Contents

HOT Toolbox

This wiki is designed to provide HOT teams and OSM Communities with a repository of HOT Training Materials and a guide to the large amount of resources that already exist for the various components of mapping projects, from software guides to running mapathons.

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1.1.1 LEGIT Project Workflow

Local Empowerment for Government Inclusion and Transparency (LEGIT)

The Liberia Local Empowerment for Government Inclusion and Transparency (LEGIT) project supports the Ministry of Internal Affairs and Governance Commission as they lead, monitor and coordinate the implementation of the government's decentralization agenda.

HOT, in close coordination with the LEGIT project team, have contributed to several areas of the project, working with the Ministry of Internal Affairs (MIA)'s Department of Urban Affairs, city administrations in the cities of Gbarnga, Ganta and Zwedru, and selected CSOs and CBOs. HOT's objectives within LEGIT are to map administrative boundaries and service delivery infrastructure or points, support our Liberian partners to conduct mapping, develop a service delivery database and to support the development of urban resilience strategies for each city.

Project page:

Supporting Decentralization in Liberia

Dates: January 2017 - February 2019

Status: Complete

Tools used:

- Software
  - ODK
  - OMK
  - OSMAnd
  - Maps.Me
  - [JOSM]
  - QGIS
  - TileMill
- Hardware
  - POSM (used as an external hard drive)
  - Tecno C9

Field Mapping Workflow

1. Technical Set-up

- Remote digitization through HOT Tasking Manager
- Development of data model (in coordination with project partners and stakeholders)
- Creation of ODK & OMK Forms
- OMK set-up
  - Creation of mbtiles using TileMill (no aerial imagery, just vector layers)
  - Creation of .osm layers used JOSM
- Set up phones
- Created map assignment areas in QGIS to guide teams in data collection
- Created print maps of assignment areas (aerial imagery in background)

2. Field Mapping

- Field mappers grouped into teams with leaders
- Use of OMK (full survey) and OSMAnd (tracking field movement) by field mappers on a daily basis
- Extracting field data from phones on a daily basis

- Uploaded field data to POSM as a back-up on a daily basis

3. Data Cleaning

- Manually merging field data files and resolving conflicts in JOSM at end of mapping activities
- Data cleaning and upload procedures
- Data cleaning in JOSM

4. Map Creation

- Download data from OSM via QuickOSM
- Creation of maps in QGIS using Print Composer & Atlas

1.3 Hardware

Hardware encompasses all physical assets related to technology, computers, and electronics needed for a project. When designing a mapping project, managers will need to assess what hardware, and specifications, are necessary to complete the work. While the anticipated project workflow influences the selection of hardware, it is important to note that the availability of technology and resources for procurement may place restrictions on hardware selection. In this way, hardware availability can also influence the workflow, making hardware selection an important part of the planning process. Questions to ask during hardware selection:

- Will mappers be collecting data in the field? If yes, see Mobile Data Collection: smartphones & tablets to determine what devices are best for field data collection.
- Will mappers be collecting data for more than: 4 hours a day with OpenMapKit and/or navigation/tracking apps? 6 hours with OpenDataKit or KoboCollect? If yes, see Powerbanks and charging.
- Will data need to be stored or backed up physically? see Storage Devices: POSM & Hard Drives
- Will there be digitization and editing of data? Will maps and visualizations need to be made from data? See Computers to understand what specifications are needed for different activities.
- Will there need to be drone imagery capture? see Drones and UAVs to understand what machines are best suited depending on the need.

- Will there need to be street view imagery capture? see Street view imaagery: phones, cameras, and 360 devices.

Mobile data collection: smartphones & tablets

Smartphones versus tablets When choosing a type of device for mobile data collection, it is important to determine if a smartphone or tablet is more appropriate for mapping activities. Each device types have pros and cons, so it's important to understand what is best for a particular project, mapper, and environment.

When planning to use OpenDataKit:

Most any Android smartphone or tablet will do, as long as it has a relatively modern Android version (4.1+).

When planning to use OpenMapKit:

To enable OpenMapKit to run fluently and be able to handle larger background maps (in 'mbtiles' format) and OSM data, please make sure that phones have:

- At least 1.5, but preferably 2 GB of RAM
- Preferably 16 GB of storage
- A modern Android version (6.0+)

Furthermore, the following are recommended:

- A 5" screen for usability
- A decently sized battery. For extended usage, it may be necessary to have battery packs
- Make sure to have enough charging options, such as car chargers and extension cords

The following phones/models have been verified to work well on various projects:

Smartphones:

- Tecno Camon C9 (2 GB RAM)
- Tecno L9 (2 GB RAM, 16 GB storage)
- Huawei Y5 (2017) and Huawei Y6 Pro (2 GB RAM, 16 GB storage)
- Sony Experia L1 (2 GB RAM, 16 GB storage)
- Motorola Moto G5 (2 GB RAM, 16 GB storage)
- Infinix

Tablets:

- Samsung Tab A (SM-T285, 7", 2016) (1.5 GB RAM, 8GB storage)
- Huawei Mediapad t3 10 AGS-W09

Protecting mobile devices HOT recommends that cases are procured for all mobile data collection devices, regardless of type. This will help protect the devices from weather, dropping, sun exposure, and other hazards. Ultimately, protecting devices not only reduces costs associated with device loss or replacement, it also protects the loss of data stored in the devices.

Power banks and charging

Storage Devices: POSM & Hard Drives

Street view imaagery: phones, cameras, and 360 devices

Mapillary provides an up-to-date list of recommended equipment for capturing street view imagery at: https://help.mapillary.com/hc/en-us/articles/115001478065-Equipment-for-capturing-and-example-imagery. In addition to recommended devices, this list provides additional equipment recommendations including mounts, memor cards, charging, and cases. Additionally, HOT has used mobile devices provided in the OpenMapKit list above for street view imagery capture.

Computers

Determining the specifications, quality, and type of computer depends on the needs of the project or activity. At minimum, computers involved with mapping activities should have the following specifications:

- 15" screen or larger
- Processor: Core i5, relatively new
- RAM: preferably at least 8gb
- 512 GB hard disk or larger
- Operating system: Windows or Linux preferred for most applications

The following computers have been verified to work well on various projects, categorized by typical use:

a) Training, data cleaning and basic GIS/data processing

- Lenovo Ideapad 320
- HP 250 G6
- Lenovo ThinkPad X234
- DELL Latitude E6430s
- HP Elitebook 840

b) Advanced GIS and drone imagery processing

- Acer Aspire e5-575
- Lenovo P50

Drones and UAVs

When quality imagery is not available or up-to-date imagery is necessary for a data collection process, such as capturing the impact of a recent flood or to capture newly constructed buildings, using a drone or unmanned aerial vehicles (UAVs) may fulfill imagery needs. Selecting a UAV/drone depends on the need of the project and available resources. Drones/UAVs are generally classified into three types based on mode of flight. See the table below for a compariison of the different types. *Note: cost is based on HOT experience and is not necessarily representative.*

Type	Flight time	Max speed	Payload	Coverage	Cost range
Multi-rotor UAV	25-45 minutes	45-60 mph	450g-5.5kg	2-7 km2	$3-65k
Fixed Wing UAV	45 minutes	40-110 mph	1-3 kg	<12 km2	$25-120k
Hybrid UAV	60 minutes	70-120 mph	1-6 kg	<13 km2	$30k+

In brief, multi-rotor UAVs are best suited for small-scale operations with smaller mapping areas and/or quick response time for flight deployment (i.e. responding to natural disasters), whereas fixed wing UAVs are better suited for aerial mapping of large areas.

For HOT projects, we have selected and used the following drones:

- Multi-rotor: DJI Phantom 4 Pro
- Fixed wing: senseFly eBee

Please note: anyone interested in drone flying should understand local drone/UAV laws and regulations, as well as seek out proper training in piloting.

Hardware Management Considerations

- Create and have all mapping participants sign an agreement for the responsibility and liability of devices
- Create an equipment sign out log

1.4 Safety and Security for Field Operations

Each context is so different that it is difficult to make specific recommendations for safety. Communities and organizations conducting mapping activities should establish contingency plans to address the different types of security incidents that may occur. Team members should coordinate all responses to such incidents so as to safeguard the rights and well-being of local community members, and ensure that staff members and volunteers are not put at risk.

For operations, the key to effective safety and security management is the creation of a culture of security. Each staff member and volunteer has a responsibility for their own safety and security, and that of other team members.

Please note: The below topics are suggestions for mapping teams to consider when building and discussing security plans for mapping activities, and is in no way comprehensive.

Considerations

- Personal Security
  - Behavior
  - Dress code
  - Language and communication
- Legal Requirements
  - Survey letter/Permission to conduct field activities
  - Local laws and customs
- Communications
  - Communication network
  - Internal Contact Details (mapping team)
  - External Contact Details (authorities)
- Travel
  - Attire
  - Visibility
  - Documentation
  - Accidents
  - Theft
- Common Crime
  - Types of crime
  - Frequency and patterns of occurence
  - Mitigation strategies
- Medical Emergencies
  - Pre-existing medical conditions of team members
  - Location and contact information for local health facilities
- Contingency Plans
- Incident reporting

Tips:

- Know the emergency services numbers for the local area
- Always have access to a first aid kit
- Teams should have someone trained in first aid
- Let people decide where they work and feel most safe in
- Avoid performing field work alone
- Always obtain relevant permits, licenses, permissions, and visas for work
- Develop a country specific security plan
- Create a minor incident and suspicious activity report
- Establish a process for regular monitoring and review of hazards
- If operating outside of your home country, sign up for travel alerts from your embassy

Resources:

- HOT General Hazard Mitigation Advice

1.5.1 Setting up phones and servers

Setting up phones for data collection

Device set-up and testing instructions for OpenDataKit (ODK), OpenMapKit (OMK), and OSMTracker can be found here.

Open Data Kit (ODK)

Download application

For information on downloading and installing ODK, go to Data Collection Applications. #### Tool set-up

1. Find the ODK Collect app icon on your mobile device and tap to open the app.
2. After downloading the ODK app, an odk folder will be automatically created in on the internal memory of the device. Connect your device to a laptop to confirm that this folder is created. If you don't see this folder on your device's internal storage, Restart the device.
3. Once the device has been restarted, connect it to your laptop, and navigate to internal storage -> odk folder. You will find for sub-folders inside the openmapkit folder. I.e 'forms', 'instances', 'layers' and 'metadata' folders.
4. Add your xml forms to the forms folder.
5. In the ODK Collect Main Menu window, select Fill Blank Form. This will display all forms downloaded from the server, which you will be using to field data collection testing.
6. Once you confirm that you have all forms on your device, click on the device back button to exit the ODK Collect App.

Open Map Kit (OMK)

Note: You will need ODK to run OMK. We advise installing ODK first to allow for proper set-up and testing. #### Download application

For information on downloading and installing ODK, go to Data Collection Applications.

Tool set-up

1. After downloading the OMK app, a openmapkit folder will be automatically created in on the internal memory of the device. Connect your device to a laptop to confirm that this folder is created. If you don't see this folder on your device's internal storage, Restart the device.
2. Once the device has been restarted, connect it to your laptop, and navigate to internal storage -> openmapkit folder. You will find for sub-folders inside the openmapkit folder. I.e 'constraints', 'deployments', 'mbtiles' and 'osm' folders.
3. If you have a customized constraints file, in the constraints folder, delete the Buildings.json and default.json files. Add your custom the default.json file to the constraints folder.
4. Add your .mbtiles file to the mbtiles folder.
5. Add your .osm file to the osm folder.
6. Now you are set to start working with OMK. Exit the file manager window.
7. Open OMK application.
8. Tap on the Settings button in the top right corner. Under "basemap", select the appropriate .mbtile. Under "OSM XML Layer" select the .osm layer to use for your mapping. Exit settings.
9. Tap on the GPS button, your location will be displayed on the screen.
10. To begin mapping, exit OMK and open the ODK application. You will notice that OMK works within the ODK application.

1.8 Trainings and Workshops

Overview

This section covers considerations and resources to use while planning trainings and workshops for mapping and OSM.

Training Requirements

Attendee requirements

Requirements for attendees will vary depending on the scope of the trainings, the intended participants, and the available resources. No matter the scope of the training, it is important to communicate these requirements BEFORE the training so that participants can come prepared.

Some attendee requirements may include:

- Have a laptop and mouse.
- Be computer literate with basic computer skills.
- Have enthusiasm and willingness to collaborate with others.
- Attendee's computers should have sufficient free disk space (approx 10GB) and attendees should have administrator rights so that they can install software on their computers.
- Attendees should have a PDF document viewer installed on their computers.

Workshop venue requirements

- Wi-Fi Capability
  - If the venue can provide Wi-Fi, confirm with the venue managers that the Wi-Fi has enough capacity for the number of attendees expected to show. For example, if you expect 10-15 people to show up to your event, the Wi-Fi will need to be capable of hosting 15-20 internet connections - remember, you will need to connect as well!
  - If there are no venues with wi-fi capability, consider the option of using a Mi-fi device or other Hotspot options
- Space, tables, and chairs to provide for your expected attendance.
- Enough power outlets for charging laptops and other devices.
  - If this is limited, you'll need to consider power strips and extension cables.
- Generator/electricity access for duration of workshop.

Creating an Agenda

Training Agenda Examples

- Three-day mapping workshop
- Five-day mapping workshop
- Four-day GIS workshop

Training Agenda Template

- Template

Tools, Software, and Materials to Provide

It is highly recommended that prior to the training/workshop, all necessary installation files are downloaded and loaded onto USB drives for offline installation. The following is a list of all the recommended installation files you will need depending on the scope of the training/workshop.

JOSM

Installation instructions

- Java OpenStreetMap Editor installer
- Java

QGIS

Installation instructions

- QGIS installer

Mobile Applications

Installation instructions

- ODK apk
- OMK apk
- OSMAnd apk
- OSM Tracker apk
- Maps.ME apk

InaSAFE

Installation instructions

Resources and further reading

- Beginning OpenStreetMap Trainer Toolkit
- Intermediate OpenStreetMap Trainer Toolkit
- Advanced OpenStreetMap Trainer Toolkit
- TeachOSM
- [LearnOSM]
  - Mapping Party
- Offline InaSAFE QGIS plug-in

2.1 OpenStreetMap

OpenStreetMap is a collaborative project to create a free editable world map and is at the core of HOT's mapping activities. You are free to use it for any purpose as long as you credit OSM and its contributors.

The power of OpenStreetMap is that it empowers anyone, anywhere in the world to add information to a collective map and use the data for any purpose. You can think of OSM as the "Wikipedia of maps" – it is an online database and global community of over 5 million registered users. This community collaborates to build a free and open map of the world to which anyone can contribute and which anyone can use in their own context. All that is needed to contribute to OSM is an internet connection and email address.

OpenStreetMap can, and has, been used for a wide variety of purposes - from disaster response to commercial use. The first organized use of OSM in disaster response was following the 2010 Haiti Earthquake. As high-resolution imagery of the affected area was made available to the public, over 600 individuals from the global OSM community began digitizing the imagery and tracing roads and other infrastructure. They made what quickly became the most detailed map of Port-au-Prince in existence, which was then used by search and rescue teams to help route supplies around the devastated capital and to coordinate many other aspects of the response and reconstruction effort.

Training Materials

- Introduction to OSM

Resources and further reading Read

- LearnOSM - Introduction to OSM
- OSM Wiki - Abot OpenStreetMap

Watch

- Two Minute Tutorial - What is OpenStreetMap?

2.1.1 Opening OSM accounts

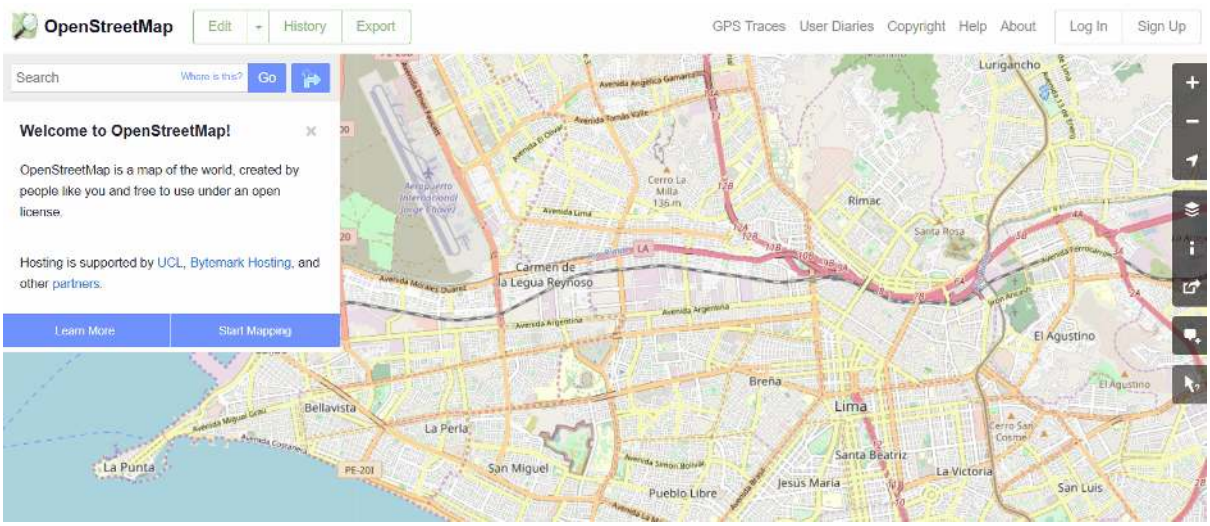
With OpenStreetMap (OSM) at the core of mapping activities, it is critical that all team members and participants have activated OSM accounts. This will be necessary before using many mapping tools such as HOT Tasking Manager, JOSM, and HOT Export Tool.

