U1q0&ll=12.913263339520828%2C77.58722016694749&z=16>

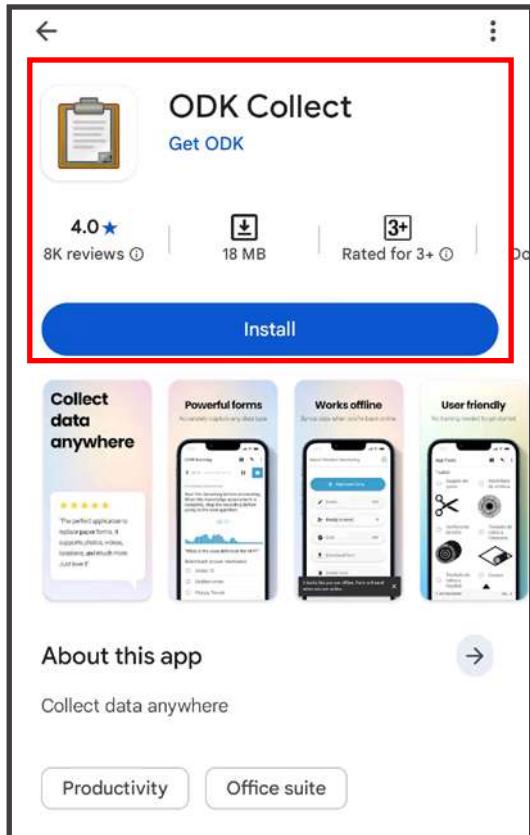
Team code A1 - Google My Maps
 Team code A1
www.google.com

Unique Team Code

Google My Maps Link

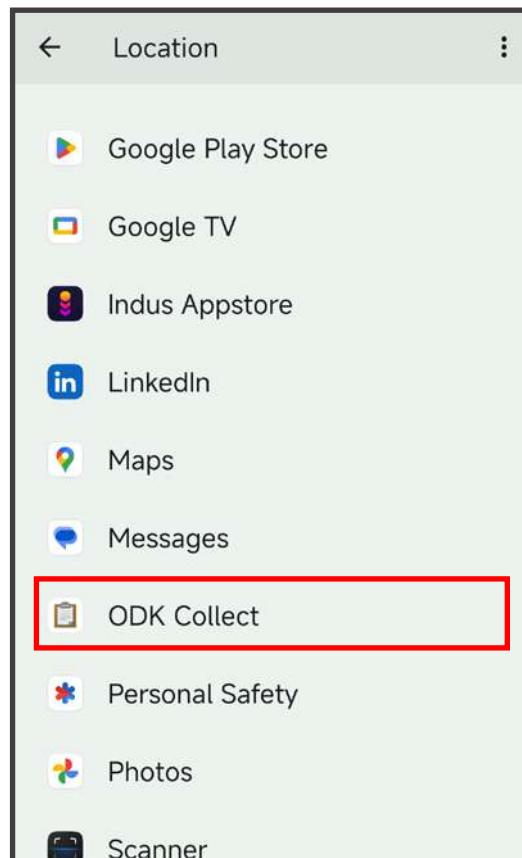
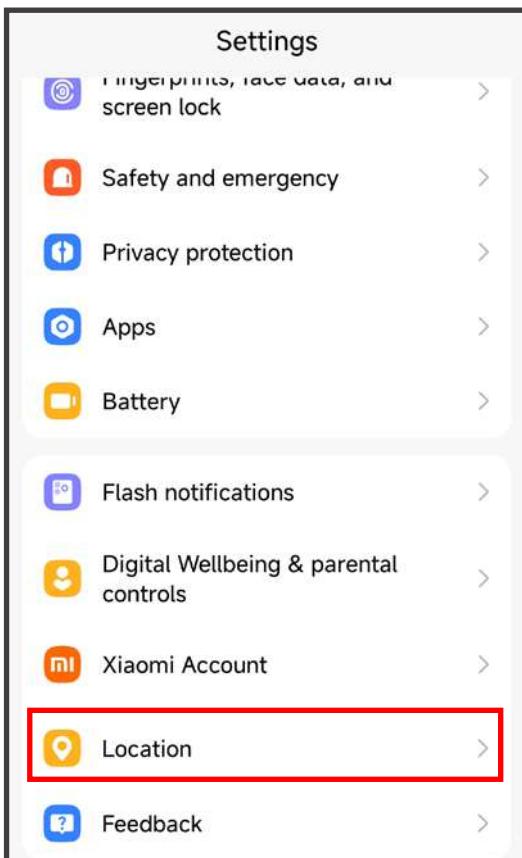
— Details about the unique team code and Google Maps location to the assigned SWD will be **communicated through an email**.

Download the Audit Tool



- Link to [download the audit tool "ODK Collect"](#) has also been provided in the email. Conversely, the participants can download the audit tool by searching for it on the Google Play Store.

Enable Location Access



- Open phone settings and scroll down to find the "Location" page.
- Inside the "Location" page, you will see a list of apps. Select "ODK Collect" from the list to change the location permissions for this app.

Location permission



ODK Collect

Location access for this app

Allow only while using the app

Ask every time

Don't allow

Use precise location

When precise location is off, apps can access your approximate location



Location permission



Camera

Location access for this app

Allow only while using the app

Ask every time

Don't allow

Use precise location

When precise location is off, apps can access your approximate location



- Under Location permission, select "Allow only while using the app." Toggle on "Use precise location."

- Follow the same steps to allow location access for the Camera app.

Download the audit forms



Collect data
anywhere



Configure with QR code

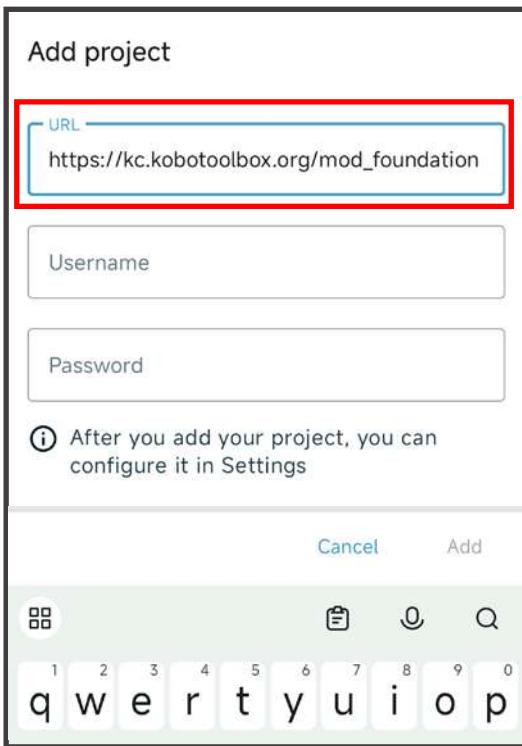


Manually enter project details



- Open ODK Collect. A homepage will appear. To continue forward, you can either select the "Configure with QR code" option or the "Manually enter project details" option.

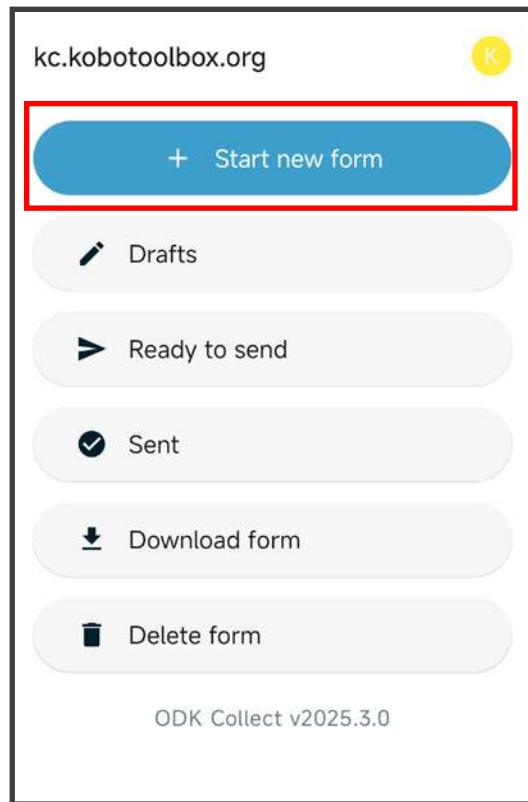
- To configure with QR code, scan the above QR code.



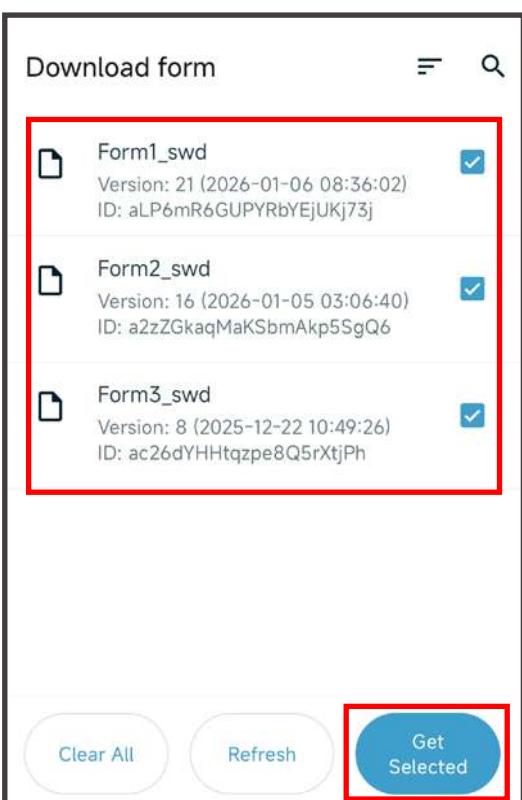
- To manually enter project details type the URL given below and select "Add."

URL: https://kc.kobotoolbox.org/mod_foundation

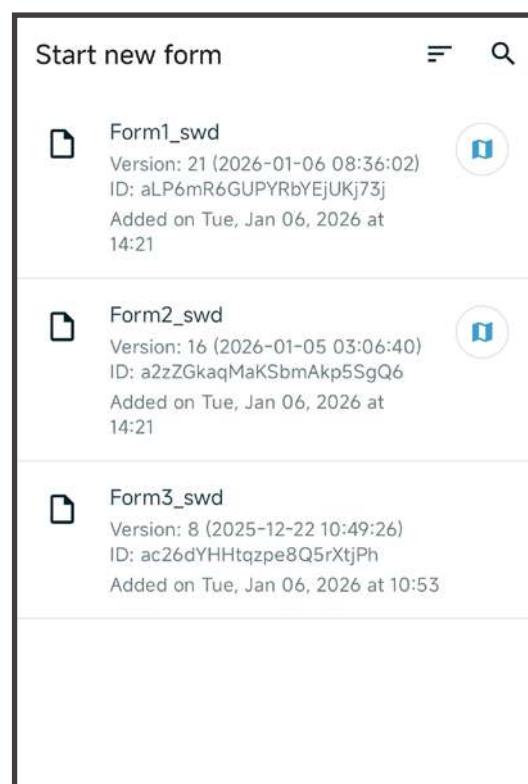
Leave the username and password boxes empty.



- Once configured, the above page will appear. Select "Start new form" to download the audit forms.



- Tap all the check-boxes to select all forms. Then select "Get Selected" to download.

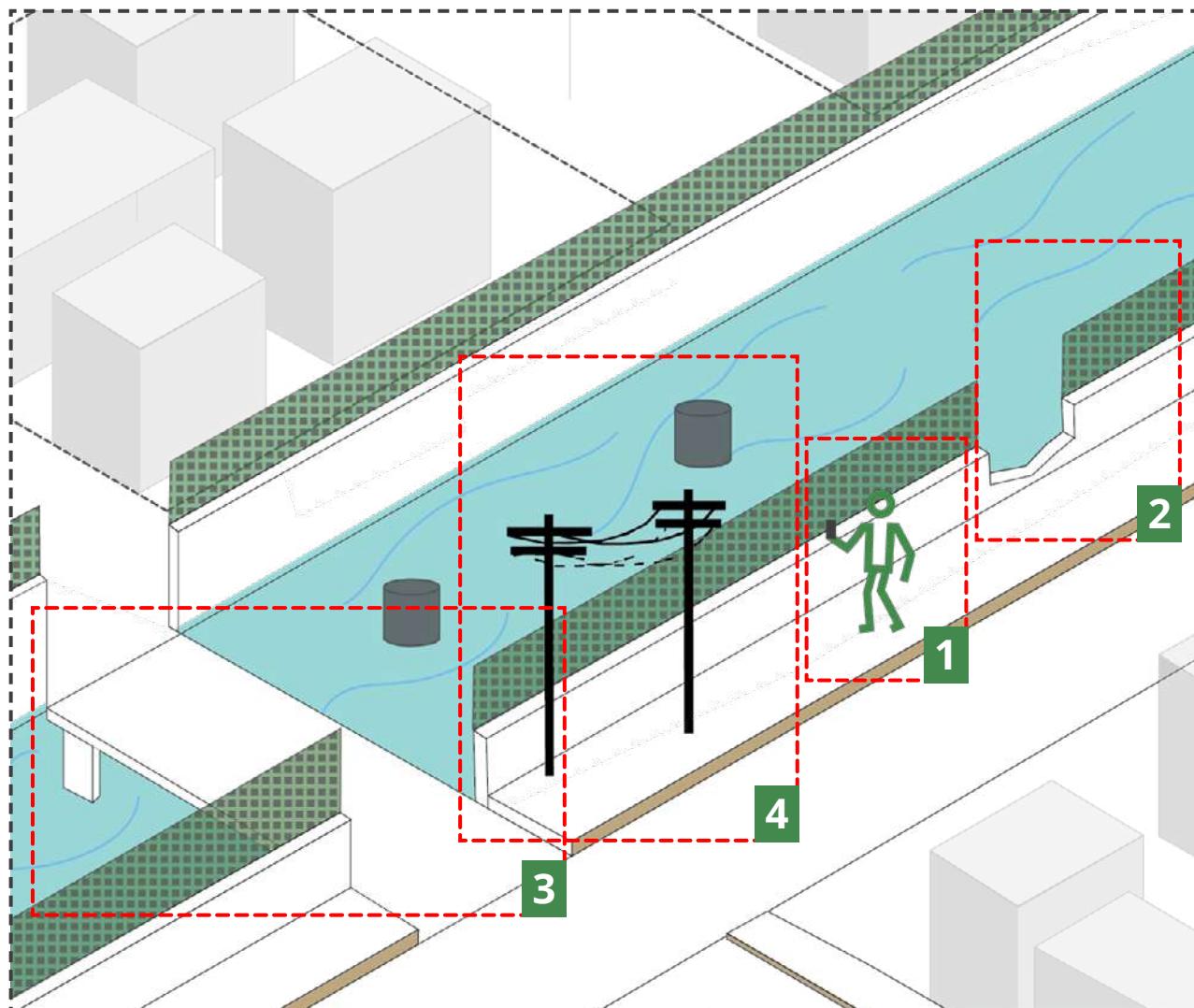


- Now you have all forms ready to start the audit!

FORM 1

OBSERVING THE PHYSICAL CONDITION OF STORMWATER DRAIN (SWD) AND ADJOINING UTILITIES

This form helps the participant record information regarding (1) the physical condition of the retaining wall that enclose the SWDs, (2) the bridges that exist at particular distances over the SWDs, (3) and utilities such as power lines, sewer lines etc that tend to run along the SWDs.



1 General information and safety

Ensure safety
Select team code
Select side of stormwater drain
Record current location
Record date and time

2 Retaining wall

Condition of the retaining wall
Height of the retaining wall
Presence of fence
Material type
Street character

3 Bridge condition

Type of bridge
Condition of the bridge
Number of piers

4 Utility lines and manholes

Utility lines along the SWD
Utility lines inside the SWD
Sewer manholes

Start new form

Form1_swd
Version: 21 (2026-01-06 08:36:02)
ID: aLP6mR6GUPYRbYEjUKj73j
Added on Tue, Jan 06, 2026 at 14:21

Form2_swd
Version: 16 (2026-01-05 03:06:40)
ID: a2zZGkaqMaKSbmAkp5SgQ6
Added on Tue, Jan 06, 2026 at 14:21

Form3_swd
Version: 8 (2025-12-22 10:49:26)
ID: ac26dYHtqzpe8Q5rXtjPh
Added on Tue, Jan 06, 2026 at 10:53

Form1_swd

Form 1: This form is regarding physical condition of Stormwater Drain (SWD) and adjoining utilities. For the audit, visit the SWD and observe the state. Each team is given a team code. Refer to the audit checklist emailed to you. Document the different parameters. Please conduct the audit for the path given. LHS and RHS are given to you in the form of lat./long in the My Maps link. Your safety is our priority. Please ensure that you and your teammates are safe at all times. Thank you for participation.

- To start form 1, click on 'Form1_swd'

Form1_swd

Section 1: General information and safety

Form1_swd

* 1.1 Your safety is our priority. Please stand at a safe distance from the SWD

Yes, I feel safe to conduct the audit

No, I do not feel safe. I will stop the audit at this point.

- Before you begin observations confirm your safety and record general information in Section 1.

- Make sure to stand at a safe distance before you start recording your observation.

Form1_swd

* 1.2 Team code
Please write the team code given to you in the audit checklist email.

Select Answer

←

A1

A2

A3

A4

- Select your team code from the drop down list (your team code is assigned to you in the email communication).

- Select from the drop down list.

Form1_swd

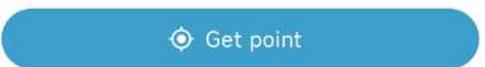
* 1.3 Enter Right hand side and Left hand side (as per the My Maps)

Select Answer

Form1_swd

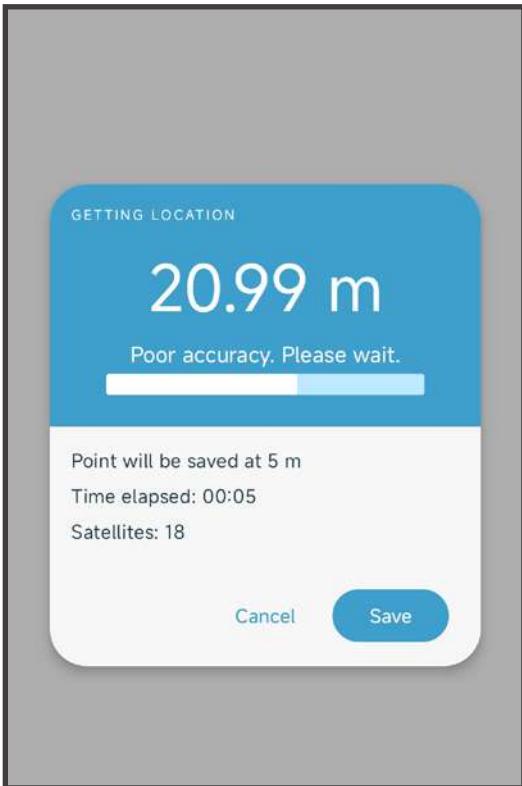
* 1.4 Record your current location, when prompted for selecting between precise and approximate location accuracy, always select precise

This is your audit point. You are expected to make all observations at and around this point. Look around and make observations.

 Get point

- Mention if you are standing on the LHS or RHS side of the stormwater drain (SWD).

- Select 'Get point' to record the precise location of your observation point.



* 1.4 Record your current location, when prompted for selecting between precise and approximate location accuracy, always select precise

This is your audit point. You are expected to make all observations at and around this point. Look around and make observations.

 Change point

Latitude: N 12°58'32"

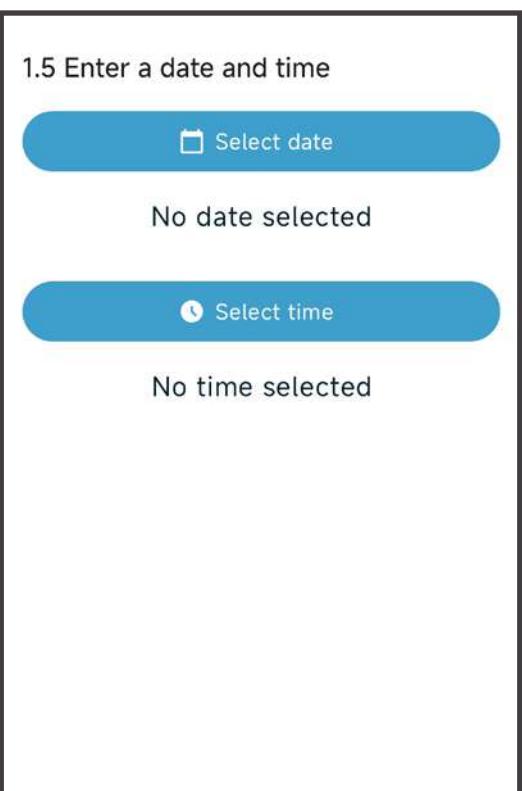
Longitude: E 77°36'9"

Altitude: 844.8 m

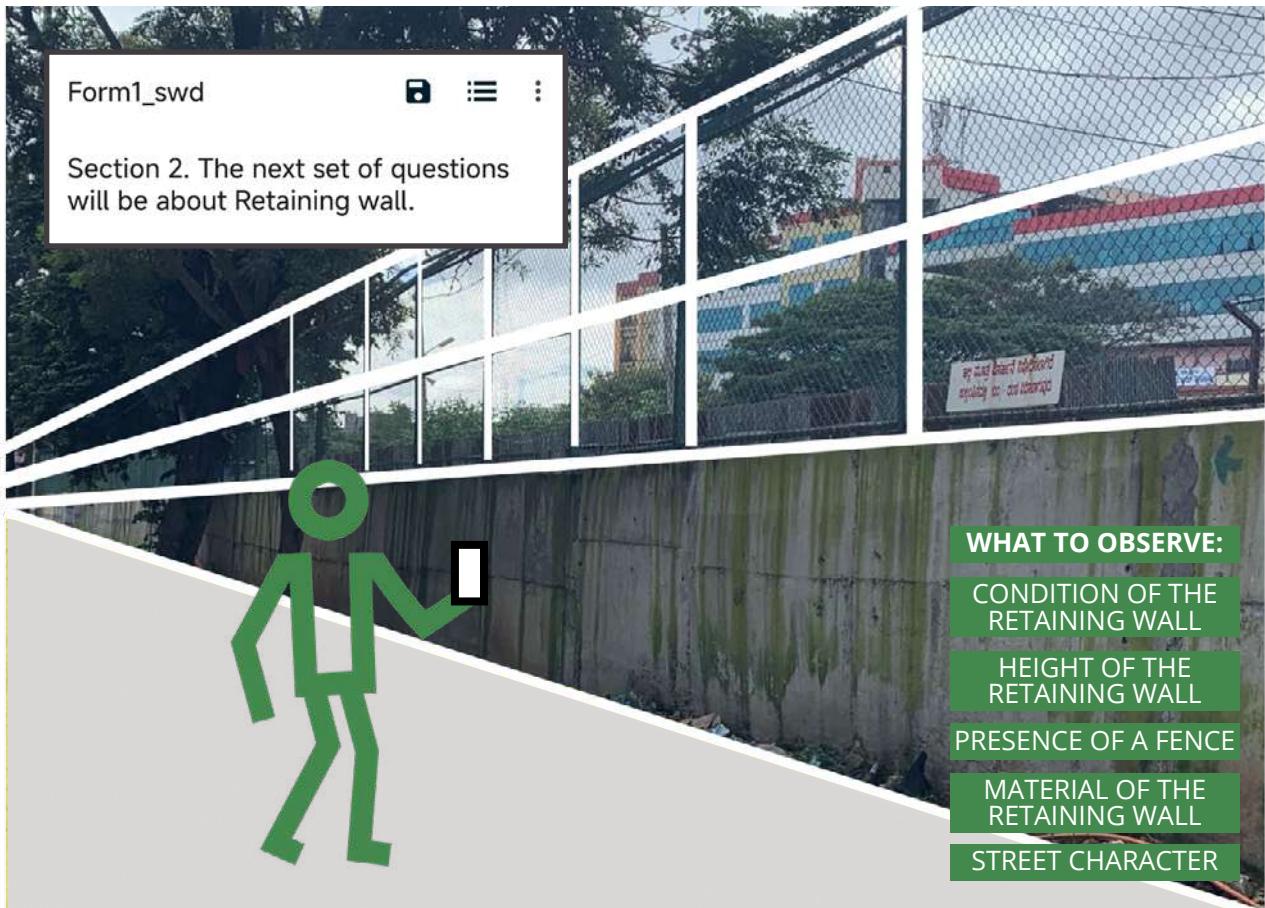
Accuracy: 4.45 m

- Wait till the location accuracy is within 5 metres.

- Your location coordinates, altitude and accuracy will be recorded for the specific observation.



- Enter the date and time for the specific observation.



Observe the retaining wall in Section 2. You will be required to click photos of the retaining wall. **Refer to best practices on how to click the ideal photo and the reference sheet** at the end of this section to guide you to make observations.

Form1_swd

* 2.1 What is the condition of the retaining wall?

- Retaining wall does not exist
- Retaining wall intact throughout the stretch
- Broken in some places

Form1_swd

2.2 Height of retaining wall from the road level (approx.)? Ask a person to stand near the wall. If you know their height you can use it to write the approximate height of the retaining wall.

- Observe the condition of the retaining wall along the SWD and select the relevant option.

- Calculate the approximate height of the wall from the road (not from inside the SWD.) Mention the height in feet.

Form1_swd



* 2.3 Observe if there is a fence on top of the retaining wall.

- Yes, covered only on sides
- Yes, covered on sides and top
- There is no fence
- Not applicable

Form1_swd



* 2.4 Material of retaining wall

- Solid Stone Masonry (SSM)
- Reinforced Cement Concrete (RCC)
- Both, SSM and RCC
- I do not know what the material is
- Not applicable

— Check if there is a fence on the sides and top of the SWD.

— Check the material of the retaining wall. It may be built out of RCC, SSM or a combination of the two.