Skills and Technology Needed

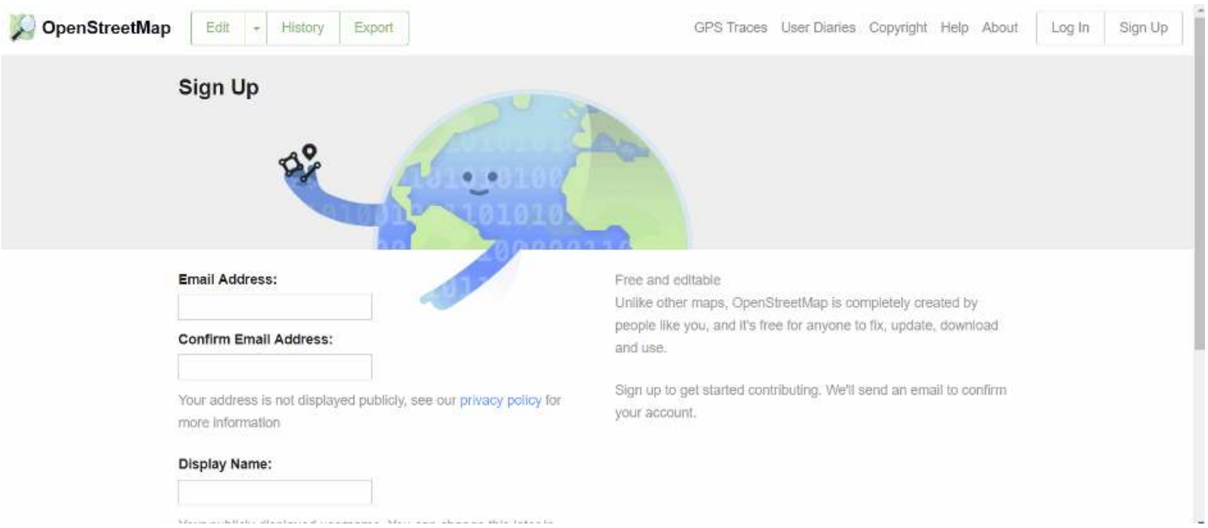
- Computer
- Activated email account
- Internet connection

Creating an OSM Account

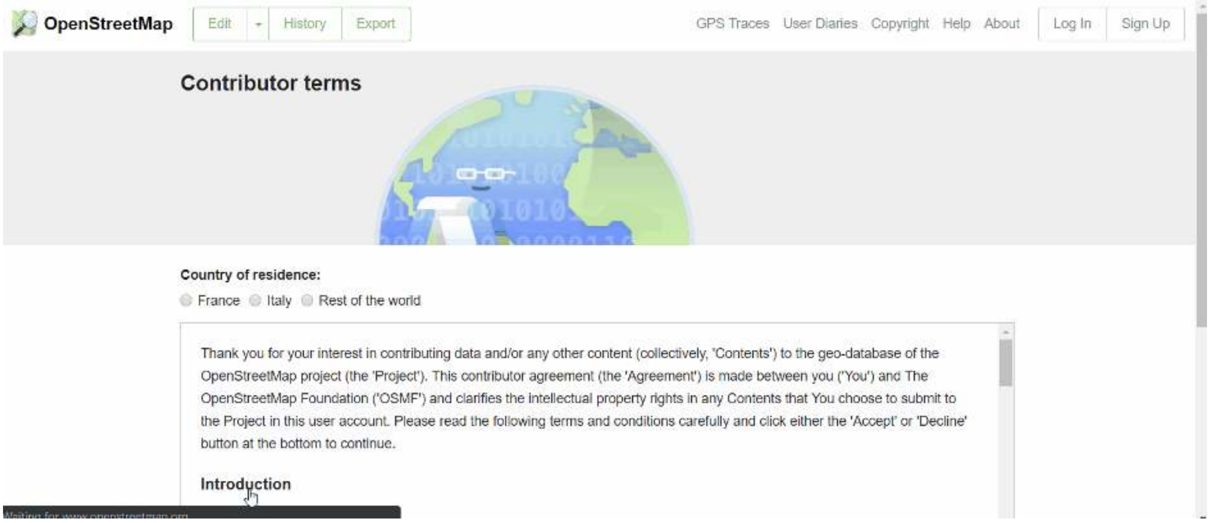
To get started, you will need to create an account on www.openstreetmap.org. Please use the "Sign Up" tab in the top right corner to begin.



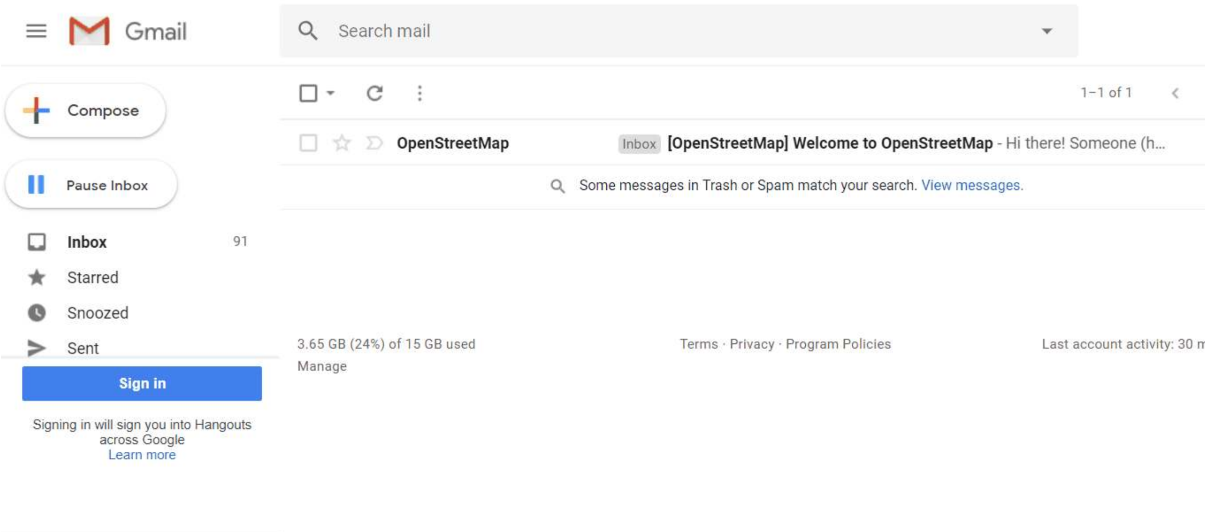
Please fill in all the fields in the form. We recommend using an email you have easy access to e.g. your work email, as you will receive a confirmation email to verify your account. You will not receive any spam/marketing emails. Click the blue "Sign Up" button when finished.



Next, please read and accept the contributor terms and agreements by selecting where you are based (France, Germany, or the Rest of the World), and clicking the blue "Agree" button on the bottom of your screen.



To activate your account, please now check your email and click on the link provided.



Considerations for signing up large numbers of individuals

- Prior to beginning the OSM registration process, all individuals signing up for OSM accounts will need to have an existing and accessible email account. If registering a large group of individuals at one time, we recommend asking the group if they have accessible email accounts. When planning mapathons and trainings in areas where regular email use may be low, we also recommend planning for time in assisting individuals with setting up email accounts.
- Consider internet connectivity and capacity prior to registering large numbers of individuals for OSM accounts. Having individuals taking turns to register or running registration simultaneous to other activities can reduce the load on a slow internet connection.
- It is crucial that usernames and passwords are remembered by participants so that they can access other tools that require OSM accounts to log-in. We recommend encouraging participants to find a way of safely storing this information for future reference.

Training Materials

- Introduction to OSM (including Signing up for OSM Accounts)

Resources and further reading Watch

- Two Minute Tutorial - How to Sign Up for OpenStreetMap

3.1 Working with the HOT Tasking Manager

The HOT Tasking Manager is a mapping tool designed and built for the Humanitarian OpenStreetMap Team's collaborative mapping process in OpenStreetMap. The purpose of the tool is to divide up a mapping project into smaller tasks that can be completed rapidly with many people working on the same overall area. It shows which areas need to be mapped and which areas need the mapping validated.

Note: To become a project manager send an email to info@hotosm.org and they will make sure you get set up.

Skills and Technology Needed

- Computer
- Internet connection
- OSM account

Resources

- OSM Tasking Manager Wiki
- Learn How to Use the Tasking Manager
- Two Minute Tutorials: How to use the OSM Tasking Manager

Training Materials

- Worksheet: pdf | doc
- Presentation pdf | ppt

3.2 Working With Imagery

Assessing available imagery

Satellite imagery

There is only a limited number of companies/satellites that actually capture most of the available satellite imagery, with many more resellers providing access to and selling imagery. See Wikipedia for a good introduction. When assessing the imagery available for your project, try to look for:

- Freshness (the date of the imagery)
- Resolution
- Quality (color, contract, obliqueness/angle of imagery, lack of cloud cover)

Some useful tools to help in this:

- Visually compare imagery available for use in OpenStreetMap: http://osmz.ru/imagery/ (or from within JOSM)
- To find specific dates/scenes from DigitalGlobe satellites: https://discover.digitalglobe.com/
- To find image metadata on ESRI imagery: https://www.arcgis.com/home/webmap/viewer.html?webmap=c03a526d

UAV/drone imagery

3.3 Editing with iD and JOSM

There are several ways to edit in OpenStreetMap. The two most commonly used tools and best programs for mapping projects are iD editor and JOSM.

iD Editor

The iD editor is a user-friendly tool that allows you to directly make changes in OpenStreetMap. iD is good for:

- Simple edits
- Fast Internet access to load the imagery and save the edits.
- Following a consistent and simple tagging scheme.
- When you are restricted from installing a program on the computer you are using.

Skills and Technology Needed:

- Computer
- Strong Internet connection
- OSM account

Java OpenStreetMap Editor (JOSM)
JOSM (Java OpenStreetMap Editor) is an open source editor for OpenStreetMap data. JOSM is best for:

- Adding many buildings (See buildings_tool plugin).
- Editing many polygons or lines that already exist.
- When you are on an unreliable Internet connection or offline.
- Using a specific tagging scheme (or custom presets).

Training Materials

- Mapping with iD Editor
  - Presentation pdf | ppt
- Mapping with JOSM
  - Worksheet pdf | doc
  - Presentation pdf | ppt

Resources

- Awesome OSM: A Comprehensive Guide on Mapping Building Footprints

4.1.2 Designing The Data Model

Tagging

Tags are used in OSM to categorize features, and to add information that is useful for:

- Understanding of the map
- Planning
- Routing
- Querying

OSM doesn't work with layers or attribute tables, but tags. Each tag consists of a key, and a value. Each map feature should have 1 or more tags Such as:

- building=residential
- highway=primary
- amenity=school

Resources

- Check the OpenStreetMap wiki. Start at the Map features page, search, and discover!
- Research tag use and occurence on TagInfo

Data Models

A data model defines what features are surveyed or mapped and what attributes are collected for each feature. If a project will upload data to OpenStreetMap, the data model should be designed to match OSM tagging.

Example data models

- Uganda Refugee Crisis
- Ramani Huria

Training Activity

Presentation: https://docs.google.com/presentation/d/1CU6cBtu9ZAeCWKIz6xLVN4fBrdsN7R5tFELPXbepilI/edit#slide

**Estimated time:

Skills and technology needed:**

4.2 Data collection applications

Overview

Several mobile applications exist to assist with field data collection. Choosing an application to use depends on mobile device capability, varying set-up requirements, and survey needs. Options include OpenDataKit, OpenMapKit, KoboCollect, OSMTracker, and Maps.me

Which data collection application should I use?

I want to collect…	ODK	Kobo	OMK	Maps.me	OSM Tracker	Mapillary
Qualitative survey data	☒	☒	☒	×	×	×
Quantitative survey data	☒	☒	☒	×	×	×
GPS Points	☒	☒	☒	☒	☒	×
Photos attached to GPS Points	☒	☒	×	×	☒	×
GPX Tracks	×	×	×	×	☒	☒
Streetview imagery	×	×	×	×	×	☒
Data attached to OSM points of interest	×	×	☒	☒	×	×
Data attached to OSM polygons (i.e. buildings)	×	×	☒	☒	×	×

Training Materials

- Introduction to field data collection applications

Resources and further reading Watch

- HOT Community Webinar: Mobile Data Collection Best Practices and Tools

1. Open Data Kit (ODK)

ODK is a free an open-source set of tools which help organizations author, field, and manage mobile data collection solutions. ODK Collect is part of ODK and is an Android app that replaces paper forms used in survey-based data gathering. It supports a wide range of question and answer types, and is designed to work well without network connectivity.

Skills and Technology Needed

- Computer
- Internet Connection
- Mobile devices (see Hardware for specifications.)
- ODK forms
- Spreadsheet software (such as Excel or LibreCalc)

Use OpenDataKit (ODK) if: * You have access to mobile devices but they have limited RAM & storage * You do not need to collect data for buildings in OSM OR you are able to manually transfer data collected as points to OSM polygons after data collection. * You want or need to have an easy set-up option for data collection.

Resources

- OpenDataKit: https://opendatakit.org
- ODK Guide: https://docs.opendatakit.org/collect-intro
- ODK Build: https://build.opendatakit.org
- Building ODK Forms: http://xlsform.org/en

Download

- Google Play: https://play.google.com/store/apps/details?id=org.odk.collect.android&hl=en_US

Set-up

1. Create ODK forms
2. Add ODK forms to mobile data collection devices. See Device and Tools Set-up and Testing

2. OpenMapKit (OMK)

OMK is an extension that launches directly from within ODK Collect when the OSM question type is enabled in a standard survey. It is what allows you to browse OSM features, and to create and edit OSM tags.

Skills and Technology Needed

- Computer
- Internet Connection
- Mobile devices (see Hardware for specifications.)
- OMK forms
- Spreadsheet software (such as Excel or LibreCalc)
- Additional files
  - .mbtiles
  - OSM layer
  - Constraint file
- Recommended: Server

Use OpenMapKit (OMK) if: * You have access to mobile devices with sufficient RAM & storage (see Hardware for specifications.) * You need to collect data for buildings in OSM * You have the capacity for more intensive set-up prior to data collection

Resources

- OpenMapKit: http://openmapkit.org

Download

- Google Play: https://play.google.com/store/apps/details?id=org.redcross.openmapkit&hl=en_US

Set-up

1. Create OMK forms
2. Create .mbtiles
3. Create .osm layer
4. Create constraint file
5. Download and set up ODK and OMK applications.
6. Add all above files to mobile data collection devices.

3. KoBoCollect

Kobo is in almost all ways similar to ODK Collect, and is built on top of the ODK platform. Kobo also has prebuilt analysis tools and is another popular option.

Skills and Technology Needed:

- Computer
- Internet Connection
- Kobo Account
- Mobile devices (see Hardware for specifications.)

Resources

- KoBo Collect: https://www.kobotoolbox.org
- UNHCR instance of KoBo Collect: https://kobo.unhcr.org/
- OCHA instance of Kobo Collect: https://kobo.humanitarianresponse.info/

Download

- Google Play: https://play.google.com/store/apps/details?id=org.koboc.collect.android&hl=en_US

4. Maps.Me

Maps.me is a navigation application that uses OpenStreetMap data, and can be used offline. It is suitable for collection Point of Interest (POI) information, as far as these fit within the types of data that Maps.me shows you on the map.

Skills and Technology Needed

- Internet Connection (for application download)
- Mobile devices (see Hardware for specifications.)
- Android or iOS device

Resources

- Maps.me: https://maps.me
- OSM Wiki: https://wiki.openstreetmap.org/wiki/MAPS.ME

Download

- Google Play: https://play.google.com/store/apps/details?id=com.mapswithme.maps.pro&hl=en_US

5. OSMTracker

OSM Tracker is “an offline GPS tracker designed for collecting points of interest (POI) to be added to the map and for recording GPX tracks.” OSM Tracker is free and open-source.

Skills and Technology Needed

- Internet Connection (for application download)
- Mobile devices (see Hardware for specifications.)

Resources

- OSMWiki: https://wiki.openstreetmap.org/wiki/OSMTracker_(Android)
- LearnOSM: https://learnosm.org/en/mobile-mapping/osmtracker/

Download

- Google Play Store: https://play.google.com/store/apps/details?id=net.osmtracker&hl=en_US

Set-up

- Device and Tools Set-up and Testing

4.3 Navigation Applications

Several mobile applications exist to assist with field navigation using OpenStreetMap as a baselayer and functioning offline for low-connection environments. Options include OSMAnd and Maps.me

1. OSMAnd

OSMAnd is a global mobile map viewing and navigation app for online and offline OSM Maps. It is used for recording tracks as well as mapping features. It provides easy way to record and submit information in the field.

Skills and Technology Needed

- Internet Connection (for application download)
- Mobile devices (see Hardware for specifications.)
- Android

Resources

- LearnOSM: https://learnosm.org/en/mobile-mapping/osmand/
- OSM Wiki: https://wiki.openstreetmap.org/wiki/OsmAnd

Download

- Google Play: https://play.google.com/store/apps/details?id=net.osmand&hl=en_US

2. Maps.Me

Maps.me is a navigation application that uses OpenStreetMap data, and can be used offline. It is suitable for collection Point of Interest (POI) information, as far as these fit within the types of data that Maps.me shows you on the map.

Skills and Technology Needed

- Internet Connection (for application download)
- Mobile devices (see Hardware for specifications.)
- Android or iOS device

Resources

- Maps.me: https://maps.me
- OSM Wiki: https://wiki.openstreetmap.org/wiki/MAPS.ME

Download

- Google Play: https://play.google.com/store/apps/details?id=com.mapswithme.maps.pro&hl=en_US

Training Materials

- Introduction to mobile data collection tools

4.4 Creating forms (ODK OMK)

Form design

Creating ODK forms

Forms can be created using spreadsheet software (such as Excel or LibreCalc) or using the ODK Form Builder. Documentation on how to design a form can be found here.

- Example ODK form
- Blank ODK form

Creating OMK forms Forms for OMK are slightly altered from ODK forms to incorporate the OSM tagging scheme and need to be built using spreadsheet software (such as Excel or LibreCalc). In addition to the structure of an ODK form, OMK forms require an additional 'osm' tab that alters the form structure for OMK. Documentation on how to design a form can be found here.

- Example OMK form
- Blank OMK form

Form conversion

After forms are developed, they need to be converted from .xlsx/.xls to .xml to be used by the ODK application. This can be done by using XLSform online or offline.

Set-up

Once forms are converted, follow these instructions for mobile device set-up.

4.5 Creating .mbtiles

Overview

MBTiles (.mbtiles) is the file format used for storing map tiles as a single file - the most common use case as baselayers for mobile mapping applications. There are multiple tools to create mbtiles, with selection based on baselayer type (aerial imagery), addition of vector layers, file size, zoom, etc.