Form1_swd



2.5 Please take a picture of the retaining wall.

Please refer to the audit guidebook for good photograph practices.

Take Picture

Choose Image

Form1_swd



2.6 Take a photo of the street such that the buildings are visible. Take photo in the direction of your movement.

Please refer to the audit guidebook for good photograph practices.

Take Picture

Choose Image

— Click a photo of the retaining wall and fence by selecting 'Take Picture'. Refer to the best practices in the following page.

— Click a photo of the street by selecting 'Take Picture'. Refer to the best practices in the following page.

Best practices for clicking a photo of the retaining wall:



Click the photo facing along the SWD.

Make sure a section of the retaining wall and fence from top to bottom is clearly visible. Include some of the surroundings.

A person can be in the frame and stand near the wall as reference.



Don't click the photo facing straight towards the wall.

Don't click the photo from across the road.



Avoid clicking where there are a lot of obstructions blocking the view of the retaining wall.



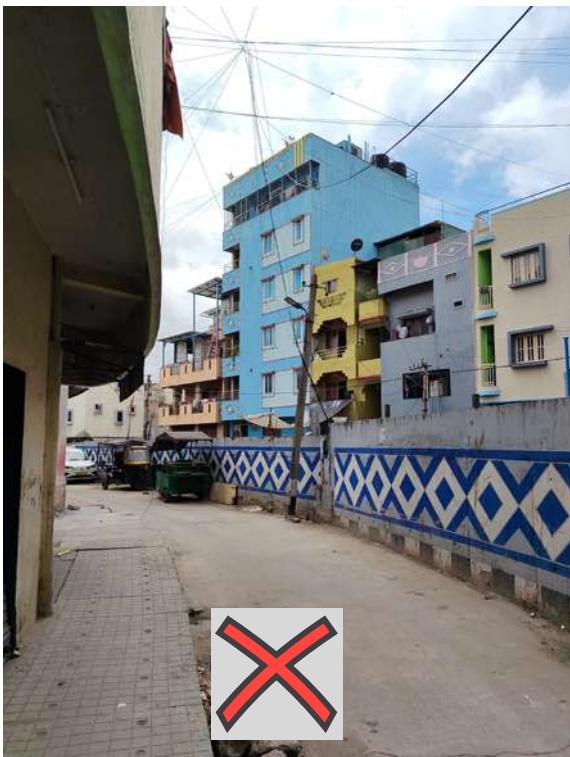
Don't crop the top or bottom of the wall and fence.

Best practices for clicking a photo of the street:



Click the photo facing toward the street.

Make sure the buildings along the road are visible. You may also include part of the retaining wall of the SWD in the photo.



Don't crop out or zoom in on the buildings. Find the angle that captured most of the buildings opposite the SWD.



Avoid clicking where there are obstructions such as vehicles blocking the view of the street.

Reference Sheet for Retaining Wall and its Conditions

This reference sheet is provided to familiarise the participant on what to look out for when conducting the audit.

Condition of Retaining Wall



Height of Retaining Wall

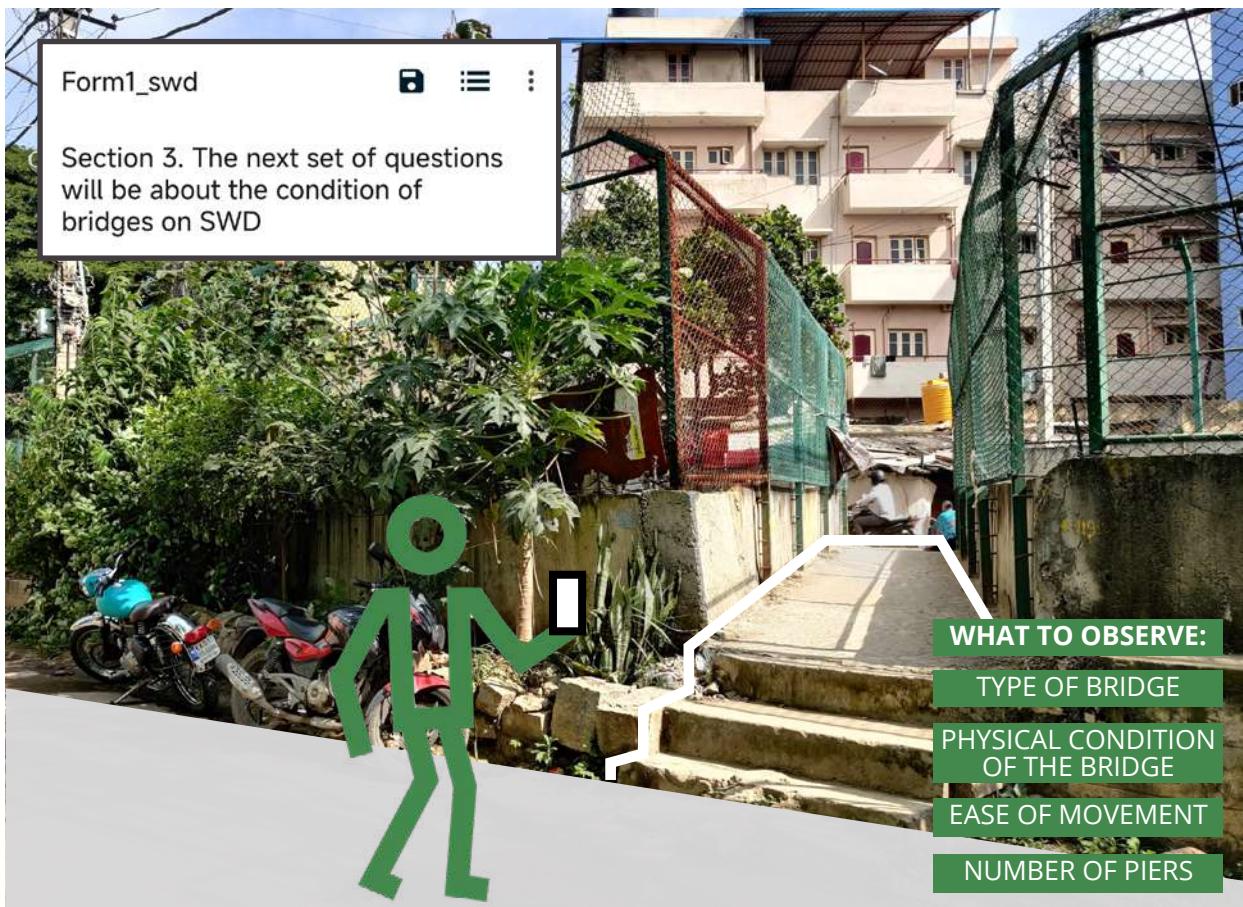


Presence of Fence



Material of Retaining Wall





Observe the bridge and its condition in Section 3. You will be required to click photos of the bridge. **Refer to best practices on how to click the ideal photo and the reference sheet** at the end of this section to guide you to make observations.

Form1_swd

* 3.1 Type of Bridge?

- Vehicular, I can see vehicles on the bridge
- Pedestrian, I see only people walking on the bridge
- Not applicable

Form1_swd

* 3.2 Bridge Condition

Look for physical condition

- Broken wall/fence
- Broken path
- Intact; path and fence not broken
- Not applicable

- Bridges can be either pedestrian or vehicular. Judging by how the bridge is being used select the appropriate response.

- Observe the physical condition of the bridge based on broken or intact path and fence.

Form1_swd

**3.3 Bridge Condition**

Please answer based on ease of movement.

- Safe to walk (clear path)
- Obstructed path (solid waste)
- Obstructed path (parking)
- Not applicable

Form1_swd

**3.4 Take a picture of the bridge. A good image will ideally include the top of the bridge, showcasing entry/exit.**

Please refer to the audit guidebook for good photograph practices.

Take Picture

Choose Image

- Observe the ease of movement on the bridge based on clear or obstructed path.

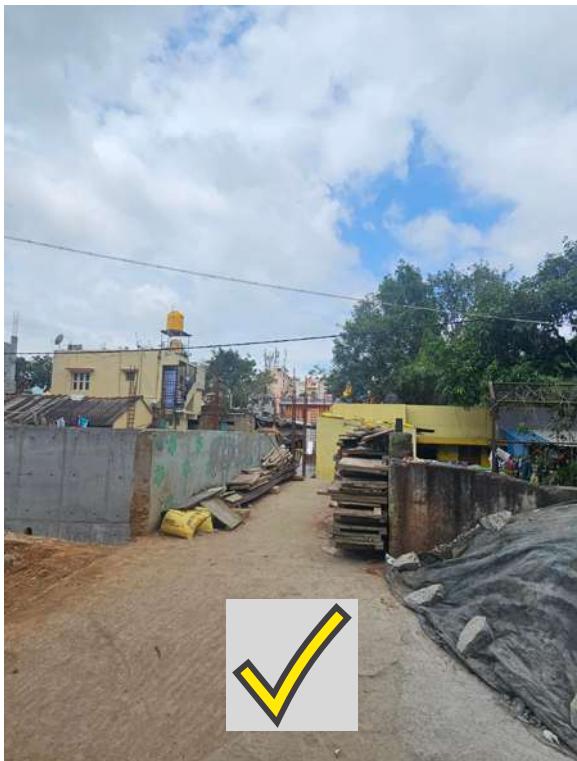
- Click a photo of the bridge by selecting 'Take Picture'. Refer to the best practices in the following page.

Best practices for clicking a photo of the bridge:



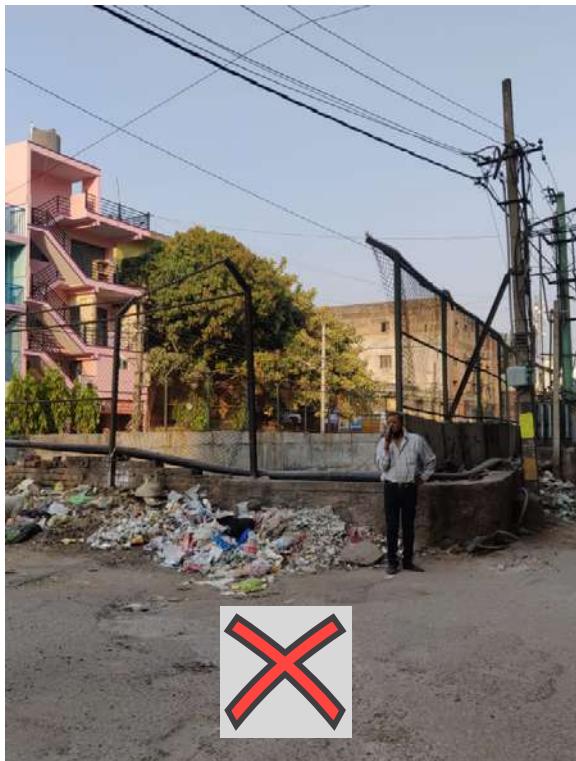
Click the photo facing towards the bridge at an angle where most of the bridge is visible.

A person can be in the frame and stand on the bridge as reference.



If possible, include some of the surroundings in the frame.

Also make sure to include the bridge walls, fences and path or any obstructions on the bridge.



Don't click the photo standing on the bridge or standing parallel to the bridge.

If the bridge is too wide, you may click from across the road.

Form1_swd



* 3.5 Does the bridge have piers?

- Yes _____
- No _____
- Not applicable _____

Form1_swd



* 3.6 Number of Piers? Please specify. If there are no piers, write 0
Please refer to the audit guidebook for good photograph practices.

- Bridge is usually supported by piers that emerge from inside the SWD. Check if you see any piers under the bridge.

- If you see piers, count and fill the number. If there are no piers, type 0.

Form1_swd



3.7 Take a picture of the bridge. A good image will ideally show underside of the bridge with piers.

Please refer to the audit guidebook for good photograph practices.

Take Picture

Choose Image

- Take a photo of the bridge by selecting 'Take Picture.' Refer to the best practices in the following page.

Best practices for clicking a photo of the bridge piers:

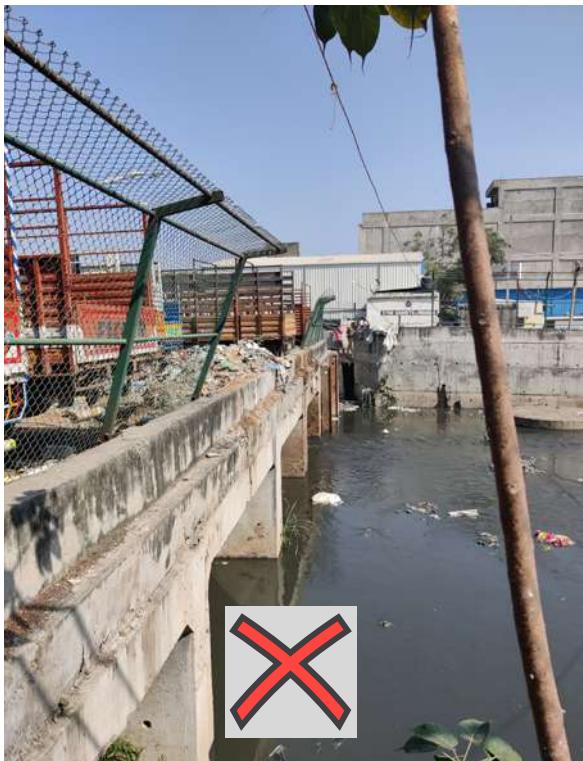


Click the photo facing towards the bridge at an angle such that the piers below it are visible. Include the base of the piers where they stand on the SWD



You may click the photo from a distance to include the entire bridge in the frame.

You may also click a photo of bridges that don't have piers.



Don't click the photo standing on the bridge or standing perpendicular to the bridge. Make sure to include the opposite ends of the bridge in the frame.



Do not zoom in too close, crop out the bridge or click the photo from a horizontal angle looking over the bridge.

Reference Sheet for Bridge and its Condition

This reference sheet is provided to familiarise the participant on what to look out for when conducting the audit.

Type of Bridge



Vehicular
Wide road, predominantly used by vehicles



Pedestrian
Narrow, may have steps, predominantly used by people

Bridge Condition – Physical condition



Broken wall or fence



Broken path



Intact wall, fence and path

Bridge Condition – Ease of movement



Safe to walk/ clear path



Obstructed path (solid waste)

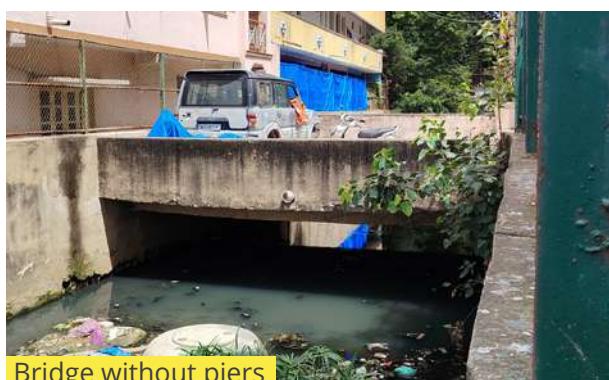


Obstructed path (parking)

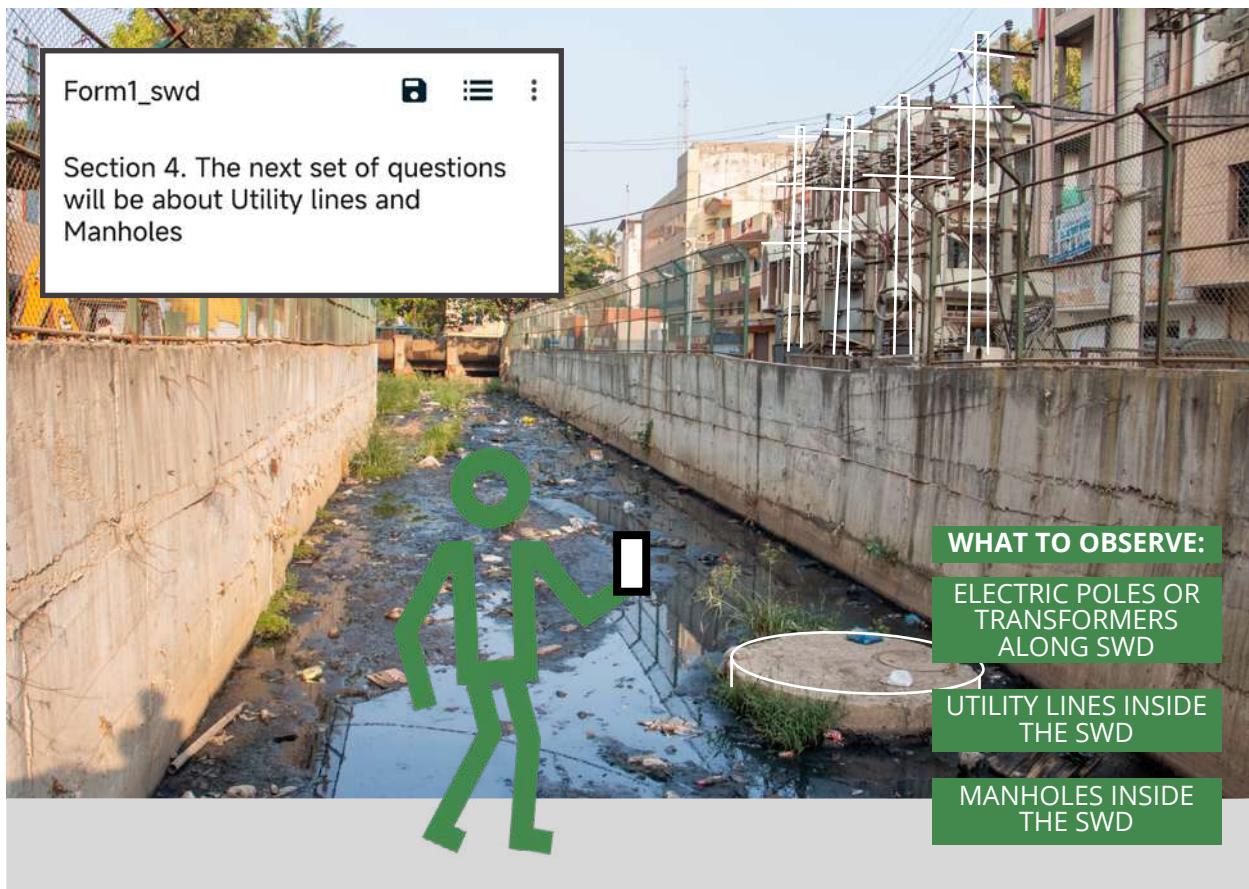
Piers



Bridge with piers



Bridge without piers



Observe the utility lines and manholes in Section 3. You will be required to click photos of the utilities. **Refer to best practices on how to click the ideal photo and the reference sheet** at the end of this section to guide you to make observations.

Form1_swd

* 4.1 Are there any electricity lines, transformers outside the SWD?

Yes

No

Form1_swd

4.2 Please take a picture of electricity lines, transformers outside the SWD.
Please refer to the audit guidebook for good photograph practices.

Take Picture

Choose Image

- Note the presence of electric poles, transformers or electric boxes along the SWD (outside the SWD).
- Take a photo of the electric lines you see outside, along the SWD by selecting 'Take Picture.' Refer to the best practices in the following page.

Form1_swd

*** 4.3 Are there cables or lines crossing the SWD?**

You should observe utility line inside the SWD.

- Yes
- No
- Cannot see

Form1_swd

**4.4 Please take a picture of utility lines inside the SWD.**

Please refer to the audit guidebook for good photograph practices.

— Note the presence of any cables/ lines inside/ crossing the SWD.

— Take a photo of the utility lines inside the SWD by selecting 'Take Picture.' Refer to the best practices in the following page.

Best practices for clicking a photo of the utility lines outside:



Click a photo of the utility lines that are outside but running along the SWD.

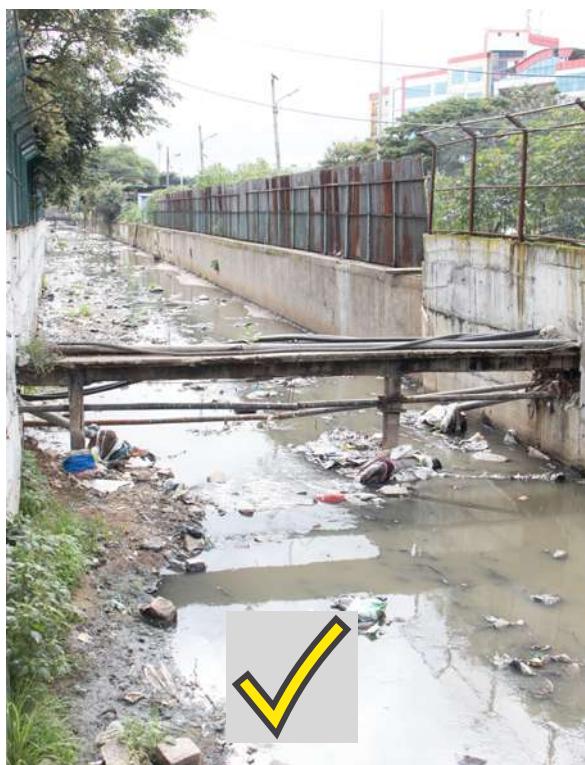
You may click the photo a little away and from across the road to include all the utilities in the frame.



Don't stand too close or crop out the utility structures. SWD retaining wall and fence should be visible in the background.

Don't click the photo of the utility lines that are across the road from the SWD.

Best practices for clicking a photo of the utility lines inside:



Make sure to include both ends of the utility lines crossing the SWD.

Click the photo along the SWD, include SWD and surroundings in the frame.



Do not zoom in too close or crop out the utility lines.

Form1_swd



* 4.5 Are there manholes in the SWD?

Yes

No

Cannot see

Form1_swd



4.6 Please take a picture of manhole in the SWD

Please refer to the audit guidebook for good photograph practices.

Take Picture

Choose Image

— Note the presence of manholes inside the SWD (indicating presence of a sewer line.)

— Take a photo of the manholes by selecting 'Take Picture.' Refer to the best practices in the following page.

You are at the end of Form1_swd.



Edits can't be made after finalizing.

If you need to make edits to your form, "Save as draft" until you're ready to send.

Save as draft

Finalize

— Select 'Finalize' to submit the form before moving on to the next observation point.

Please repeat form 1 at every point along the SWD.

Best practices for clicking a photo of the manholes:



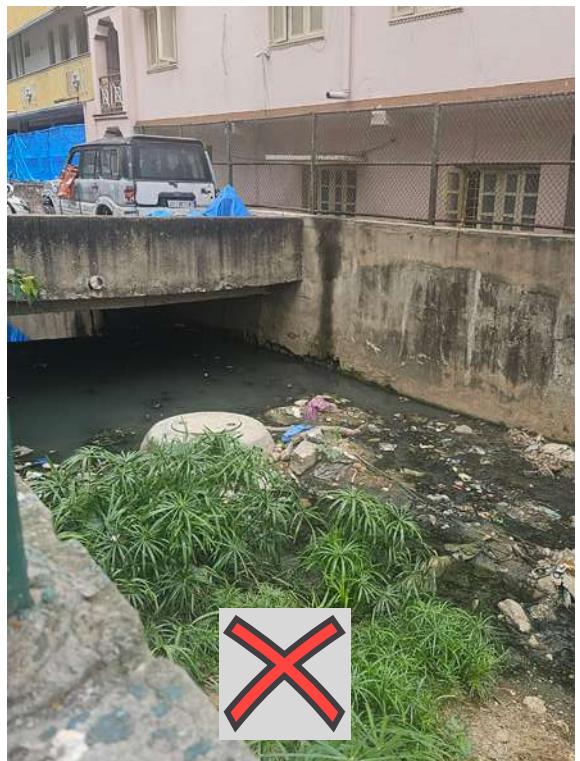
The photo of the manhole should include the SWD base and retaining walls along with some of the surroundings.



In case of multiple manholes, try to include all in one frame.



Do not zoom in too close or crop out the manholes or surroundings.

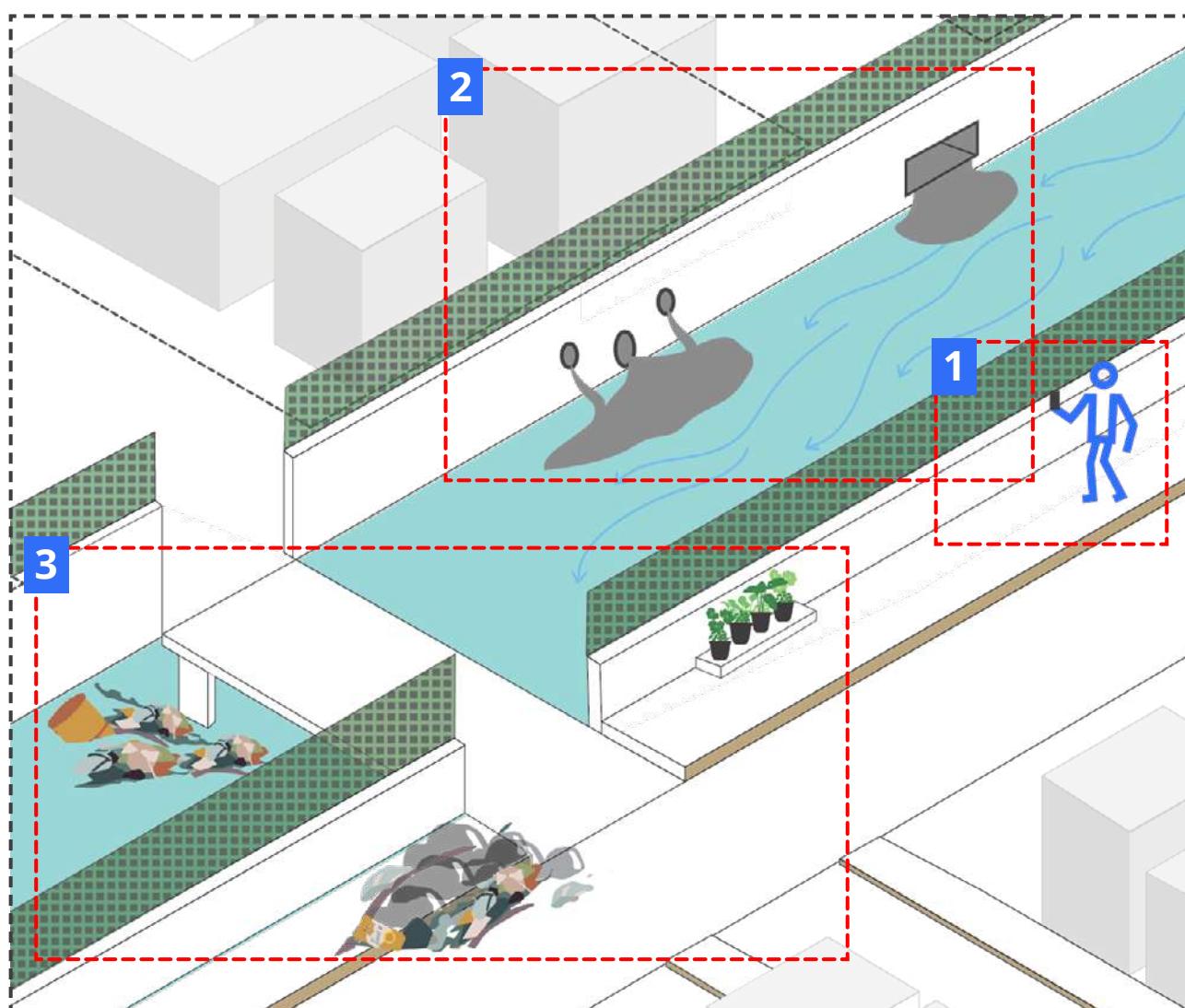


Do not take photo where other objects such as vegetation or solid waste may obstruct the view of the manhole.