I need .mbtiles with…

HOT Export Tool

Tile Mill

TileHuria

Aerial Imagery Basemap

X

☒

☒

OSM Basemap

☒

X

☒

Vector layers (i.e. enumeration areas)

X

☒

X

Resources

- OSM Wiki: https://wiki.openstreetmap.org/wiki/MBTiles
- Mapbox: https://docs.mapbox.com/help/glossary/mbtiles/

HOT Export Tool

HOT Export Tool allows users to download OSM data by specifying tags, area of interest, and file type. Learning resources and walkthroughs can be found at the HOT Export Tool Learn page.

Tools and Technology Needed:

- Computer
- Internet Connection
- OSM Account

See Data Export Tools for more information and training materials on using the HOT Export Tool.

TileMill

TileMill is an offline, downloadable application used to create mbtiles. TileMill allows for vector layers to be inserted into mbtiles (i.e. assignment area shapefiles, roads).

Workflow for creation tiles with aerial imagery and vector layers can be found [here].

Tools and Technology Needed:

- Computer
- Internet Connection
- Optional: .shp files for vector layering

Resources

- TileMill Documentation: https://tilemill-project.github.io/tilemill/docs/crashcourse/introduction/

Download

- https://tilemill-project.github.io/tilemill/

Tile Huria

Tile Huria is a simple tool for creating mbtiles based on an area provided via Geojson format with aerial imagery.

Tools and Technology Needed:

- Computer
- Internet Connection
- .geojson file for area of interest

4.6 Creating .osm Layers for OMK

Overview

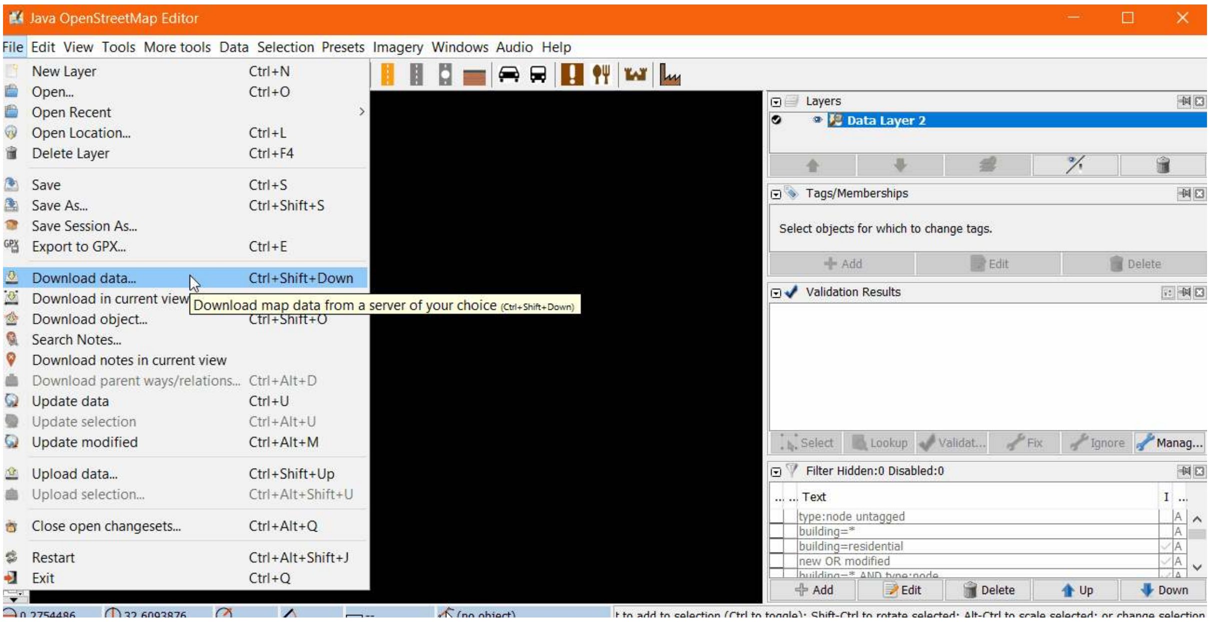
To conduct data collection using OpenMapKit (OMK), you will need to create an .osm layer. This .osm layer provides the buildings for selection in the OMK application.

Skills and Technology Needed

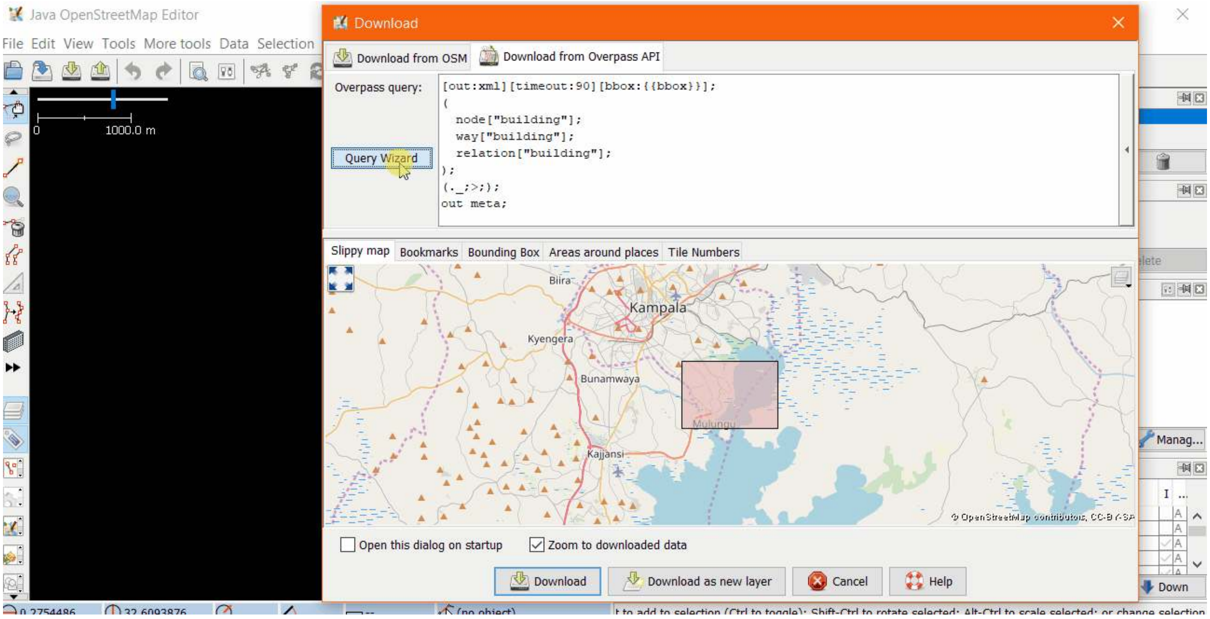
- Computer
- Internet Connection
- JOSM Installed
- Basic JOSM skills

Creating an .osm layer with JOSM

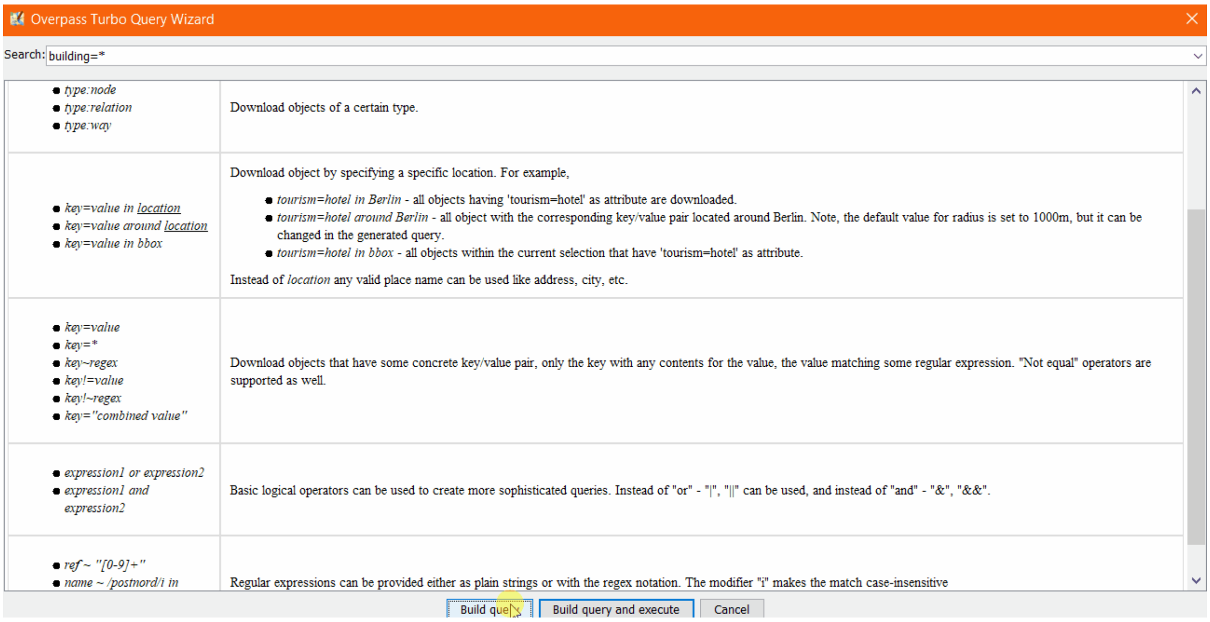
In JOSM, click the top-menu File > New Layer to start. Then click the top-menu File > Download Data.



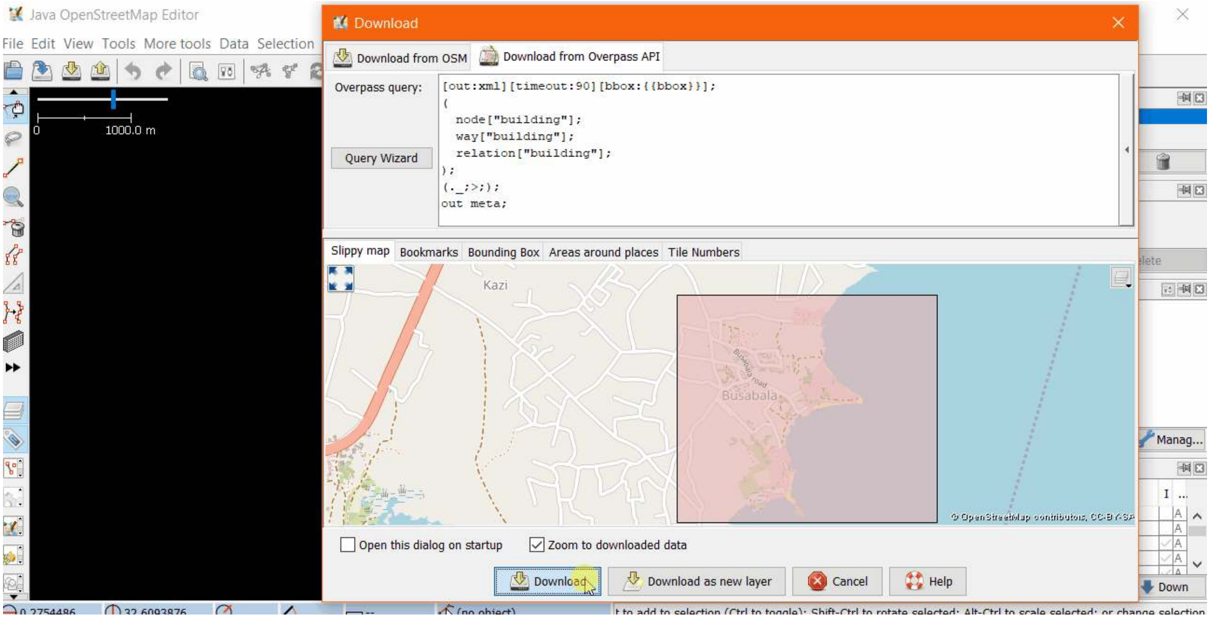
In the 'Download' window, click the tab 'Download from Overpass API'. This will allow you to download data with specific key=value tags in an area of interest. The top of this tab provides space for a query to be entered. Click 'Query Wizard.'



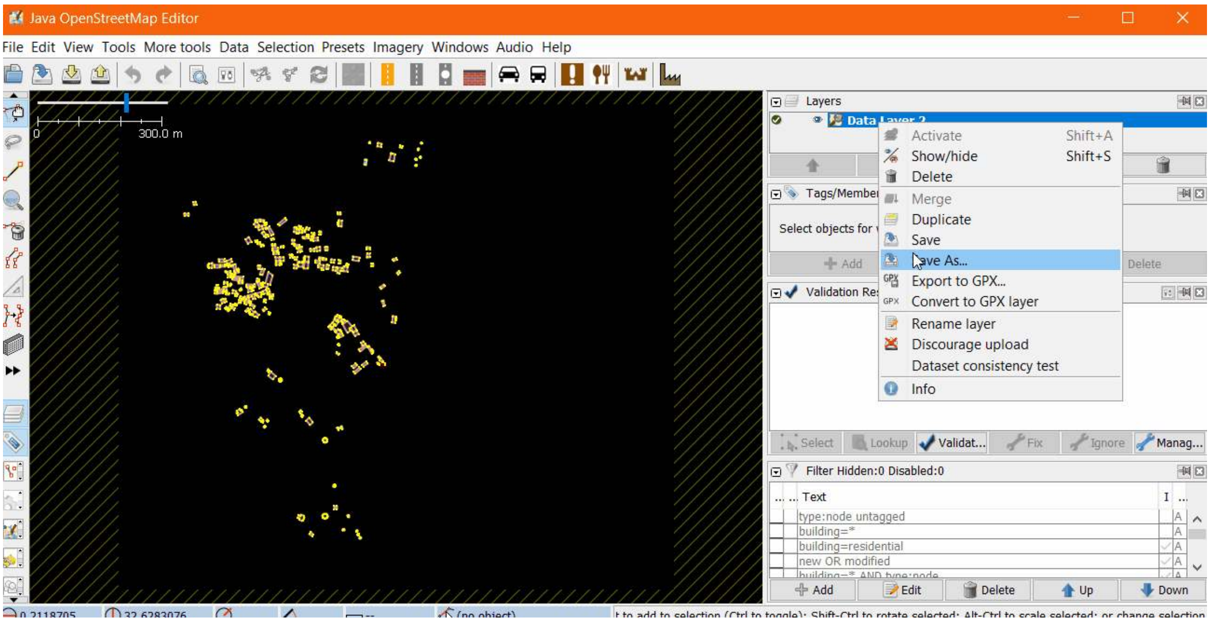
For an OMK .osm layer, we want a layer with only building polygons. In the search bar, type "building=*". This will return an OSM feature with a building tag. Click 'Build query'.



In the slippy map below the Overpass query, navigate to your area of interest in OSM. Drag the map by holding down the right-click button and dragging your mouse. To zoom, use the '+'/'-' keys on your keyboard. Once navigated to your AOI, hold down the left-button of your mouse or navigation pad and drag your mouse to create a pink box. This pink box is your *bounding box*, all buildings within this area will be downloaded. When complete, click 'Download'.



Right click on the layer file in the ‘Layers’ window. Click ‘Save as’. The default file type is OSM Server Files (*.osm), this is the correct file type.



Once saved, this file can be uploaded to devices for data collection with OMK.

4.7 Data Collection Servers

Overview

When beginning a mapping project, many organizations ask if they need to have a server. After collecting data, you'll need to get the data from the devices. Sometimes, it works to simply collect and process data directly from the data collection devices. However, this does not scale well when you get more people collecting data, and also means your data is not backed up - if you lose the device, you can lose the data. Prior to data collection, it is important to have a data management strategy that is suited for your operations.

Using a data collection server allows for much better management of forms and deployments, collection and aggregation of responses, and can offer additional features for viewing, analysing and exporting data. Use of a server may be restricted by available resources (cost of a physical server) and/or internet connection (access to cloud server). Servers used in HOT workflows include:

- POSM
- OpenMapKit Server
- Kobo Toolbox

If the use of a server is not available to you, it is still possible and crucial to store backups of data. In this case, data will need to be downloaded or otherwise shared with a central location, such as a laptop computer, and cloned to a secondary location such as a hard-drive or second computer.

Cloud server vs. Physical server

Which should I use?

I want to use a server that…	Kobo Toolbox	OpenMapKit Server	POSM
Is physical or does not require internet connection for upload	⊠	⊠	⊠
Is cloud-based (data upload via internet)	⊠	⊠	⊠
Accepts ODK data	⊠	⊠	⊠
Accepts KOBO Collect data	⊠	⊠	×
Accepts OMK data	×	×	×
Can provide data visualizations	×	×	×
Provides a map visualization of GPS data collected	×	×	⊠

Kobo Toolbox

Kobo Toolbox is an online application that allows users to build Kobo/ODK surveys as well as store, aggregate, and perform analysis of Kobo/ODK data.

Skill level to implement and manage Easiest

Skills and Technology Needed:

Use Kobo Toolbox Server if:

- OpenMapKit is NOT being used.
- Geospatial data collection does not include polygons - GPS points are accepted

Resources

Set-up

Data Management

OpenMapKit Server

OpenMapKit Server is a cloud based storage system for specially designed to store and compile OpenMapKit data. Data collected through OpenDataKit can also be uploaded to an OpenMapKit Server.

Skill level to implement and manage

Moderate

Skills and Technology Needed:

Use OpenMapKit Server if:

Resources

Set-up Set up and hosting is provided by HOT for local OSM communities and projects that HOT has an active agreement with.

Data Management

POSM

Portable OpenStreetMap, or POSM, is a physical server that contains a set of OpenStreetMap tools, including OpenMapKit server. POSMs allow multiple users to connect and upload data from data collection devices to a central location without the need for internet access. This data can then be aggregated using the OMK Server and synced with OSM directly or downloaded for analysis and processing.

Skill level to implement and manage Hardest

Skills and Technology Needed: Hardware

Use POSM if:

- Surveyors will not have access to internet for data upload
- Surveyors will be able to convene for upload to POSM (i.e. able to gather to return to a location where the POSM is kept)
- Project managers are able to procure and purchase a POSM device

Resources

Set-up http://posm.io/docs/posm/setup/

Data Management

5.1.1 Server Data

Server data in this case refers to data sent to a server from the field. This data then has to be downloaded from the server, in order to prepare it for cleaning and validation. We will take for example data collected during the NMP Building Validation Project in Botswana. Servers used can be:

- A local Portable OpenStreetMap Server **- POSM** (for both **ODK** and **OMK** data)
- An online OpenMapKit Server (for both **ODK** and **OMK** data)
- KoboToolbox (for only **ODK** data)

Preparing OMK Data

Preparing ODK Data

Merging OMK data with ODK Data

5.1.2 Serverless Data

Serverless data in this case refers to data collected without the use of a server to receive field data. In order to clean and validate this data, it is copied from data collection devices (phones or tablets) directly. We will take for example data collected during the Local Empowerment for Government Inclusion and Transparency Project in Liberia.

5.2 OMK Field Data Cleaning Workflow

After field data collection with OMK, clean the data before upload to OSM. Below is an example version of the OMK Field Data Cleaning Procedure. This is provided for guidance but should be modified as needed.

Skills and Technology Needed * JOSM

Step 1. Create folders

Create the folder structure for the data cleaning process.

1. Create primary working folder: `[omk_field_data_cleaning]`
2. Create a container folder: `[village_name]_[current-date]`. For example: `akweteyman_2019-01-31`
3. Create a sub-folders within the container folder:
   1. Add a folder for the raw data: `/01_raw_[yourOSMname]`
   2. Add a folder for the working data: `/02_working_[yourOSMname]`
   3. Add a folder for the final data: `/03_final_[yourOSMname]`

Step 2. Raw Files

Supervisor or team leader will download data from the server, and select sections of data for individual data cleaners to clean up.

For Supervisor:

- *Each mapper's device id (IMEI) and username should be registered, to keep track of their submissions to the server.*
- *Using the filter option of the server, filter server submissions according to dates, download data for a specific data, divide it into subsections and give those to the data cleaning team.*

1. Create a sub folder `[server_downloads]` for all downloads from the server naming downloads according to the date of download, i.e `akweteyman_2019-01-31_server_download.osm`
2. While dividing out this data to the different team members, **purge** everything else except what you want to give to a specific team member, and then 'Save As…' that section. Do not copy a section of the data downloaded from the OMK server into another new file, as this will not sync while downloading data from OSM database to start cleaning field data. Read about the purge action: https://josm.openstreetmap.de/wiki/Help/Action/Purge
3. Do this for every team member you are giving data to clean.

For data cleaners:

1. The file your supervisor gives you will be named as: `[projectArea_name]_[current-date]_raw_[yourOSMusernam` For example: `akweteyman_2019-01-31_raw_lusdavo.osm`
2. Copy the file your team leader gives you to the `[projectArea_name]_[current-date]` → `01_raw_[your_OSMusername]_[id]` folder. Format dates as YYYY-MM-DD.

For example:

`akweteyman_2019-01-31` → `01_raw_lusdavo` → `akweteyman_2019-01-31_raw_lusdavo_10.osm`

NB: The represents project area subdivisions you are supposed to be working on.

Step 3. Add OSM Files to JOSM

Add file to JOSM

1. Open JOSM

2. Drag the .osm file into JOSM

Step 4. Sync Field Data with OSM Data

This step covers a series of checks on the data to check if there are any issues with the data.

1. You will need several *plugins* during this cleaning process. Read about plugins here: https://wiki.openstreetmap.org/wiki/JOSM/Plugins. Add the following plugins:

- `todo`
- `opendata`
- `utilsplugin2`
- `buildings_tool`

2. You will be using several filters during your cleaning process. Read about Filters here: https://josm.openstreetmap.de/wiki/Help/Dialog/Filter. Add the following filters: 'type:node untagged' 'new OR modified'

3. Prepare your data for cleaning:

- Select field collected data using the JOSM filter: `type:node untagged`
- Select all results (Ctrl+A)
- Add the selection to the TodoList plugin. In the plugin window, click '+ Add'
- Deselect results by clicking in the 'Map View' window
- Download OSM data in the area of the field collected data, to ensure we merge properly with existing OSM data
  - Press '2' on the keyboard to zoom to the extents of your field collected data
  - Select 'File -> Download in current view'
- Now save this file to your 'working folder'
  - File → Save As → `[projectArea_name]_[current-date]_working/[working_yourOSMusername]_[id]`
  - For example: `akweteyman_2019-01-31_working_lusdavo_10.osm`

Step 5. Cleaning Data

1. Select/enable the filter 'new OR modified'
2. Select only new or modified data using the JOSM filter: 'new OR modified', tick 'E' and 'I' to differentiate between field data and OSM Server data. Check if everything looks okay.
3. You are now going to clean the 'working' file in JOSM.
4. Add Imagery being used to clean data.
5. Uncheck the 'type:node untagged' filter to enable you edit features.
6. Convert all building nodes to polygons by using replace geometry feature.
7. From the ToDoList, inspect each feature (select the first one in the TodoList)

- Are the locations correct?
- Convert comments into possible tags as possible else change the key to fixme
- Are there any spelling mistakes in the attributes of this feature?
- Are the tags capitalised correctly?
- Are the tags fields filled correctly?
- Are we not duplicating existing OSM data?
- Expand all text and correct all text, examples below:
  - St. → Street
  - Ave → Avenue
  - Ltd. → Limited
  - BANK OF GHANA → Bank of Ghana
  - GOIL → Goil, etc

8. If okay, click 'Mark' in TodoList to proceed to the next item

5.1 Cleaning Apartments

Use the `Terrace a Building` tool to divide a building into the different number of apartment units that building has, then copy and paste attributes from an apartment point to the respective building terrace. If a building is 5 or more sided, manually draw the different apartments connecting them together.

5.2 Record Errors Encountered

Capture common problems that come up while cleaning data.

1. Data cleaners should record any errors and problems encountered (both while mapping and validating).
2. Please record this in a text file with screenshots if possible
3. Save edits to <projectArea_name>_<current_date>/02_working' folder.

Step 6. Save Final Files

> NOTE: Some projects may require that datasets are split into public and private datasets, where the full dataset remains private, and personal/private data is removed from the partial dataset uploaded to OSM. For similar situations, use 6.1 and 6.2. For projects where all data collected is public and can be uploaded to OSM, skip to 6.2

1. Right-click the working layer and select 'Save As..'
2. You are to 'Save As..' to the final folder. Team Leaders are to review their team's data validation. If satisfied, get the Group Supervisor to double check the data.
3. Disable all filters used during data cleaning.
4. Run 'Validation' in the 'Validate Results' window. Correct any errors that are detected, and go through the warnings.
5. Notify supervisor for review.

6.1 Private Data

If full data set includes private/personal information: 1. Save to the final layer: `[projectArea_name]/[current_date]/` for example `akweteyman/2019-01-31/03_final_lusdavo` folder. * File name: `akweteyman_2019-01-31_final_lusdavo_` 2. From the saved file to be uploaded to OSM, remove the private/personal attributes before uploading to OSM (enable the type:node untagged and new OR modified filters). * For example: * building:population * building:sleeping_spaces * building:rooms * Building:rooms_painted

NOTE: Do not overwrite the _private file. These changes will be saved to a new layer in step 6.2.

6.2 Public Data for upload to OSM

1. Save to the final layer: `[projectArea_name]/[current_date]/03_final`, for example `akweteyman/2019-01-31/03_final_lusdavo` folder.
   - File name: `akweteyman_2019-01-31_final_lusdavo_10.osm`
2. Notify supervisor for review

Step 7. Upload to OSM

If Supervisor authorises, upload the validated data to OSM

1. Add the **source** tag to all field data. At minimum, `Field Survey`
   - Example: source= Open Cities Accra - Field Survey
2. Disable the 'type:node untagged' and 'new OR modified' filters

3. With your OSM Username and Password added to JOSM preferences, upload to OSM adding the appropriate tags for the project as a changeset comment.
    - Example: `#OpenCitiesAfrica #OSMGhana #MobileWebGhana #HOTOSM` Specify the data source for change as survey.

Step 8. Quality Assurance using OSMCha|QGIS|JOSM|Osmose

This is intended to be used by supervisors to ensure data quality

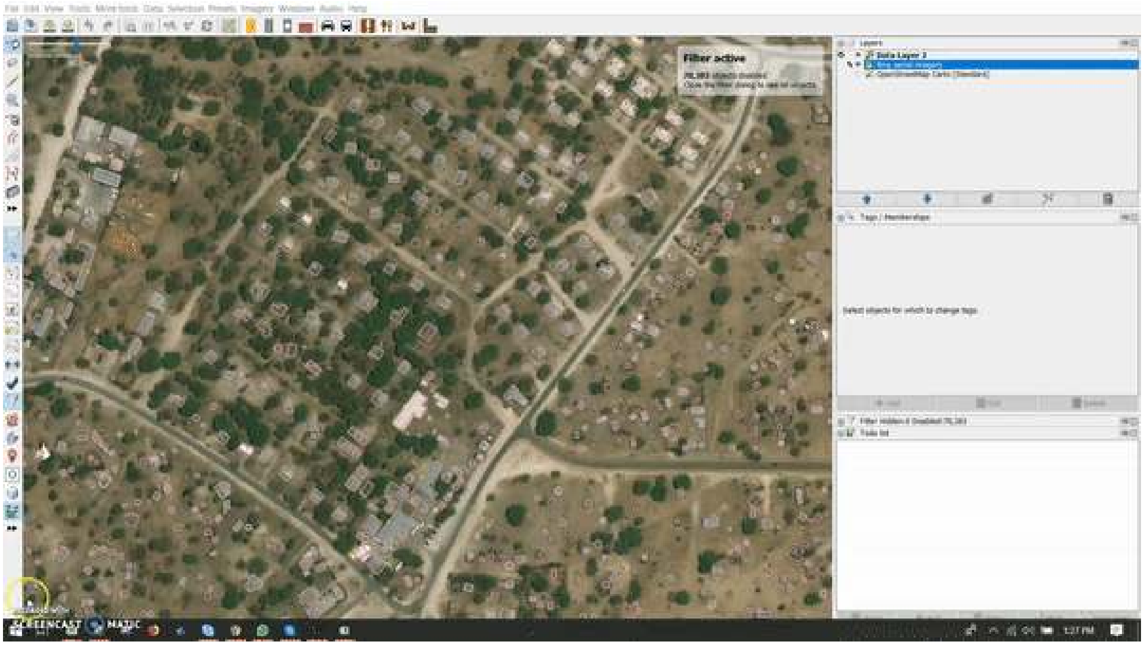
Once data is cleaned and uploaded to OSM, several tools will be used to monitor Quality Assurance. * OSM Cha: Will be used to monitor the edits made by users uploading data to OSM, Filters will be made using UserIDs of data to give a summary of modified, deleted, added nodes, which the QA person will review and either flag as bad or good, sending feedback to the person who uploaded the data. Example of filtered changesets * JOSM: JOSM Validation tools, filters and customised MapCSS will be used to flag data quality issues, then give feedback to the data entry people for improvement. * Osmose

For more information, see Quality Assurance Tools.

5.3 Data Cleaning with JOSM

There are tools built into JOSM, as well as additional plugins that can assist with data quality control during the upload process.

- **Filters** is a built-in tool that allows you to disable, hide, select, and highlight specific groups of objects based on flexible custom parameters. This tool will help you to spot and avoid common mistakes, and review data.
- The **Validation Tool** is another built-in tool that will review and search for common errors as well as provide warnings about potentially problematic data.
- The **Todo List** plug-in allows users to systematically review data that is to be uploaded, and monitor progress of data cleaning work. The “ToDo List” plug-in, needs to be downloaded before it can be used. Visit this page to learn how to install plug-ins in JOSM, then download the “ToDo List” plug-in.



- **MapCSS Paint Style** is an advanced JOSM quality assurance tool that can be used to visually identify errors such as missing tags and road network issues. Existing MapCSS Styles can be imported or with some training, quality control teams can create their own MapCSS styles that match their data model.

5.4 Quality Assurance and Quality Control

Quality Assurance and Quality Control is the process by which mappers, and OpenStreetMap contributors in general, check data to ensure that all information uploaded to OSM meets high standards for usage and to prevent vandalism. As OpenStreetMap is a free and open platform that anyone can use and edit, it is critical to the sustainability of open data and OSM that everyone participates in the quality assurance and quality control process – from field data collection to data cleaning to long-term maintenance of existing OSM data.

The data quality dimensions identified through this framework as the highest priority for assessment of all datasets are:

- **Completeness**
- **Consistency**
- **Accuracy**
- **Timeliness**
- **Accessibility**

For each data quality phase, the following sets of questions should be answered:

Phase 1

Defining Needs & Requirements

Why are we collecting this data? Who will use it?

What data are we collecting?

What information will we and other users need to know about the data we collected?

What is the geographic scope of our data?

What is the temporal scope of our data collection? Does this timeline meet the needs of the users?

What quality metrics are required for the datasets? Is there an allowable margin of error or acceptable data gaps?

Have partners reviewed and agreed upon the needs and requirements of the project?

Does the scope of this project fall under the OSM Organized Editing Guidelines? If so, does it meet the requirements?

Phase 2

Defining Data Collection Methodology

Have permissions been secured to conduct data collection in the area of interest? Has proper community outreach been conducted with the community and stakeholders relevant for the area of interest?

Have team members been provided specialized and hands-on training for their role?

Has all software and hardware been selected based on the needs of the project? Has all software and hardware been tested?

Do data collection forms meet the need of the project and data model? Have data collection forms been trialed by surveyors and with survey subjects?

How will collected data be stored? What data protection strategies are in place?

Where will the data come from and what standard indicators will be used that can help achieve objectives?

Phase 3

Collecting Data & Producing Datasets

Are data collectors able to report issues and challenges in the field?

Is data quality being monitored during field data collection?

Is field data being safely secured on a daily basis?

Phase 4

Cleaning and Validating Datasets

Has raw data been reviewed for errors prior to upload or packaging? What tools were used in this process and why?

Do the cleaned data sets include private data or publicly identifiable information? If so, has the dataset been split into public and private sets?

Has data been properly uploaded to OSM with designated changeset comments and tags?

Has data uploaded to OSM been reviewed for additional quality assurance? What tools were used in this process and why?

Phase 5

Ensuring Sustainability & Providing Documentation

Has data been made available through an open and accessible program?

Has the availability of data been communicated to relevant stakeholders?

Have the workflows, tools, and processes used for the project been documented? Is this documentation open and available for users outside of HOT?

Have local stakeholders or other groups with potential for sustaining data use and data collection been trained in project methodology?

Quality Assurance Tools

The following are Quality Assurance tools commonly used in the HOT workflow. A detailed overview of these and other QA tools can be found at the Quality Assurance Tools Wiki. Different tools check for different errors and issues. If you want to:

- Check for attribute completeness, use MapCampaigner.
- Check for potential vandalism, use OSMCha.
- Check for contributions and upload issues by indivdual user, use OSMCha.
- Check for tagging issues, use Osmose AND JOSM Validation.
- Check for geometry issues, use Osmose AND JOSM Validation.

MapCampaigner

MapCampaigner is a tool developed by HOT to monitor attribute completeness for predefined areas of interest (AOI). Based on your data model, the tool checks and highlights any map features that are missing pre-defined tags within your AOI, and allows team validators to download and fix those features.

OSMCha

OSMCha, or the OpenStreetMap Changeset Analyzer, is a tool designed to review uploads and changes to OSM data, largely to prevent vandalism and bad edits made to map data. This tool allows users to filter by username, location, dates of upload, and other metadata features. OSMCha is useful for monitoring the progress of data cleaning and upload teams.

Osmose

Osmose is a tool that monitors multiple quality control issues in OSM. These include issues with feature geometry (such as overlapping buildings/nodes, incomplete features, and duplications), and also common tagging issues (such as missing, unsuitable or poorly formatted tags). More information about Osmose can be found at the Osmose OSM Wiki Page.

Note: to properly use this tool and view errors, you will need to use the Google Chrome internet browser. Firefox, Opera, Safari, and other browsers may not display the information correctly.

Steps to correct key issues identified by Osmose

1. Open JOSM on your computer.
2. Navigate to http://osmose.openstreetmap.fr in the Google Chrome internet browser.
3. Use the zoom, pan, and search features on the map to navigate to your area of interest.
4. Use the left panel to toggle common issues on and off.
5. Identified issues will appear in the map as pins matching the icons from the issues panel. Click on each pin to learn more about the object and associated issue(s).
6. In Osmose, locate the 'Export' button at the top of the page. Click 'Export', then 'JOSM'.
7. Fix the issues identified then re-upload to OSM.

6.1 HOT Export Tool

Overview

HOT Export Tool allows users to download OSM data by specifying tags, area of interest, and file type. Learning resources and walkthroughs can be found at the HOT Export Tool Learn page.

Tools and Technology Needed:

- Computer
- Internet Connection
- OSM Account

Presentation: https://docs.google.com/presentation/d/1RyHYVPZU5d4xJ1cpWga4QRdfohpEs-t9ylJ_HTJ7wm8/edit#slide=id.g51e1e04424_0_238

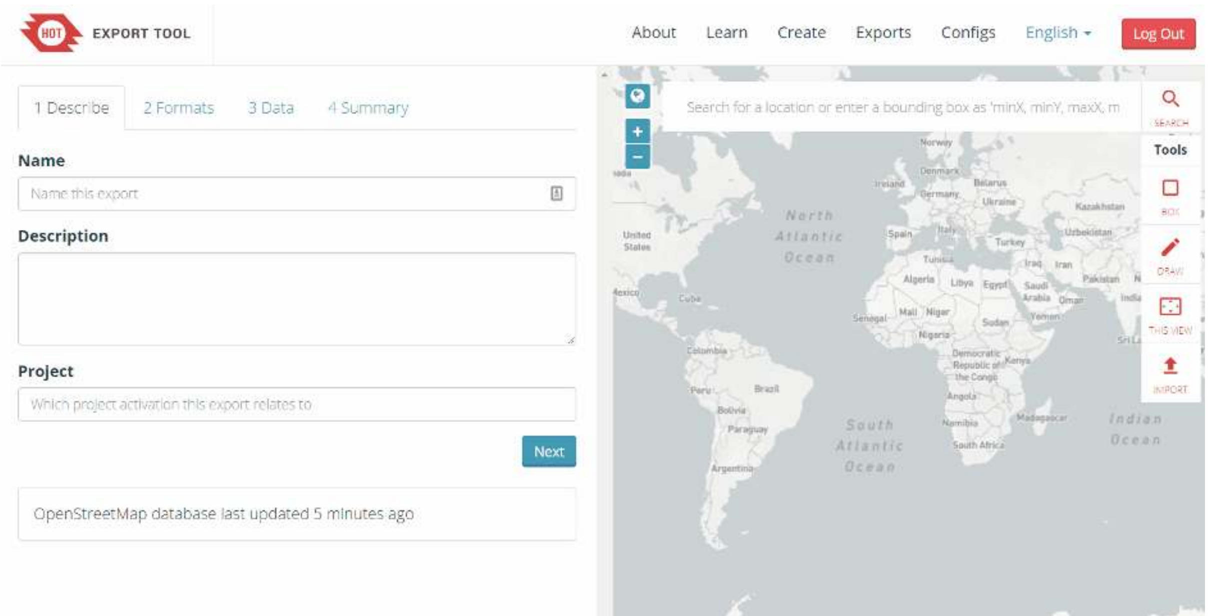
Downloading OSM data with the HOT Export Tool

Estimated time: [x min]

To get started, open an internet browser and go to: https://export.hotosm.org/ To use the HOT Export Tool, you will need to log in using your OSM username and password, by clicking the red "Log In" button in the top right-hand corner.