FORM 2

OBSERVING THE WATER QUALITY AND SOLID WASTE ALONG SWD

This form helps the participant record information regarding (1) the stormwater connections to the SWD and the water quality and (2) the solid waste inside and outside the SWD.



1 General information and safety

Ensure safety
Select team code
Select side of SWD
Record current location

2 Water Flow and Water Quality

Stormwater connections
Unauthorised connections
Stagnant or flowing
Signs of contamination
Water colour
Turbidity
Odour

3 Solid Waste

Waste inside the SWD
Types of waste inside the SWD
Waste outside the SWD
Types of waste outside the SWD
Signs of clean up effort
Signs of community ownership

Start new form



Form1_swd
Version: 21 (2026-01-06 08:36:02)
ID: aLP6mR6GUPYRbYEjUKj73j
Added on Tue, Jan 06, 2026 at 14:21

Form2_swd
Version: 16 (2026-01-05 03:06:40)
ID: a2zzGkaqMaKSbmAkp5SgQ6
Added on Tue, Jan 06, 2026 at 14:21

Form3_swd
Version: 8 (2025-12-22 10:49:26)
ID: ac26dYHhtqzpe8Q5rXtjPh
Added on Tue, Jan 06, 2026 at 10:53

Form2_swd



Form 2: This form is regarding water quality and solid waste

For the audit, visit the SWD and observe the state. Each team is given a team code. Refer to the audit checklist emailed to you. Document the different parameters. Please conduct the audit for the path given. LHS and RHS are given to you in the form of lat./long in the My Maps link. Your safety is our priority. Please ensure that you and your teammates are safe at all times. Thank you for participation.

- To start form 2, click on 'Form2_swd'

- Once selected, the form explains the general rules of the audit.

Form2_swd



Section 1: General information and safety

Form2_swd



* 1.1 Your safety is our priority

Please stand at a safe distance from SWD

- Yes, I feel safe to conduct the audit
- No, I do not feel safe. I will stop the audit at this point.

- Before you begin observations confirm your safety and record general information in Section 1.

- Make sure to stand at a safe distance before you start recording your observation.

Form2_swd

* 1.2 Team code
Please write the team code given to you in the audit checklist email.

Select Answer

←

A1

A2

A3

A4

- Select your team code as assigned to you in the email communication.

- Select from the drop down list.

Form2_swd

* 1.3 Enter Right hand side and Left hand side (as per the My Maps)

Select Answer

Form2_swd

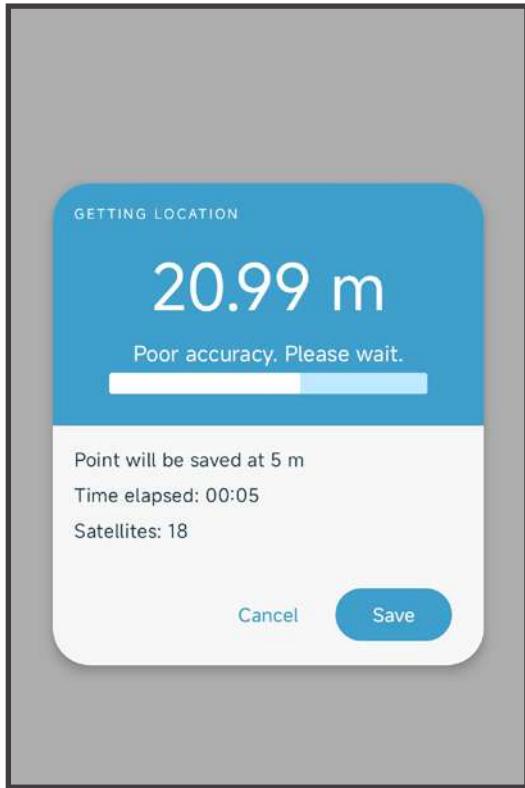
* 1.4 Record your current location, when prompted for selecting between precise and approximate location accuracy, always select precise

This is your audit point. You are expected to make all observations at and around this point. Look around and make observations.

 Get point

- Mention if you are standing on the LHS or RHS side of the SWD.

- Select 'Get point' to record the precise location of your observation point.



* 1.4 Record your current location, when prompted for selecting between precise and approximate location accuracy, always select precise

This is your audit point. You are expected to make all observations at and around this point. Look around and make observations.

Change point

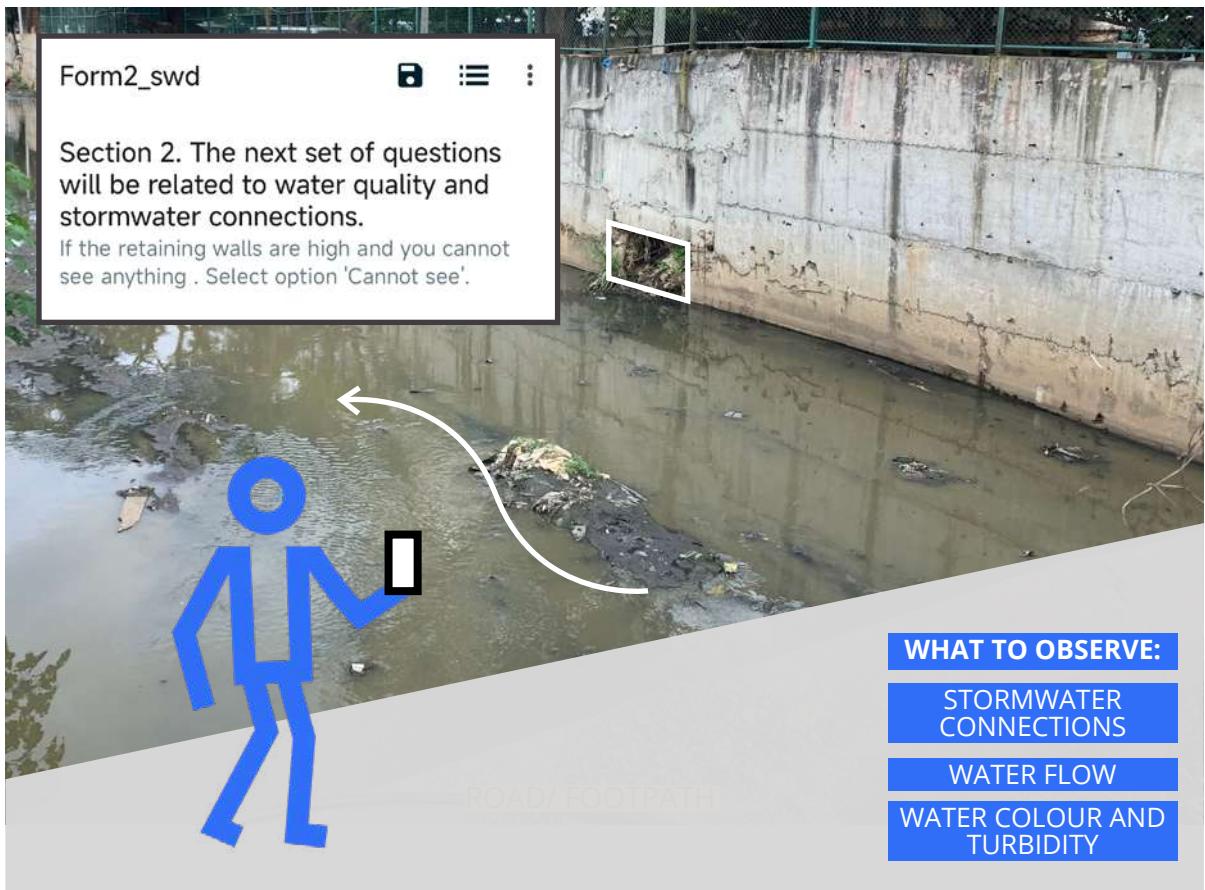
Latitude: N 12°58'31"

Longitude: E 77°36'9"

Altitude: 863.6 m

Accuracy: 3.92 m

- Wait till the location accuracy is within 5 metres.
- Your location coordinates, altitude and accuracy will be recorded for the specific observation.



Observe the SWD connections and water quality in Section 2. You will be required to click photos of the SWD. **Refer to best practices on how to click the ideal photo and the reference sheet** at the end of this section to guide you to make observations.

Form2_swd

* 2.1 Do you see stormwater connections/inlets connecting to the SWD?

yes

no

Cannot see

Form2_swd

2.2 Take a picture of stormwater connections/inlets.

Please refer to the audit guidebook for good photograph practices.

Take Picture

Choose Image

- Look for stormwater connections that join the SWD, you will be able to see inlets on the inner side of the retailing wall.
- Take a photo of the inlets you see by selecting 'Take Picture.' Refer to the best practices in the following page.

Form2_swd



* 2.3 Can you see any other unauthorized connections/inlets connecting to SWD?

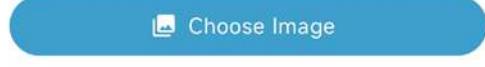
- Yes
- No
- Cannot see

Form2_swd



2.4 Please take a picture of unauthorized connections/inlets.

Please refer to the audit guidebook for good photograph practices.

 Take Picture Choose Image

- Look for inlets connecting the abutting buildings to the SWD.

- Take a photo of the inlets you see by selecting 'Take Picture.' Refer to the best practices in the following page.

Form2_swd



2.5 Any other observation, please specify

- Mention any other observations about the stormwater or unauthorised connections here.

Best practices for clicking a photo of stormwater connections/ inlet:



Click a photo of the stormwater inlets joining the SWD.

You may take the photo at an angle to include the SWD and some of the surroundings in the frame.



Don't zoom in too close or crop out the stormwater inlet.

Best practices for clicking a photo of unauthorised inlets:



Click a photo of the outlets from buildings going into the SWD. You may take the photo at an angle to include the SWD and some of the surroundings in the frame.



Do not zoom in too close or crop out the surroundings from the frame.

Form2_swd



* 2.6 Is the water stagnant or flowing?

- Flowing
- Stagnant
- Cannot see

Form2_swd



2.7 Signs of contamination (based on visible indicators)

- Froth or foam visible
- Black or grey water
- Clear
- Solid particles or oily film on water
- Cannot see

— Observe the water flow, it gives clues about the functionality of the SWD.

— Observe the visible signs of contamination, it indicated the quality of water in the SWD.

Form2_swd



* 2.8 How would you describe the water colour?

- Clear
- Yellow
- Milky
- Greenish
- Black
- Other Colour
- Cannot see

Form2_swd



* 2.9 How would you describe the turbidity?

- Clear
- Cloudy
- Opaque
- Cannot see

— Observe the colour of the water in the SWD. Water colour indicates the type of impurities/ effluents that may be mixing with the stormwater.

— Observe the clarity of water in the SWD. Turbidity indicates the presence of suspended particles in the stormwater.

Form2_swd



2.10 How would you describe the odour(smell)?

- No odour
- Less odour (I am able to stand near the SWD)
- Strong smell of sewage (unable to stand near the SWD)
- Strong smell, not necessarily sewage
- Cannot see or smell

Form2_swd



2.11 Take a photo such that the colour and turbidity are clearly visible.

Please refer to the audit guidebook for good photograph practices.