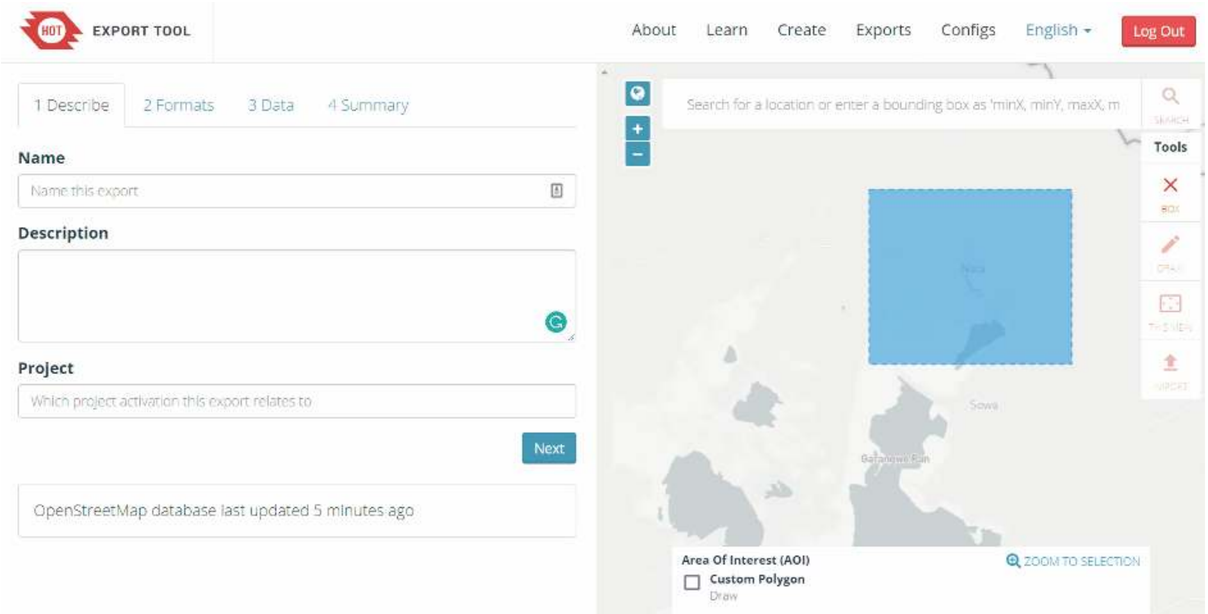
Select 'Create' in the top menu.

Select an AOI on the map by searching a place, uploading a .geojson, or drawing an area in the map to the right. To draw an area of interest, zoom in and find a location of your choice (i.e. Zwedru, Accra). Once you have zoomed in to your area of interest, select the box tool from the Tools Menu on the right. Click one corner to start drawing a box, then select the opposite corner to complete the box. This is your AREA OF INTEREST that will be downloaded.

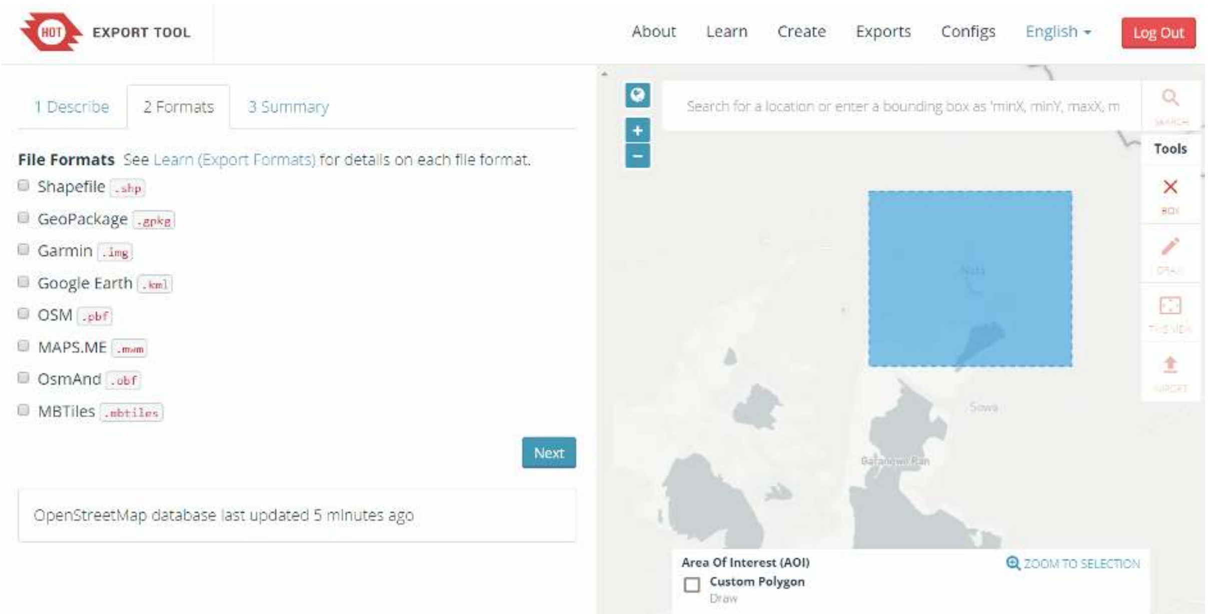


On the left hand side of the window, fill out the “1 Describe” options:

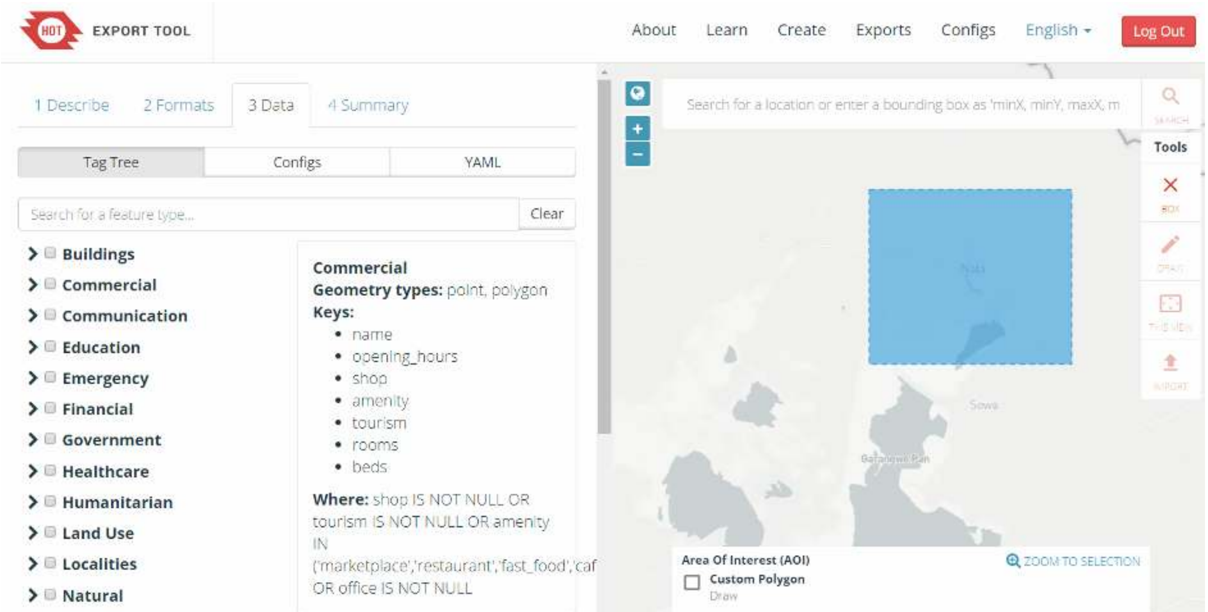
- Name: “[YOUR OSM USERNAME] Test Export”
  - For example, “jessbeutler Test Export”
- Description (optional)
- Project (optional)
  - For example, “Government Inclusion Project”



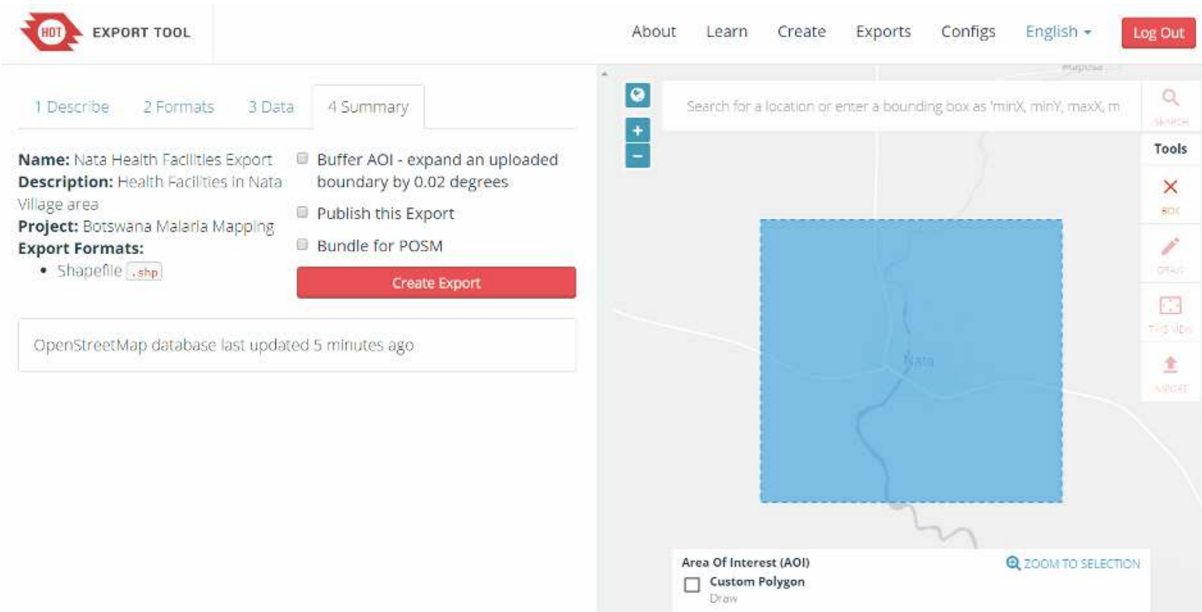
Select preferred file type in the 'Formats' tab. *If downloading data to use in a GIS program, try downloading a .shp file.*



In the 'Data' tab, select the types of OSM data to export. Recommend types to try: 'Education', 'Government', 'Healthcare'.



In the ‘Summary’ tab, select ‘Create Export’. While processing, a “Running” status will show. Processing time depends on export size. Once completed, the file will be available for download & sent to your email.



This process will take several minutes to process.

When the export process is completed, the ‘Status’ bar will be updated to ‘COMPLETED’. Download the file by clicking on the file link, as highlighted below. For shapefiles, open the downloaded .zip folder and save it to a folder of your choice on your computer. You can now use the shapefile in a GIS software such as QGIS.

[image]

6.2 Humanitarian Data Exchange (HDX)

Humanitarian Data Exchange (HDX) is a data platform for storing and sharing humanitarian data. The platform is managed by OCHA's Centre for Humanitarian Data. Types of data available on HDX include: Data includes:

- Geospatial datasets
- CSVs & spreadsheets
- text & image files

Working with HDX

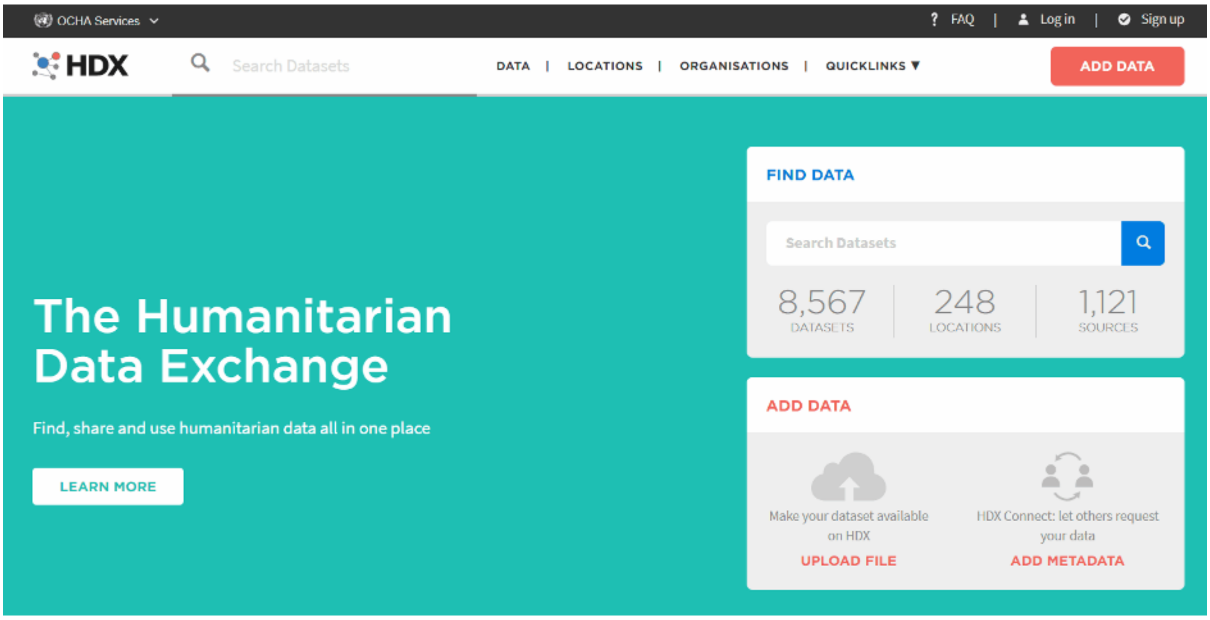
In this activity, you will practice using Humanitarian Data Exchange (HDX) for downloading OSM data for use in QGIS. HDX is an online-based tool, so you will need to be patient with internet connectivity.

Tools and Technology Needed:

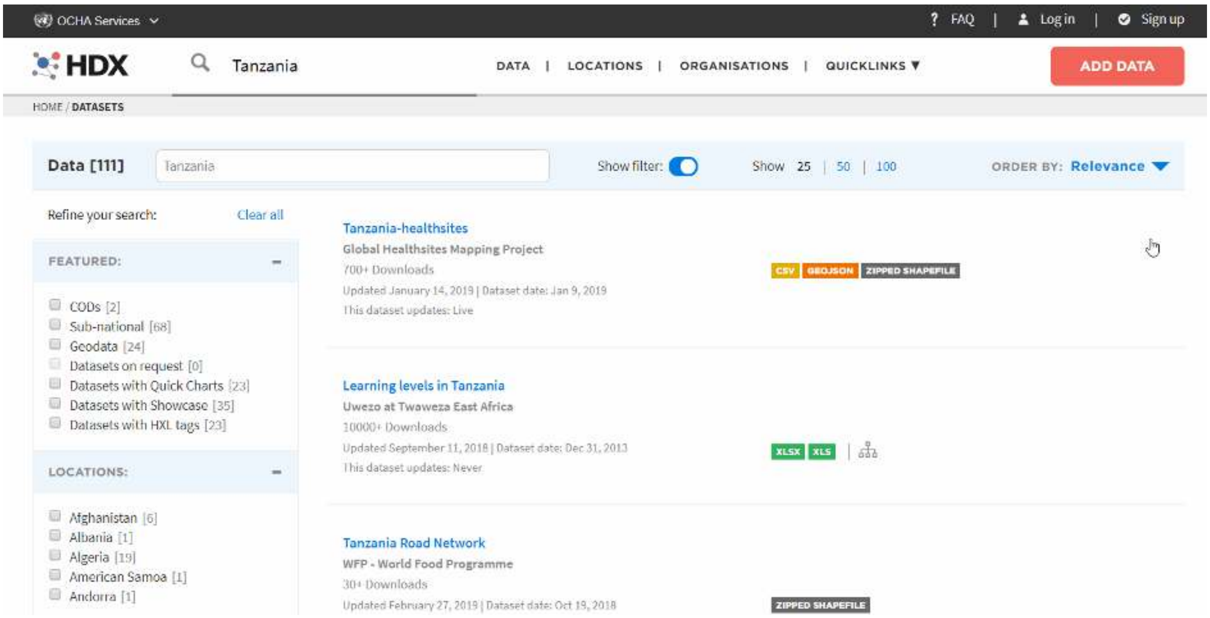
- Computer
- Internet Connection

Downloading data

Visit data.humdata.org. In the Find Data search bar, type your area of interest (i.e. Liberia, Tanzania), and click search.