Take Picture

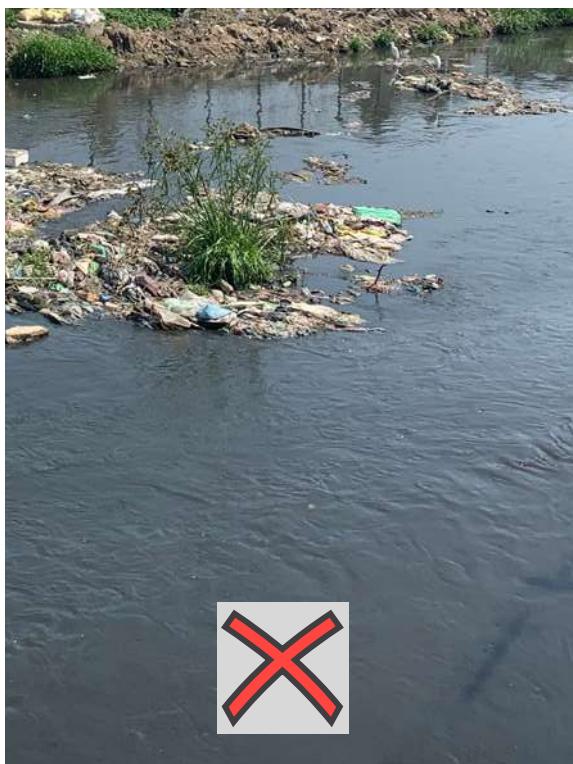
Choose Image

- Based on effluents or sewage mixing, SWDs tend to have an odour that indicated the extent of contamination.
- Take a photo of the water by selecting 'Take Picture.' Refer to the best practices in the following page.

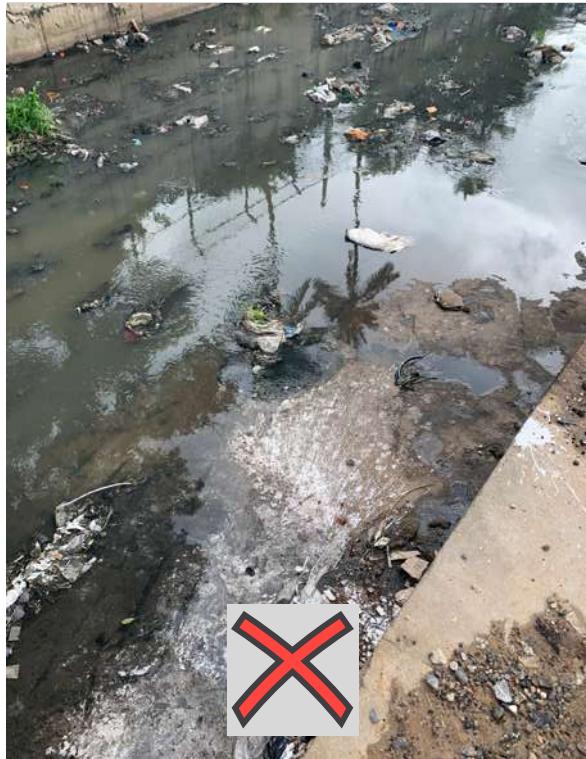
Best practices for clicking a photo of the water:



The photo of water should include the SWD retaining walls along with some of the surroundings.



Do not zoom in too close that only the water is visible.



Do not tilt the phone to take the photo. Keep the phone upright and lower it to take the ideal photo.

Reference Sheet for Stormwater Connections

This reference sheet is provided to familiarise the participant on what to look out for when conducting the audit.

Stormwater connections/ inlets

Identified as tertiary connections (often structured concrete roadside inlets) that join the SWD (the primary drain).



Unauthorised connections/ inlets

Identified as adhoc connections (often multiple holes/ piped inlets coming out of buildings) that add to the SWD (the primary drain).



Reference Sheet for Water Quality

This reference sheet is provided to familiarise the participant on what to look out for when conducting the audit.

Signs of contamination



Froth or foam visible
Indicates detergent, organic matter breakdown or high water velocity



Black or grey water
Indicates sewage cross-connection or industrial waste



Solid particles or oily film
Indicates soil runoff, construction debris, trash or oil leaks from roads

Water colour



Clear
No visible contamination



Yellow
Indicates soil runoff, plant matter, certain metal-rich discharges



Milky
Indicates detergents, paint, cement slurry, dairy/ food processing



Greenish
Indicates algae growth in slow or stagnant drains



Black
Indicates sewage cross-connection or industrial waste



Other
Bright unnatural colours indicate textile/ food dyes

Turbidity



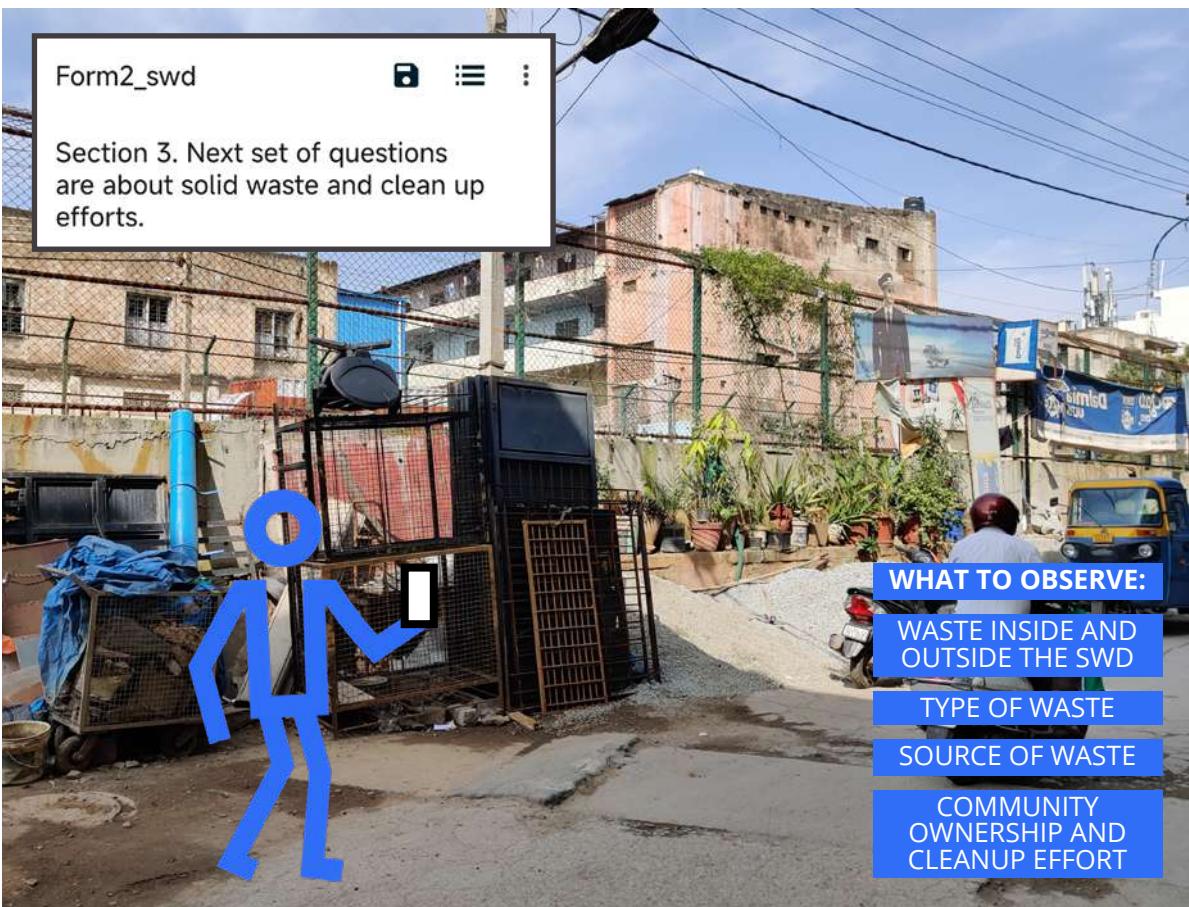
Clear
No visible contamination



Cloudy
Light or fine suspended particles



Opaque
Dense or heavy suspended particles



Observe the solid waste in Section 3. You will be required to click photos of the SWD. **Refer to best practices on how to click the ideal photo and the reference sheet** at the end of this section to guide you to make observations.

Form2_swd

...:

* 3.1 Is there solid waste inside the SWD?

Yes

No

Cannot see

Form2_swd

...:

* 3.2 Type of solid waste inside the SWD? Based on observation

Household (mostly)

Commercial (mostly)

Construction Debris

E-waste

Biomedical waste

Mixed

No waste

Cannot see

- Look for solid waste collected inside the SWD.

- Observe and identify the type of solid waste and check the boxes that apply.

Form2_swd



3.3 Likely source of waste

[Back](#)[Next >](#)

Form2_swd



3.4 Click an image of waste inside the SWD.

Point and shoot! Use the camera to take a photo

 [Take Picture](#) [Choose Image](#)

- Look around and try to find out the likely source of this waste.

- Take a photo of the waste by selecting 'Take Picture.' Refer to the best practices in the following page.

Best practices for clicking a photo of the solid waste inside the SWD:



The photo of the solid waste should include the SWD with some of the surroundings.



Most of the solid waste in the SWD should be included in the photo. If solid waste is scattered, take photo covering most of it.



Do not tilt the phone to click a photo. Keep the phone upright and lower it to set the frame.

Do not zoom in too close or crop out the solid waste.

Form2_swd

* 3.5 Is there solid waste outside the SWD?

- Yes
- No
- Cannot see

Form2_swd

* 3.6 Type of waste outside the SWD? Based on observation

- Household (mostly)
- Commercial (mostly)
- Construction Debris
- E-waste
- Biomedical waste
- Mixed
- No waste

— Look for solid waste black spots outside the SWD, along the retaining wall.

— Observe and identify the type of solid waste and check the boxes that apply.

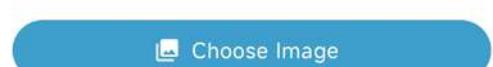
Form2_swd

3.7 Likely source of solid waste outside the SWD?

Form2_swd

3.8 Click a image of waste outside the SWD

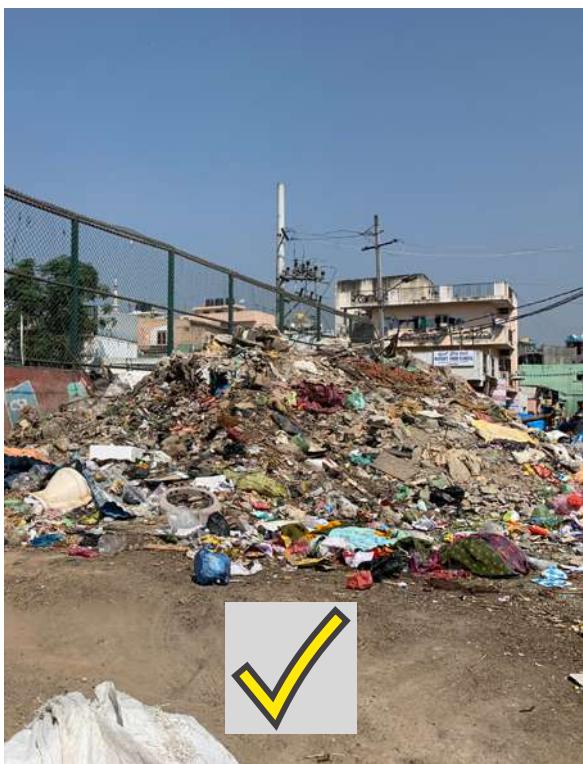
Please refer to the audit guidebook for good photograph practices.

 Take Picture Choose Image

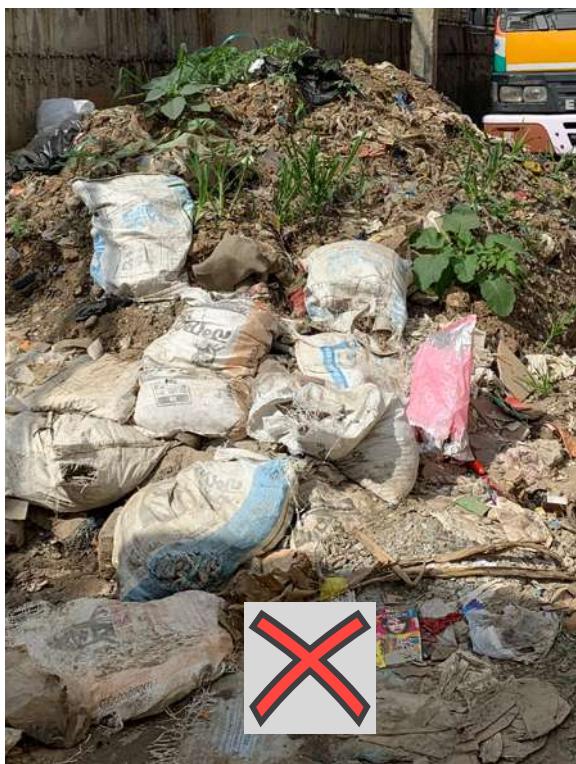
— Look around and try to find out the likely source of this waste.

— Take a photo of the waste by selecting 'Take Picture.' Refer to the best practices in the following page.