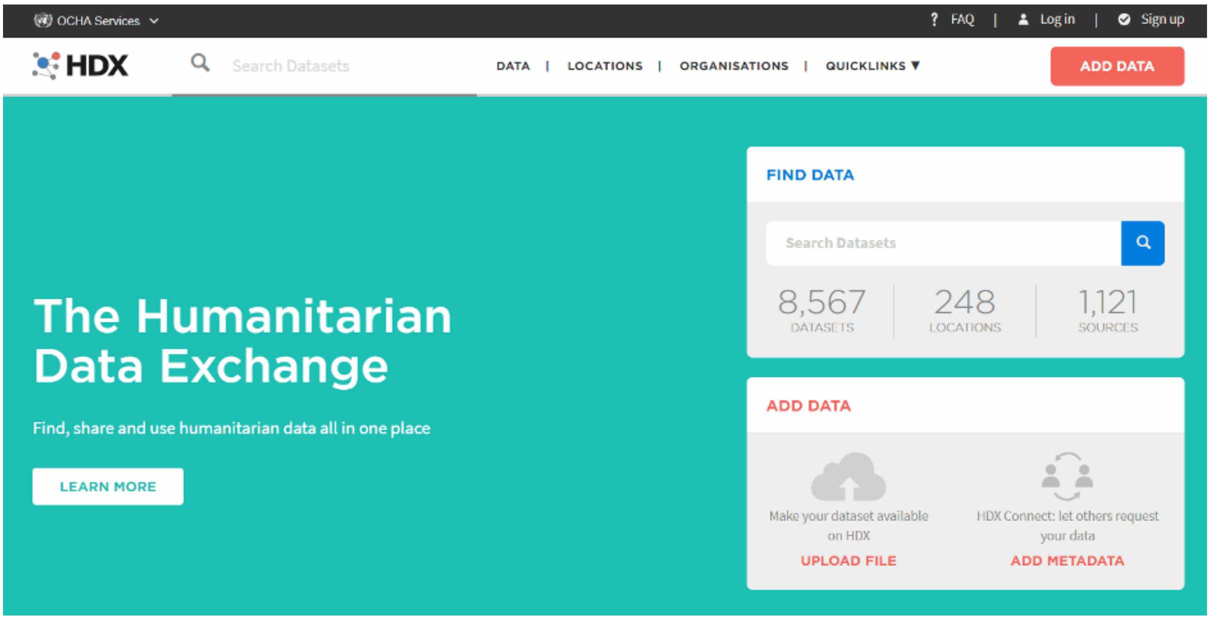


Browse list of available datasets. Select a dataset of interest and download the data file.



Adding data

Visit data.humdata.org. In the Add Data window, select 'Upload File'. You will need to sign in or register as an organization.



You will need to make sure data file meets HDX standards before uploading data file.

7.1 Introduction to QGIS

Overview

QGIS (or Quantum GIS) is a free and open source geographic information system (GIS) program. GIS programs allow users to display, manage, and analyze geospatial information on the computer, and create map products. Geospatial data that can be used in GIS includes aerial imagery, GPS data, and spatial datasets.

This section covers the basic skills necessary to using QGIS. These skills include:

- Installing QGIS
- Navigating QGIS
- Adding data
- Styling layers
- Installing Plugins
  - Installing and using QuickMapServices
  - Installing and using QuickOSM

Following completion of this section, a new user should be prepared to navigate and work with data in QGIS. For additional skills in QGIS see:

- Creating Maps and Atlases in QGIS
- QGIS for Field Project Managers
- QGIS for Tasking Manager

Presentations

- Introduction to OpenSource GIS
- Introduction to QGIS

Resources

- QGIS Training Manual: https://docs.qgis.org/2.18/en/docs/training_manual/
- QGIS Tutorials: https://www.qgistutorials.com/en/docs/learning_resources.html

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The following guide provides instructions and screenshots from QGIS 3.4. Versions before or after may have different icons and steps.

Installing QGIS

QGIS is available for download for the following operating systems:

- Windows
- Mac OS
- Linux

Skills and Technology Needed

- Computer with
  - Windows, Mac, or Linux operating system
  - Sufficient free disk space (approx 10GB) and administrator rights to install software
- Recommended: computer mouse

For Windows Prior to installation, you need to determine whether or not your computer runs on a 32-bit or 64-bit system.

1. Open the Start Menu, right-click on "Computer", and select "Properties".
2. Under "System", the correct system type will be listed.

Installing from Shared File If you are offline, you will need to install QGIS from a shared file. The QGIS Installer can be downloaded and shared via USB. This file can be shared with colleagues and others who wish to install the program. To install from a shared file:

1. Go to folder shared to you and downloaded to your computer.
2. Select the appropriate installer folder based on your operating system (Windows 32-bit; Windows 64-bit; or Mac).
3. Open the installer to begin the installation process.

Installing from QGIS Website If you have an internet connection, you can download directly from the QGIS website. Additionally, it is highly recommended to download software directly from the QGIS website whenever possible. This ensures that you have the most up-to-date version of the program. The QGIS file is larger than 300MB and may take a long time to download, depending on your internet connection.

To install:

1. Visit: http://www.qgis.org/en/site/forusers/download.html
2. Select your appropriate operating system (i.e. Windows, Mac, Linux).
3. For Windows - select your approprite system (32-bit or 64-bit).
4. Click on the QGIS Standalone Installer to begin the download process.
5. Once installed, open the installer to begin the installation process.

Resources

Further QGIS Install instructions: https://docs.qgis.org/testing/en/docs/user_manual/introduction/getting_started.html#ins qgis

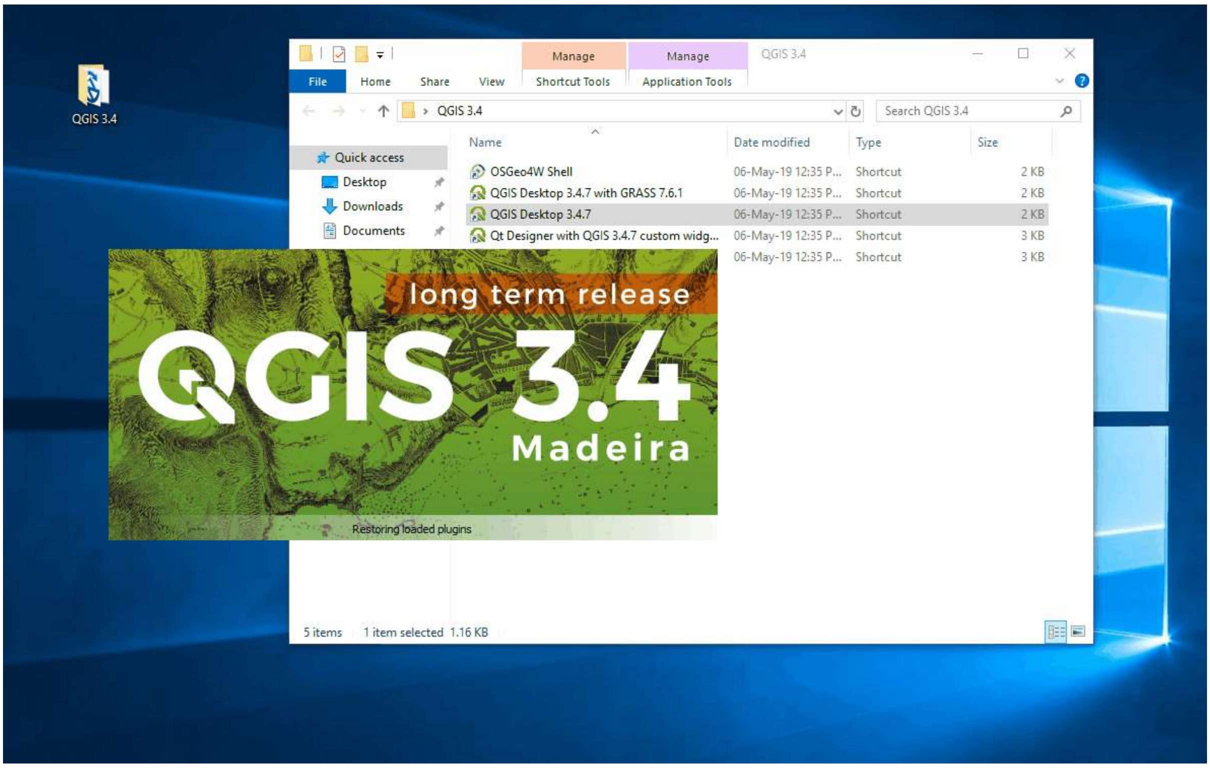
Considerations when installing QGIS for large numbers of individuals

- Consider internet connectivity and capacity prior to installing QGIS for large numbers of individuals via internet. It is highly recommended that prior to the training/workshop, installation files are downloaded and loaded onto USB drives for offline installation.
- When downloading offline installers for a large group, make sure to download an installer for all operating systems. Note: it will be important to download the Windows installer for BOTH 32-bit and 64-bit.
- The downlaod and installation process often takes longer than anticipated, especially when factoring in technical skills and hardware compatibility. Therefore, it is recommended to begin download

and installation process early in the training or during breaks to ensure a smooth process and adherance to agenda.
- Prior to the training/workshop, request attendees to make sure that they have enough space on their computers (10GB+) for installation of QGIS.

Navigating QGIS

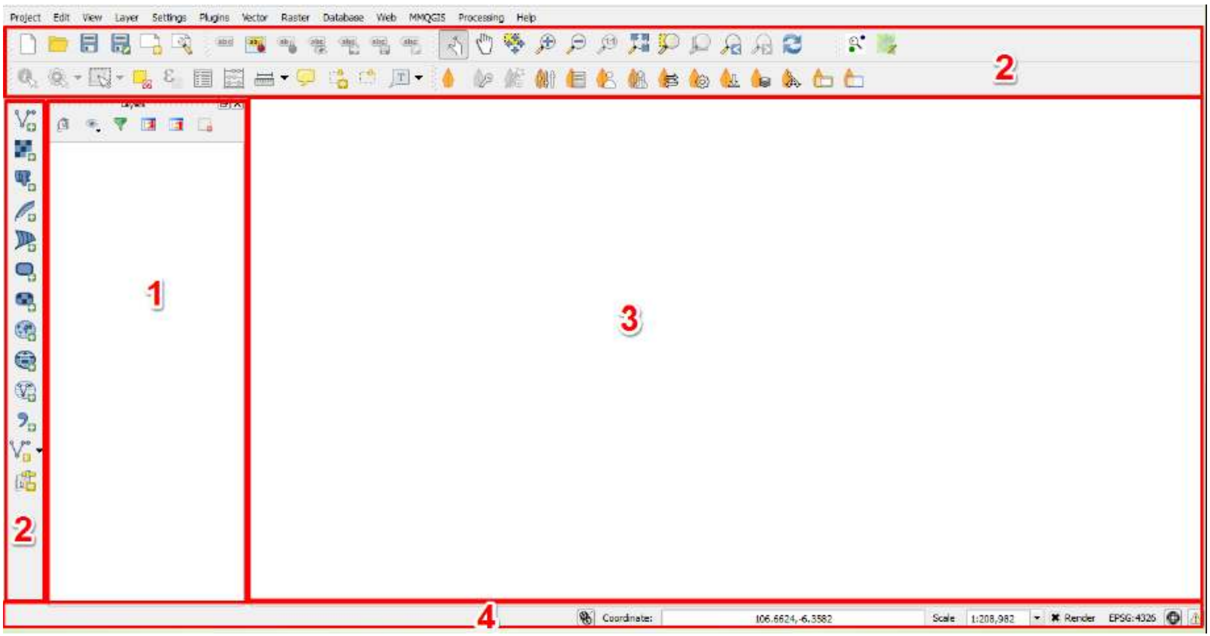
To open QGIS, open the QGIS folder on your desktop. In this folder, find QGIS Desktop. Double-click to open this program



Taking a long time? Don't panic! QGIS can take a few minutes to load.

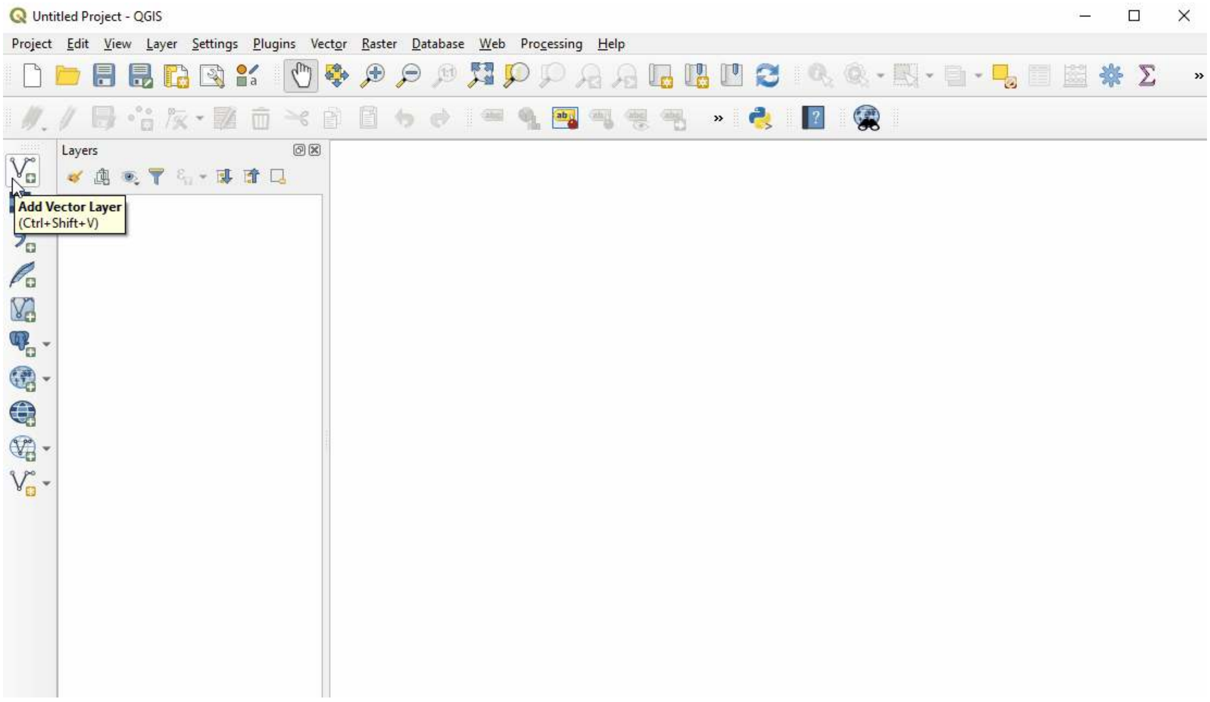
Familiarize yourself with the various parts of the QGIS browser, hover your mouse over icons to view names of various tools. Note: Your browser may have different tools than the image below.

1. Layers panel - This is where layers (i.e. imagery, building layers) will be listed. The order of layers in the panel impacts the order of layers in the map - in other words, the layer at the top of the list will appear as the top layer in the map.
2. Toolbars - Most of the tools you will regularly use in QGIS will appear as icons in the toolbars at the top, such as save, zoom, pan. The number of toolbars depends on various features you have activated or installed.
3. Map Canvas - When layers are added to the Layers Panel, they will appear in the map canvas.
4. Status Bar - Coordinates, scale, and projection will appear in the Status Bar.

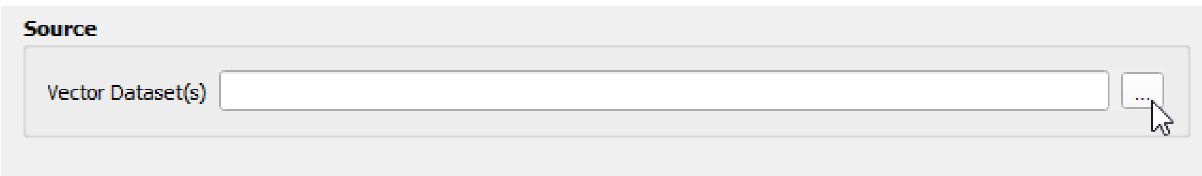


Adding Data

Hover your mouse over the tools until you find the “Add Vector Layer” tool. Click on this icon to open the Add Vector Data dialog.



Click the ‘…’ button under Source and navigate to the location on your computer where you have a saved vector layer (i.e. .shp, .geojson) Select the file and ‘open’.



For more information on exporting data from OSM, see instructions on QuickOSM and Export Tools.

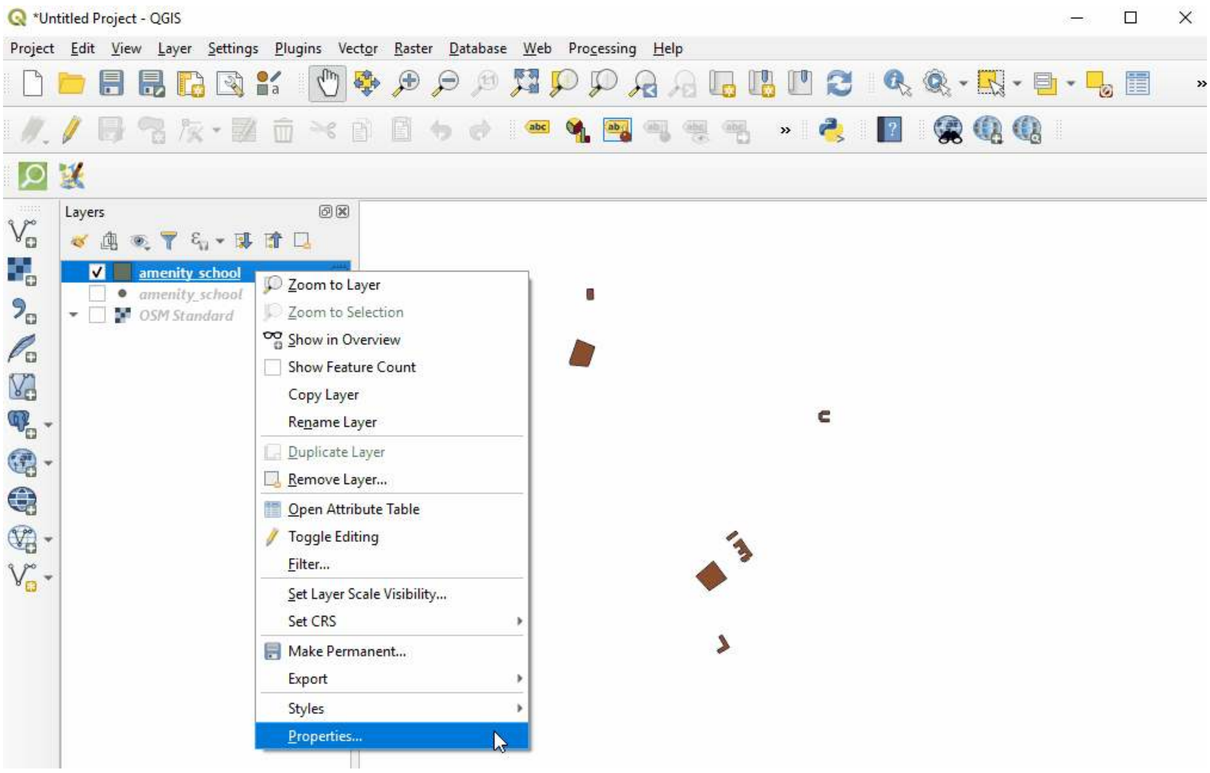
Practice data can be found here:

Styling Layers

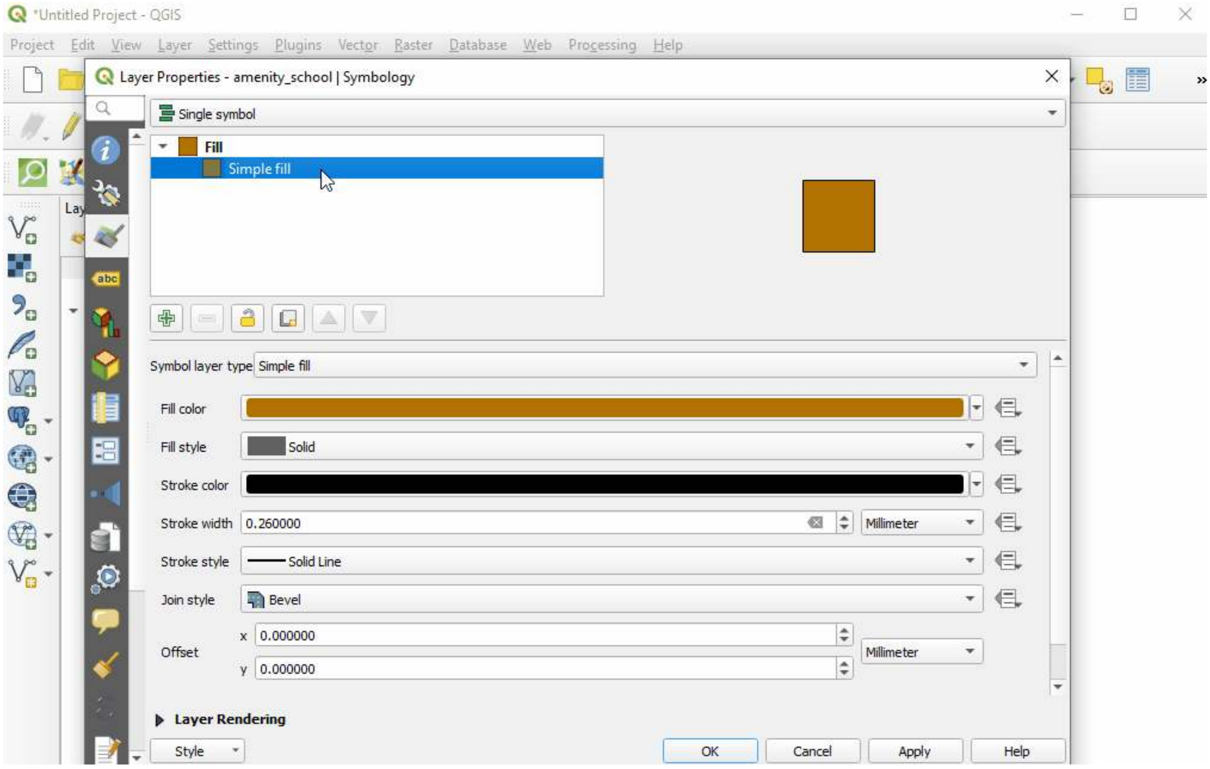
Data layers can be styled in three ways: opening the properties tab, copying from other layers in the project, and importing a .qml style.

To manually select a style:

Right-click on the point layer and select ‘Properties’. *(Alternate: Double-click on a layer in the Layers Panel.)*

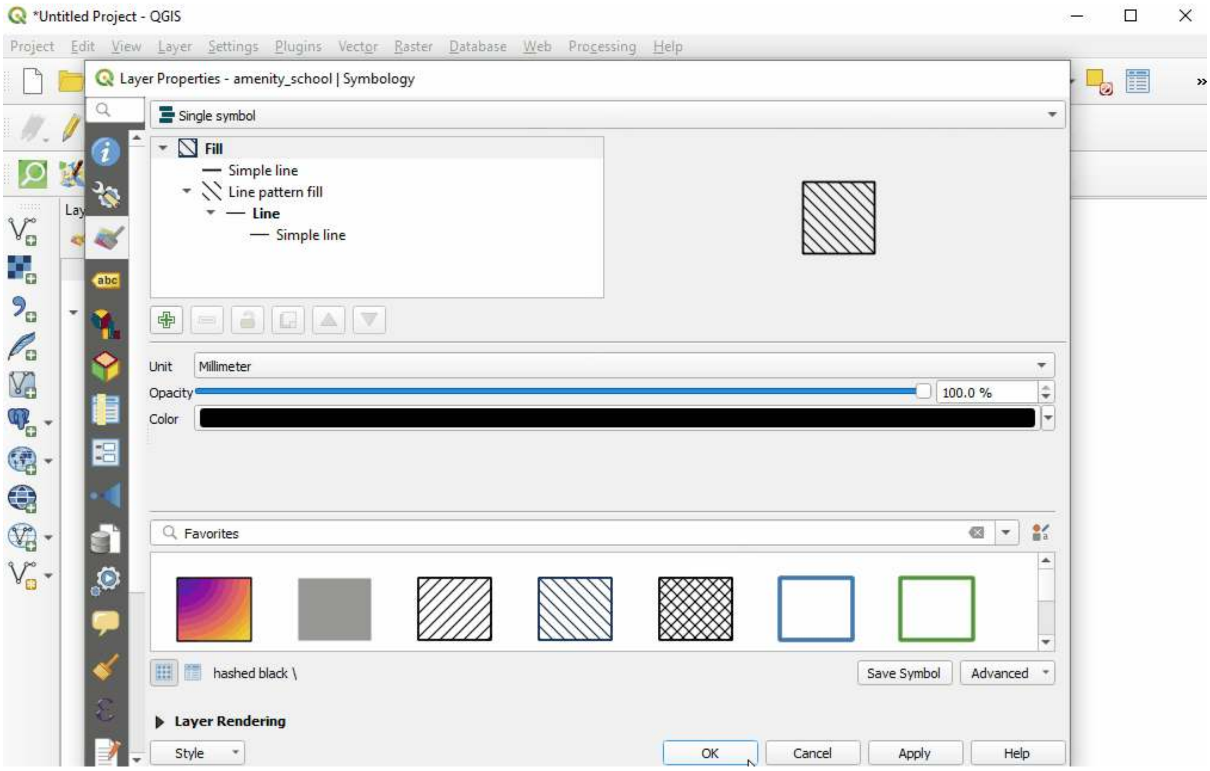


Select ‘Style’ from the left-hand menu. There are many changes and styles that can be made in this window. To complete a basic style change, select ‘Simple Fill’ near the top of the window. Now you can change the Fill Color, Fill Style, Stroke (outline) Color, Stroke (outline) Width, Stroke (outline) Style and more to your own choice.



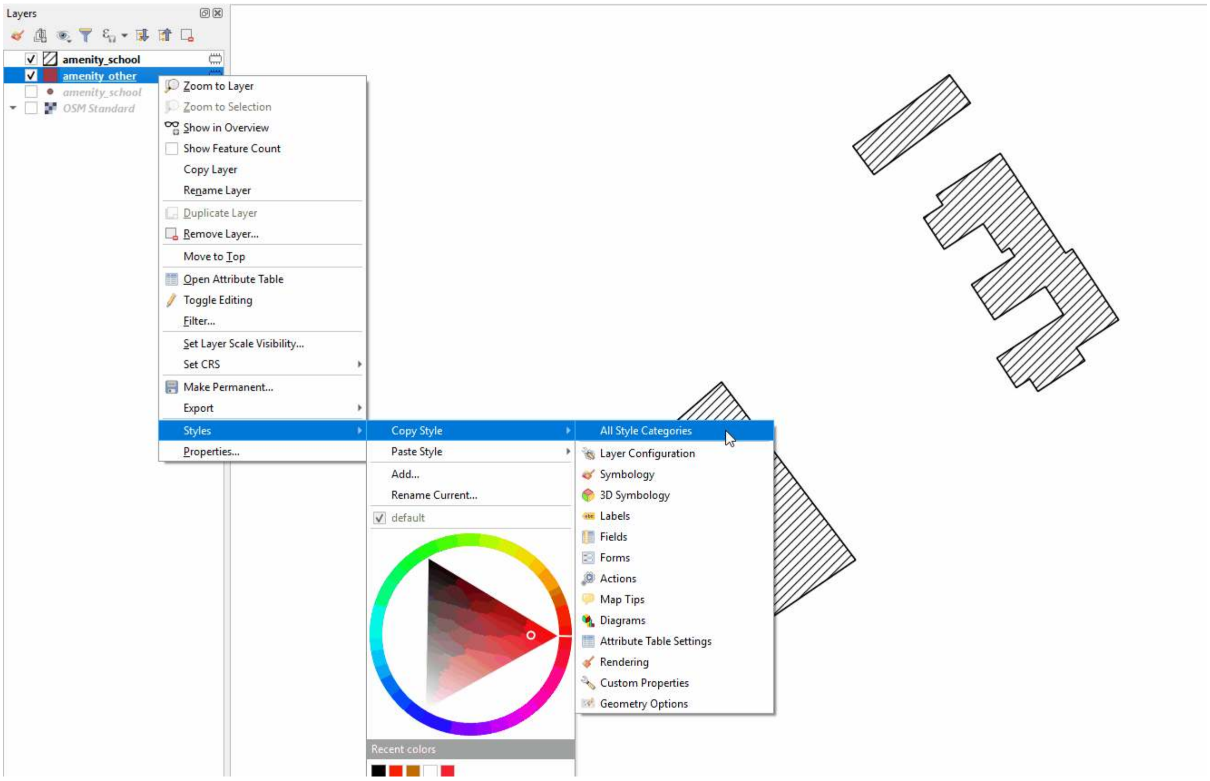
Select ‘Ok’ to see your changes in the project.

You can also select from various preset styles in the main style window.

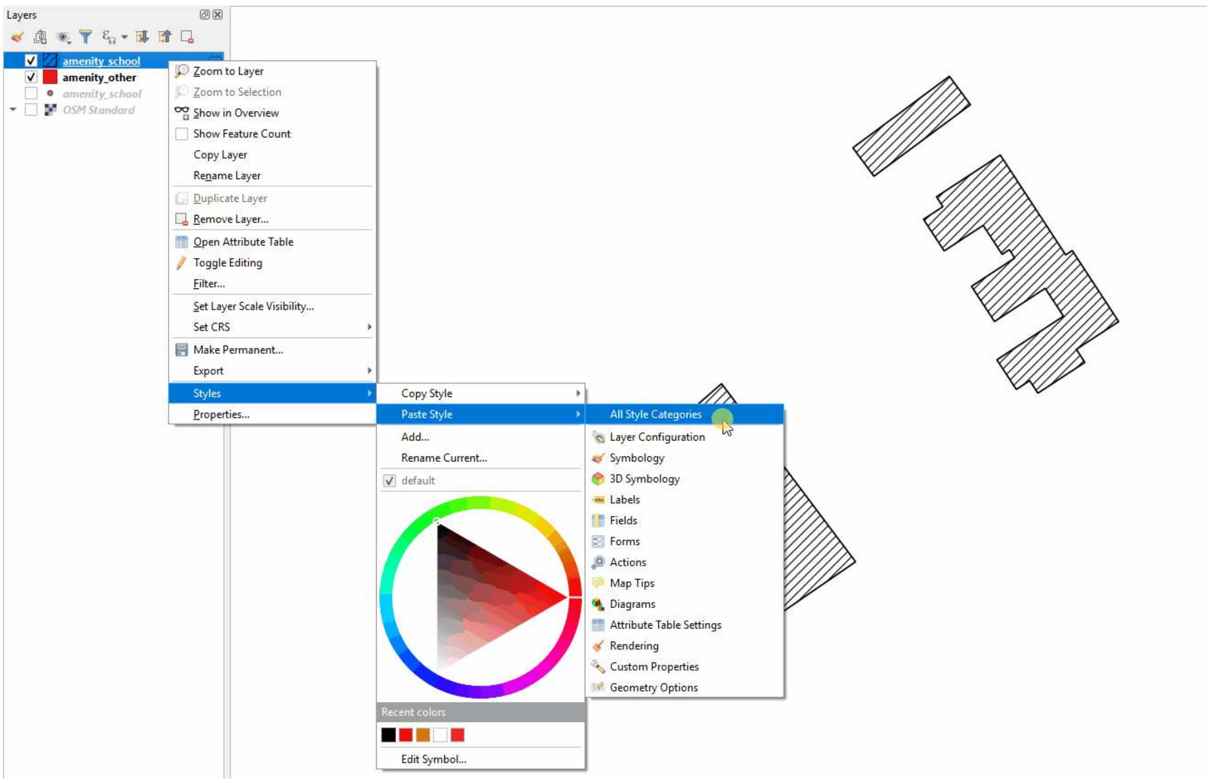


To copy styles from another data layer:

Right-click on any of the other layers. Select ‘Style’, then ‘Copy Style’, and ‘All Style Categories’.



Next, right-click on the layer you want to apply the style to. Select ‘Style’, then ‘Paste Style’, and ‘All Style Categories’. Styles from point layer styles can only be copied and pasted to other point layers, polygon layers styles can only be copied and pasted to other polygon layers, etc.



Styling a layer from an imported .qml file

A .qml file contains style information, including labels, exported from a layer. This file can be saved and shared to ensure consistent use of particular styles, for example, if an organization uses a particular color scheme and font for all maps.

Prior to importing a .qml file into QGIS, you will need to receive or download a .qml file. Practice .qml files and .shp files can be found here.

1. Double-click on a layer in the Layers Panel or right-click on the point layer and select 'Properties'.
2. Select 'Style' from the left-hand menu.
3. In the lower left hand corner of the Style window, select the 'Style' button. Click 'load' style.
4. Navigate to and select the .qml saved on your computer.
5. Click 'Ok'. Your layer will assume all style choices saved to the .qml file.

Installing Plug-ins

Tools and skills required

- Internet connection
- Installed QGIS
- Navigating QGIS
- For QuickOSM: OSM Tagging and Data Models

Estimated time: <5 minutes, depending on internet connection

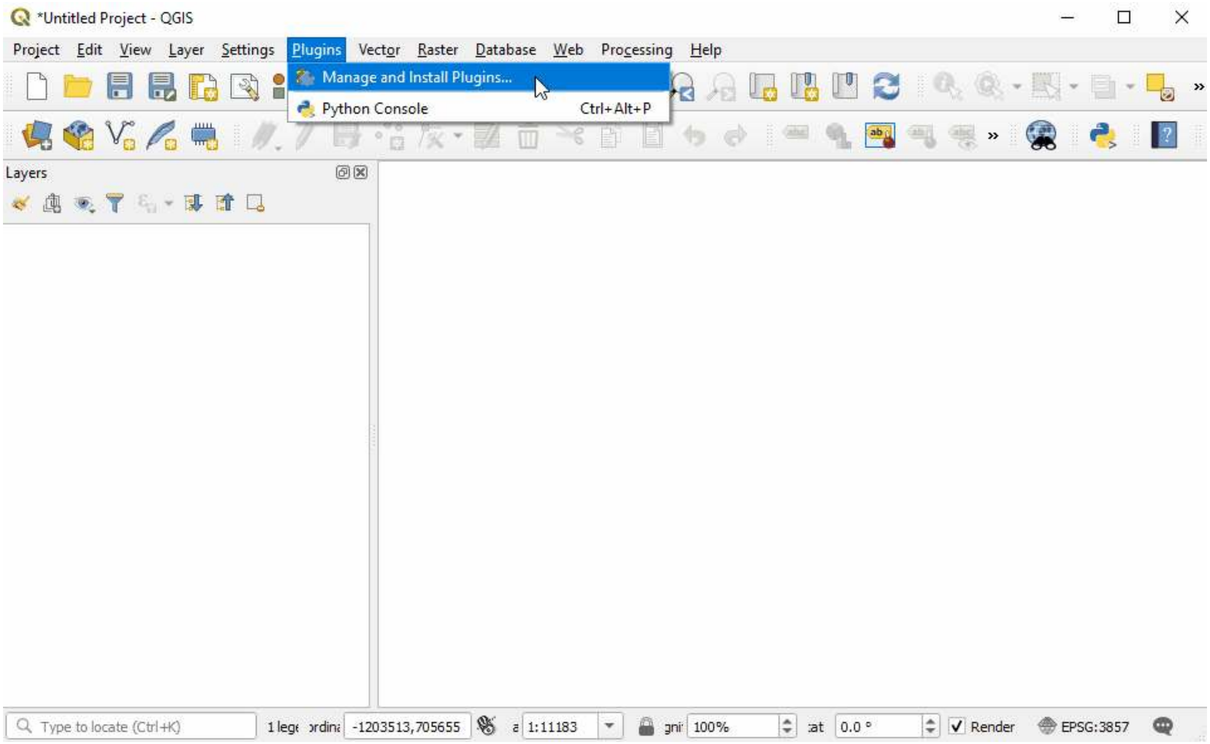
Plugins allow you to extend the functionality of QGIS. These plugins can range from allowing data to be directly downloaded from OSM to QGIS to tools that assist with analysis.

In this exercise we shall install and use two plugins: **QuickMapServices** & **QuickOSM**

Note: Managing and installing plugins requires an internet connection. If the Plugin Manager is not working, check your internet connection.

Considerations for working with large groups and/or in low-internet settings Plug-in Manager requires a consistent internet connection to download plugins. It is highly recommended for training and workshop facilitators to pre-download offline versions for sharing. For instructions on how to download an offline version of a plug-in for sharing, see section 1.8.1 Software and Tools to Share.

To install plugins, click on the menu item Plugins ⊠ Manage and Install Plugins.