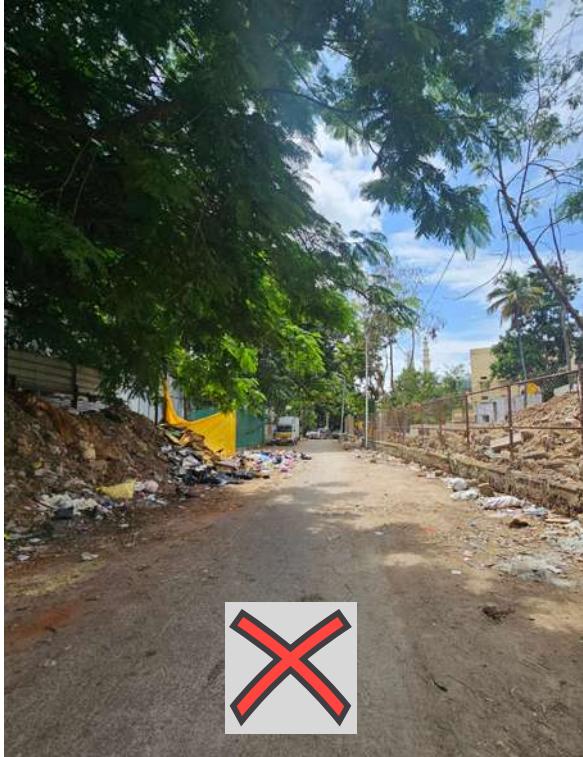
Best practices for clicking a photo of the soild waste outside the SWD:



The photo should be angled to include the SWD retaining wall with some of the surroundings.



All of the solid waste along the SWD should be included in the photo. Do not zoom in too close or crop out the solid waste.



Do not click photo of solid waste present on the other side of the road.

Form2_swd

3.9 Are there signs of clean up effort?

Yes

No

Not applicable

Form2_swd

3.10 Are there any signs of community engagement?

Murals

Idols

Plants

Benches

Not applicable

- Look for signs of clean up effort possibly done to avoid solid waste black spots.
- Look for signs of community ownership possibly enforced to avoid solid waste black spots.

Form2_swd

3.11 Please take a picture showing signs of community engagement.
Please refer to the audit guidebook for good photograph practices.

Take Picture

Choose Image

You are at the end of Form2_swd.

Edits can't be made after finalizing.
If you need to make edits to your form, "Save as draft" until you're ready to send.

Save as draft

Finalize

- Take a photo if you see signs of community engagement by selecting 'Take Picture.'
- Select 'Finalize' to submit the form before moving on to the next observation point.
Please repeat form 2 at every point along the SWD.

Reference Sheet for Solid Waste and Community Engagement

This reference sheet is provided to familiarise the participant on what to look out for when conducting the audit.

Solid Waste Types



Household Waste

Household items or food waste wrapped in small plastic bags
Present in residential areas



Commercial Waste

Commercial & industrial items, or small plastic waste
Can be seen around markets



Construction Debris

Sand and concrete waste
Present around nearby construction sites



E-waste

Discarded electronic devices such as phones, TVs, batteries



Biomedical Waste

Waste generated by hospitals, clinics or labs such as needles, chemicals, animal/ human tissue



Mixed Waste

A mix of all kinds of waste.
Seen in mixed land use areas

Signs of community engagement



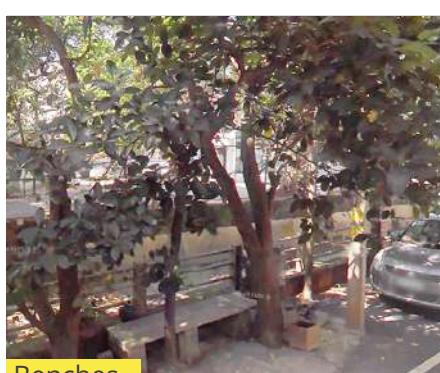
Murals



Idols



Plants



Benches

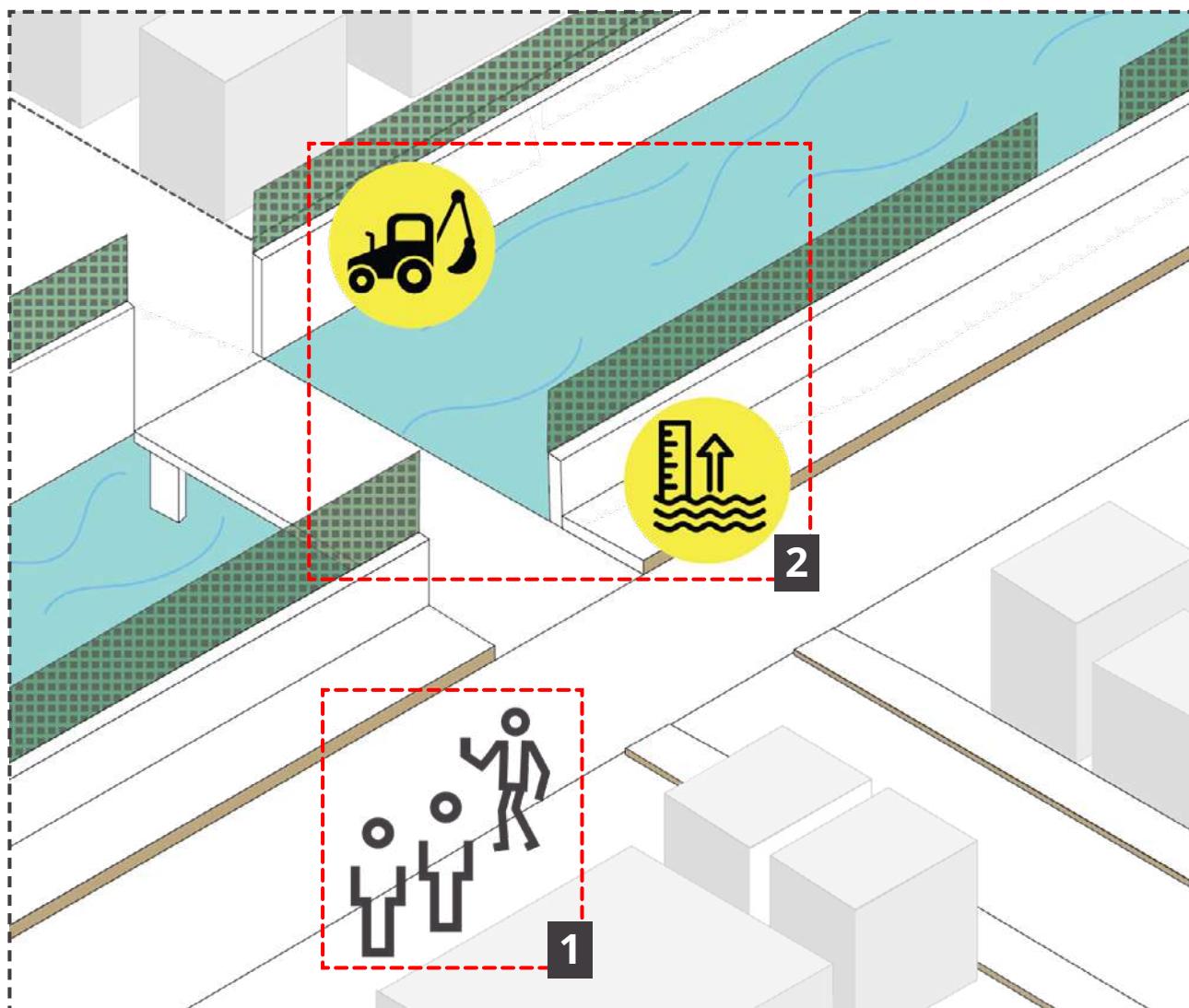


Signs/ Posters

FORM 3

FINDING OUT THE HISTORY OF FLOODING AND MAINTENANCE

This form helps the participant record information about flooding history and maintenance of the stormwater drain. The participant is expected to interview people who live or work near the SWD to fill this form.



1 General information and safety

Ensure safety
Select team code

2 Flooding and maintenance

History of flooding
Flooding on road
Frequency of desilting and cleaning
Maintenance agency

Start new form

Form1_swd
Version: 21 (2026-01-06 08:36:02)
ID: aLP6mR6GUPYRbYEjUKj73j
Added on Tue, Jan 06, 2026 at 14:21

Form2_swd
Version: 16 (2026-01-05 03:06:40)
ID: a2zzGkaqMaKSbmAkp5SgQ6
Added on Tue, Jan 06, 2026 at 14:21

Form3_swd
Version: 8 (2025-12-22 10:49:26)
ID: ac26dYHhtqzpe8Q5rXtjPh
Added on Tue, Jan 06, 2026 at 10:53

Form3_swd

Form 3. This form is regarding flooding and maintenance. To answer the questions, please interview a person from that area

For the audit, visit the SWD and observe the state. Each team is given team code. Refer to the audit checklist emailed to you. Document the different parameters. Please conduct the audit for the path given. LHS and RHS are given to you in form of lat./long as My Maps link. Your safety is our priority. Please ensure that you and your teammates are safe at all time. Thank you for participation.

- To start form 3, click on 'Form3_swd'
- Once selected, the form explains the general rules of the audit.

Form3_swd

Section 1: General information and safety In this section, you will answer general information.

1.1 Your safety is our priority.

Please stand at a safe distance from the SWD

Yes, I feel safe to conduct audit

No, I do not feel safe. I will stop the audit at this point

- Record general information in Section 1 before you begin observations.
- Make sure to stand at a safe distance before you start recording your observation.

Form3_swd

**1.2 Team code**

Please write the team code given to you in the audit checklist email.

Select Answer

Form3_swd

**Section 2: Questions are related to flood and maintenance**

You are expected to interview someone from the neighborhood and enter their responses

- Select your team code as assigned to you in the email communication.
- Section 2 comprises of questions pertaining to flooding and desilting. You are expected to fill in the form by taking responses from people who live or work in the area.

Form3_swd

**2.1 Does the drain have a history of flooding?**

- Yes
- No
- Cannot find info.

Form3_swd

**2.2 During heavy rain, approx. height of water that flows on the road?**

- Up to 1 inch
- 2-5 inches
- 6-10 inches
- More than 10 inches
- Does not flood
- Cannot find info.

- Talk to people in the area and find out if the drain has a history of flooding.

- In case the drain has a history of flooding, find out how much water collects on the road.

Form3_swd



2.3 Does desilting happen often?

- Once a year
- Every 6 months
- Do not know
- Cannot find info.

Form3_swd



2.4 When was this SWD last cleaned?

- Last month
- 2-6 months back
- More than 6 months
- Cannot find info.

- Find out how often the SWD is desilted as part of maintenance to prevent flooding.

- Find out how often the drain is cleaned as part of maintenance to prevent flooding.

Form3_swd



2.5 Does the local community know who maintains the drain?

- GBA (Previously known as BBMP) Ward Office
- GBA SWD Dept.
- Private
- No one
- Do not know

You are at the end of Form3_swd.



Edits can't be made after finalizing.

If you need to make edits to your form, "Save as draft" until you're ready to send.

Save as draft

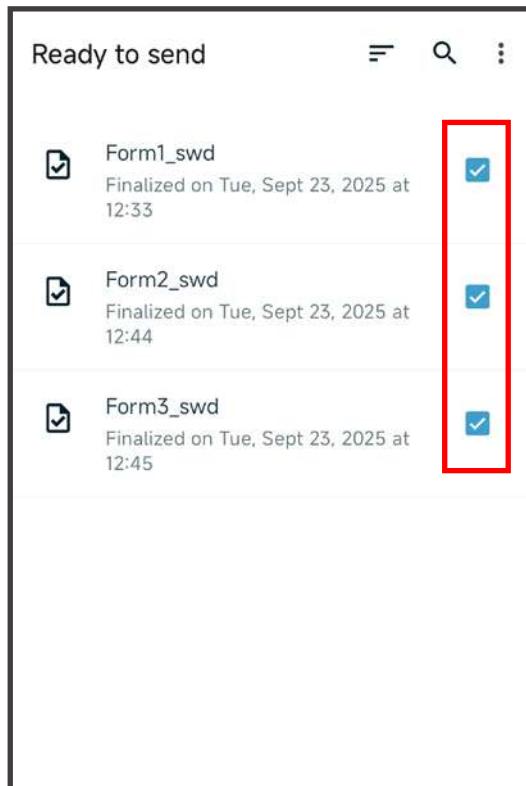
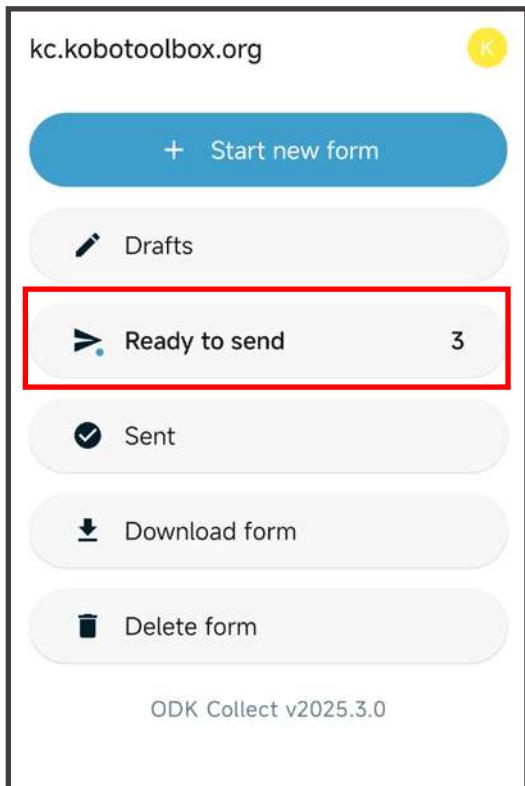
► Finalize

- Ask the people you are interviewing if they know who is in charge of SWD maintenance.

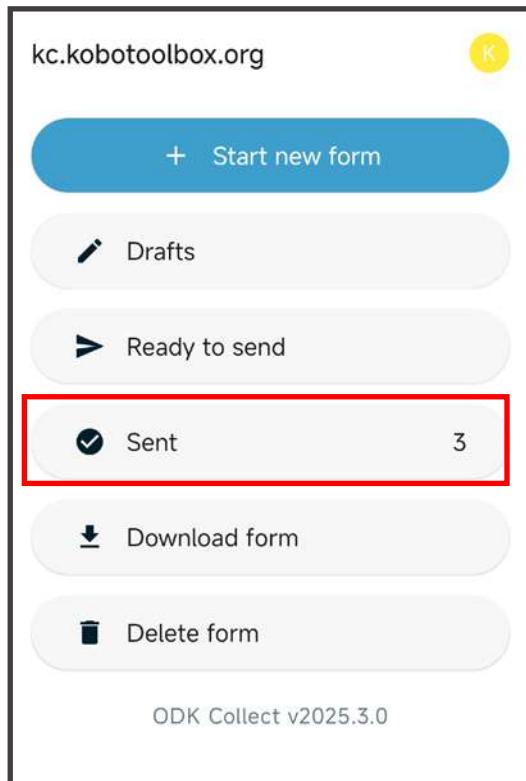
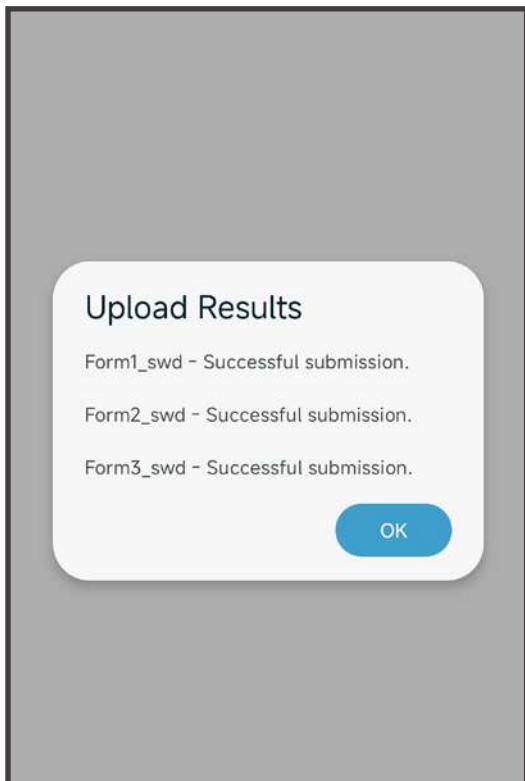
- Select 'Finalize' to submit the form before moving on to the next observation point.
Please fill form 3 once at the beginning and once at the end of the audit.

Upload and Submit

- To submit the recorded forms, follow the given steps.



- All your forms will now be in 'Ready to send' folder.



- Wait for the forms to upload then select 'OK'.

- Once submitted you can view your forms in the 'Sent' folder.

5 Building a Resilient Bengaluru Campaign

The Building a Resilient Bengaluru Campaign reimagines the city's stormwater systems as lifelines—vital infrastructure that protect against floods, secure water, and enrich urban life. For decades, these networks have been seen as little more than neglected backwaters. Yet they form the largest public water infrastructure in Bengaluru and hold untapped potential as shared urban spaces that support ecology, public health, and community resilience. The campaign aims to make these hidden systems visible and actionable.

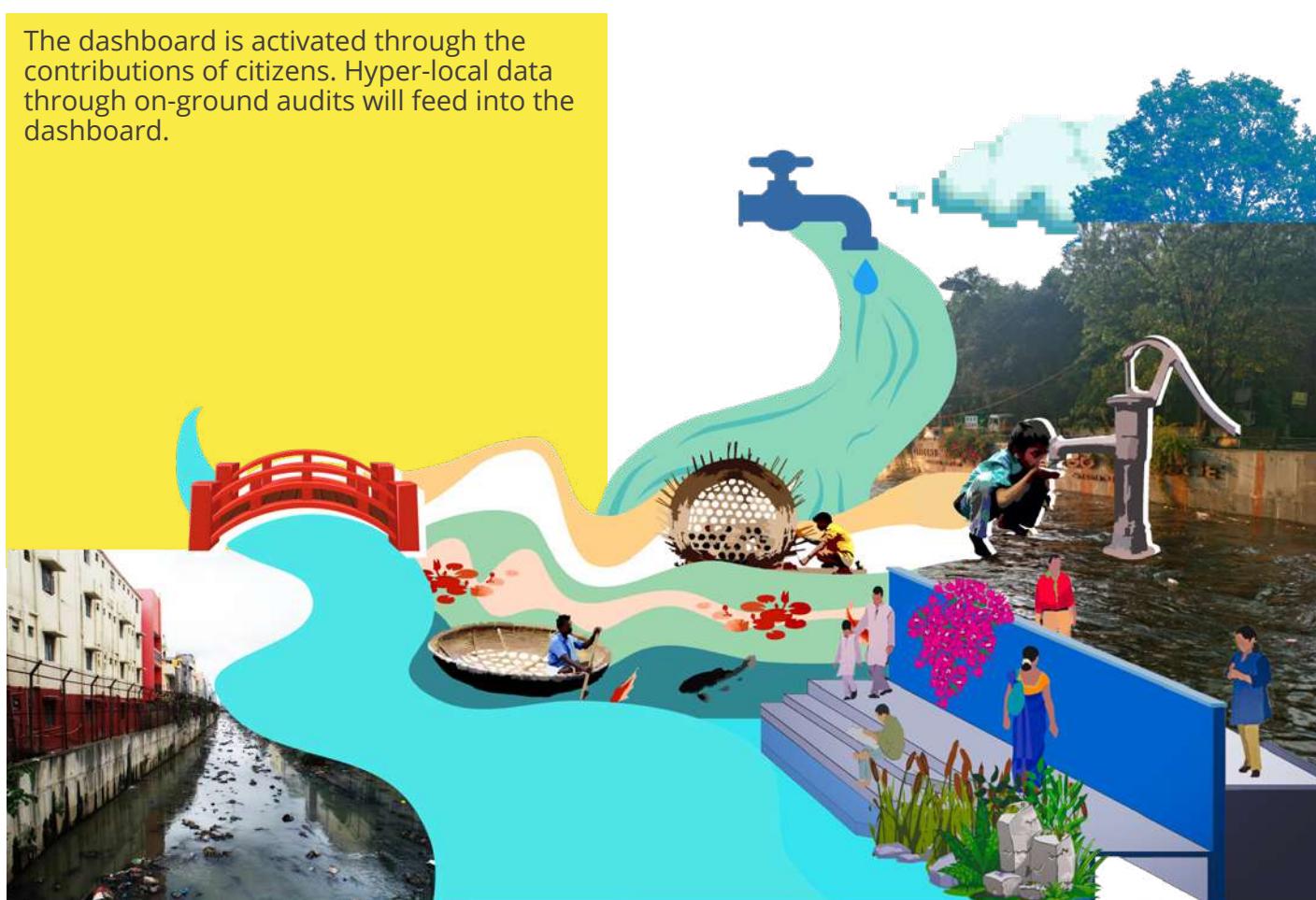
Stormwater and the City is an initiative by Mod Foundation and Oorvani Foundation supported by the BSF Small Grants Programme to build an open, interactive digital dashboard aimed to integrate spatial data, institutional mapping, and citizen insights about the stormwater drainage network in Bengaluru.

The dashboard is activated through the contributions of citizens. Hyper-local data through on-ground audits will feed into the dashboard.

The publicly available dashboard will feed into the dashboard containing all stormwater information, the citizens can map and track drain conditions, understand governance responsibilities, and contribute real-time observations and geo-tagged stories.

Through guided community walks, storytelling events, and workshops the campaign aims to foster public awareness, while creative tools—maps, data, and stories—enable people to see and value the water systems around them.

At its core, the campaign calls for shared stewardship. By engaging residents, civic groups, experts, and policymakers, it builds collective pride, accountability, and long-term ownership of Bengaluru's waterways.



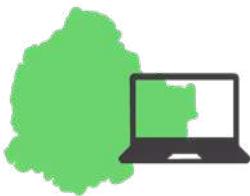
What are the goals?



PHYSICAL AND INSTITUTIONAL MAPPING

Collect data on stormwater networks

- Collate GIS and planning data
- Typology workshop
- Identify overlaps and gaps in institutional responsibility across agencies like BBMP, BWSSB, and BDA



DIGITAL DASHBOARD

Visualise this data digitally

- Story maps on the historical evolution of water infrastructure in the city
- Interactive map to explore stormwater drain typologies, catchments, and valley systems
- Governance tracker to visualize institutional jurisdictions
- Citizen audits with tools for users to submit geo-tagged photos and observations



COMMUNITY ENGAGEMENT AND AWARENESS

Involve communities

Build civic awareness and participation through social media campaigns and specific events. These activities will activate the dashboard, generate hyperlocal data, and seed community stewardship for resilient infrastructure planning.

Mission

To turn Bengaluru's stormwater systems into community assets by using open data and citizen action, building accountability and preparing the city for climate challenges.

Vision

A resilient Bengaluru where stormwater systems are seen as lifelines, cared for through citizen ownership and transparency, creating a greener, safer, and climate-ready city for everyone.

A city-wide effort to make Bengaluru flood-resilient by reimagining rajakaluves, drains, streets, rooftops, and lakes as vital water systems.

6 Do's and Don't's

Guidelines to ensure safety and comfort:

- Carry a cap, an umbrella or a raincoat, and a water bottle.
- Wear comfortable shoes.
- Always keep a safe distance from the stormwater drain when noting observations or taking photos.
- Stick with your team and follow the navigator.
- Take breaks whenever necessary.

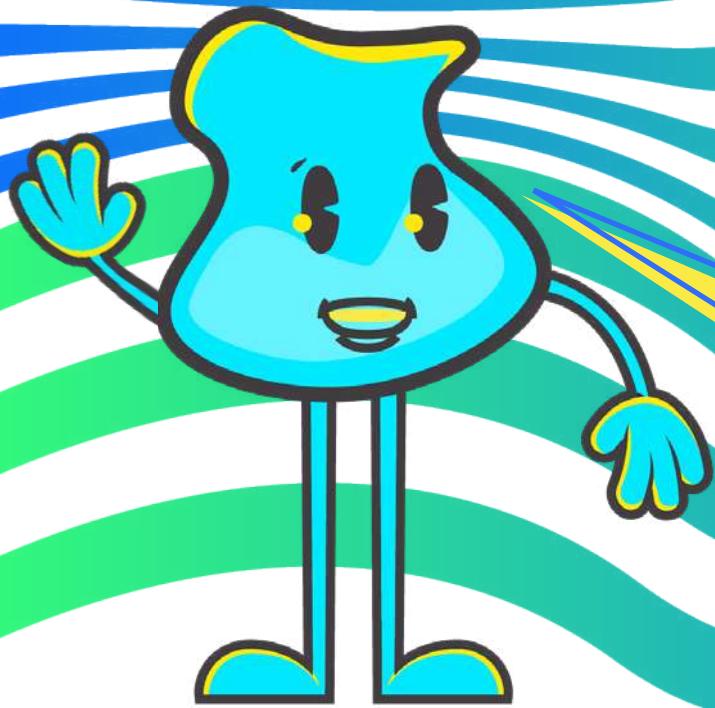
Guidelines on camera usage:

- Keep 1GB space in your phone empty for photos.
- Enable location on your phone's camera app to allow geotagging.
- Remember to clean the phone camera lens before taking pictures.
- Take pictures only in portrait orientation.
- Remember to hold the phone straight when clicking photos to avoid angled photos.

Guidelines for a successful audit:

- Remember to keep your phone battery charged before stepping out.
- Set up the apps before stepping out for audit.
- The ODK Collect App is only compatible with Android phone.
- Check reference sheets as a guide for what to observe.
- Check best practices to click the ideal photos.
- Guidelines on observation points given to the participants are to be used as a reference. You can choose to record observations at other points as well.

BUILDING A RESILIENT BENGALURU



**Thank you for
your participation!**

For updates regarding the project visit our website!



<https://buildingaresilientbengaluru.com>



resilientbengaluru@gmail.com

Write to us