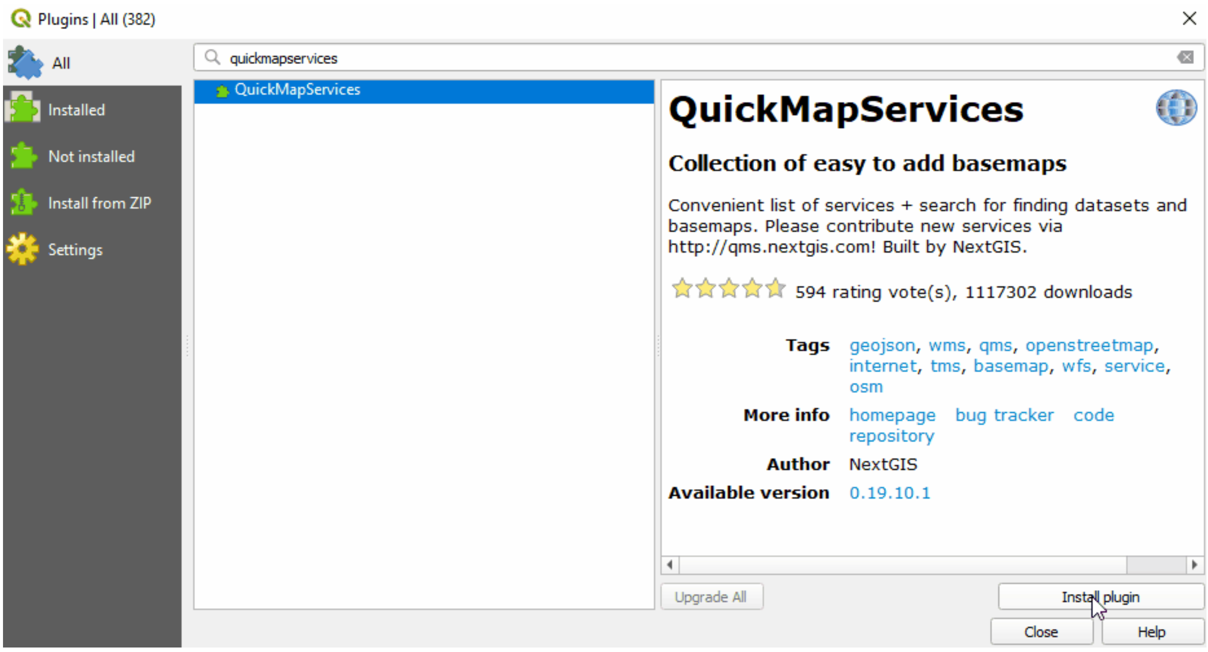


QuickMapServices

QuickMapServices allows you to add free, online basemaps to your QGIS maps, including OSM basemaps.

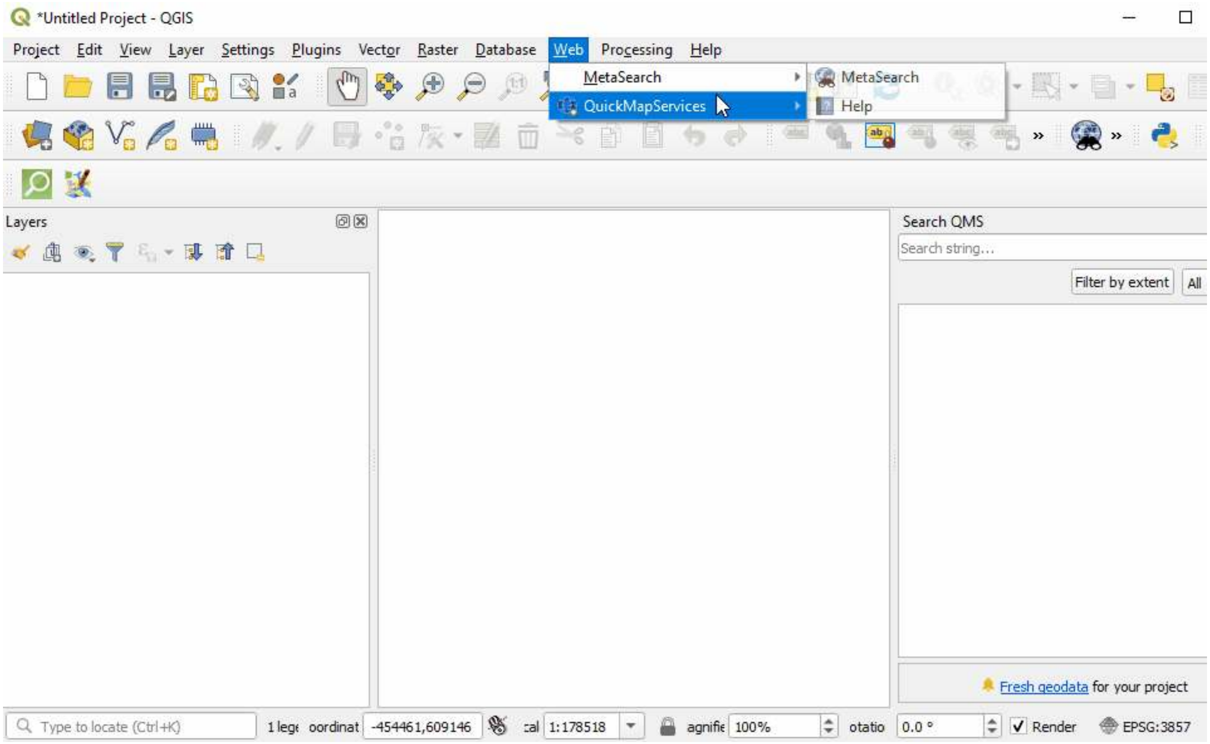
Note: as QuickMapServices provides online basemaps, use of these layers requires a consistent internet connection.

In the Plugin Manager dialog box that opens, find the QuickMapServices plugin. To do so, click on the search bar and type 'QuickMapServices', the plugin will appear in the list. Then click the Install Plugin button.

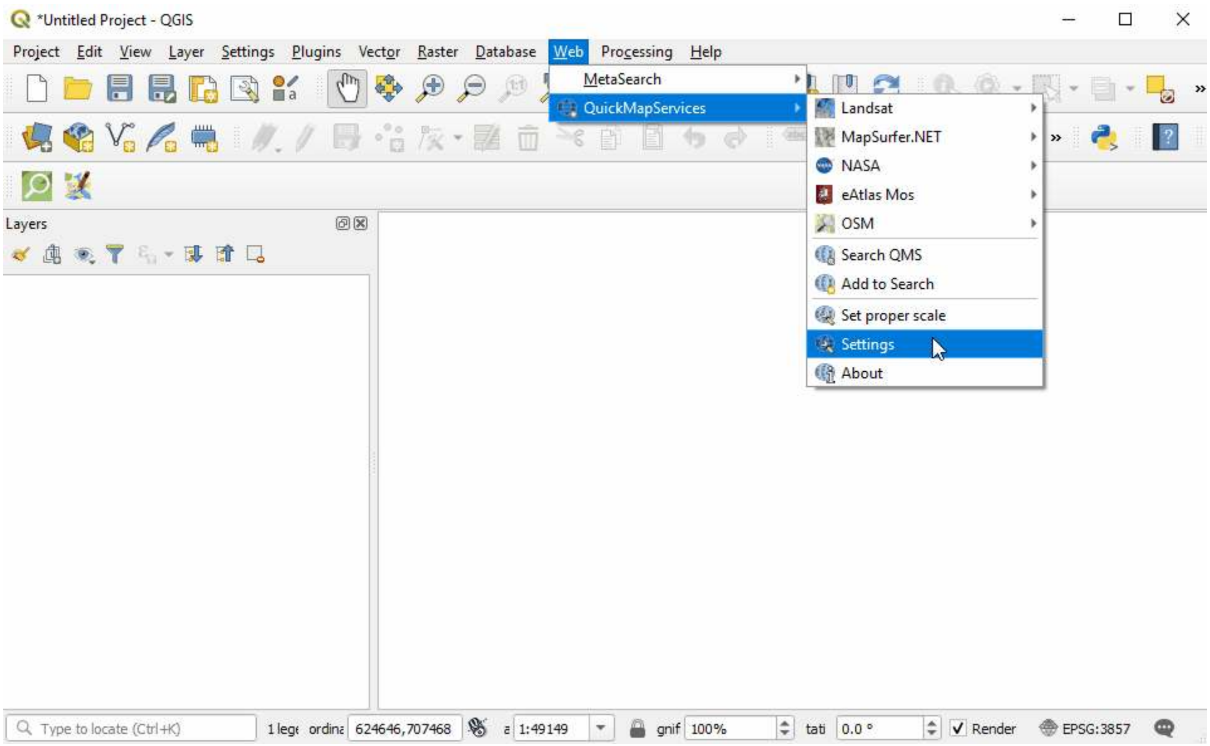


Once installed, QuickMapServices can be accessed in the top menu Web QuickMapServices

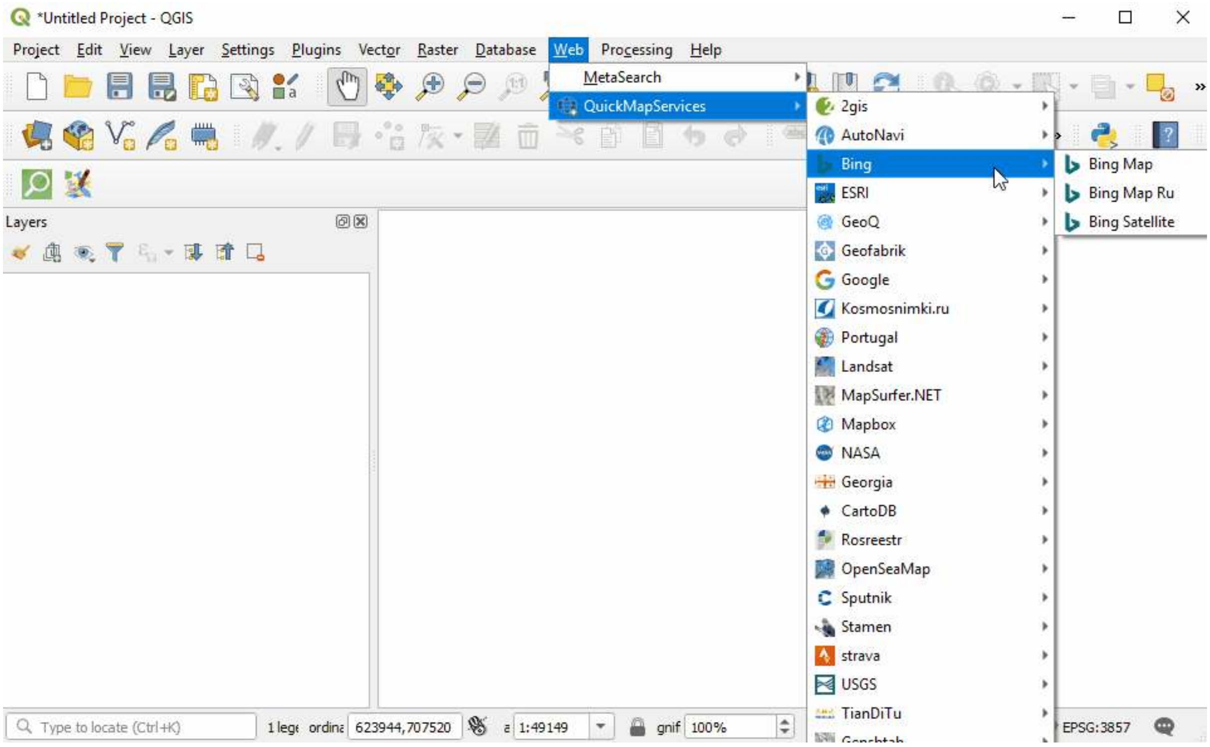
In the QuickMapServices sub-menu, several types of basemaps can be accessed including OSM.



For aerial imagery, in the QuickMapServices sub-menu, open 'Settings'. Click the 'More Services' tab. Select 'Get Contributed Pack'.

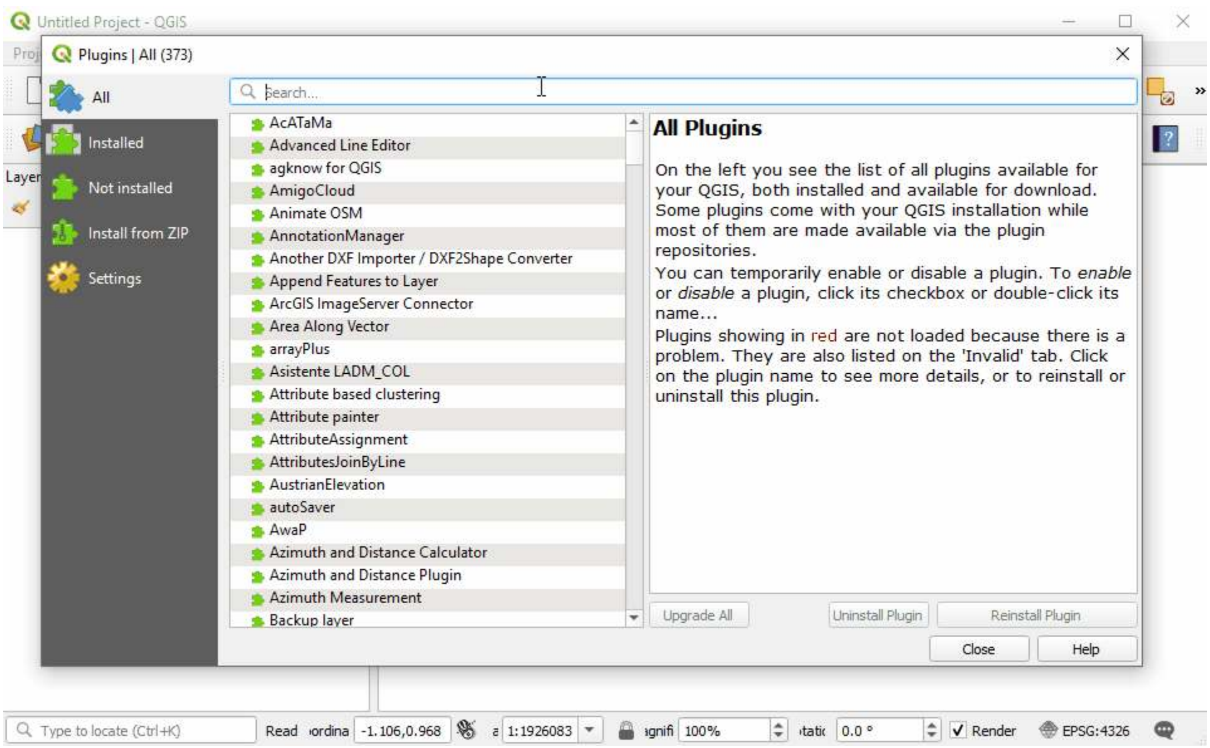


Return to the QuickMapServices sub-menu. There will now be a long list of options for basemaps, including Bing.



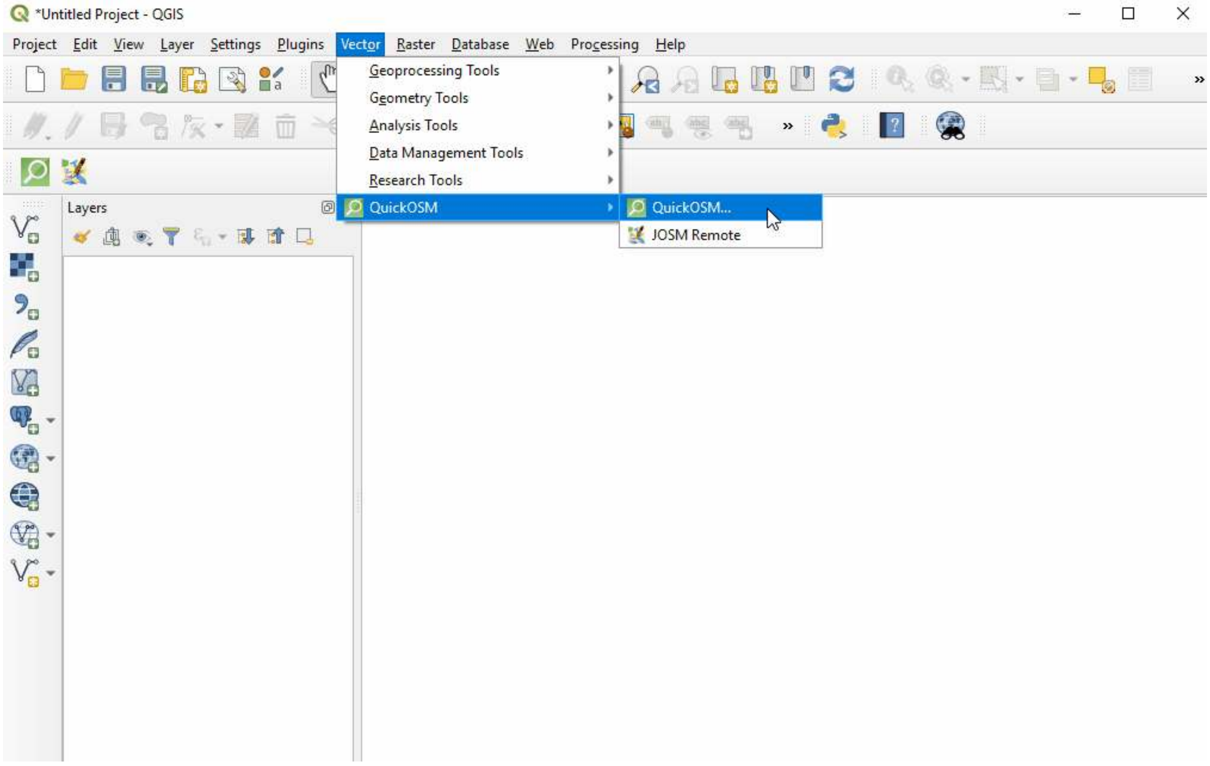
QuickOSM

QuickOSM allows you to select and download OpenStreetMap data for use in QGIS. QuickOSM works by extracting specific data based on OSM based on tags (key=value pairs) and an area of interest.



Once installed, QuickOSM can be accessed in the top menu Vector □ QuickOSM > QuickOSM

Note: When downloading data through QuickOSM, it is best to have a basemap layer focused on your area of interest (see QuickMapServices) and/or at least one shapefile/geojson layer in the area of interest. This guides QuickOSM in downloading data for the correct area of interest.



To download data in QuickOSM in QGIS, you will need to build queries to download the exact data that you need. QuickOSM makes building queries easier, but you will still need to know the tags (i.e. keys and values) to generate data. It will become easier to remember these tags as you gain experience working with OSM - in JOSM, QGIS, and other programs.

Below are some examples of common tags used in OSM queries.

Key	Value
amenity	school
	place_of_worship
	bar
	bank
highway	primary
	residential
	path
office	government
	ngo
shop	clothes
	tailor

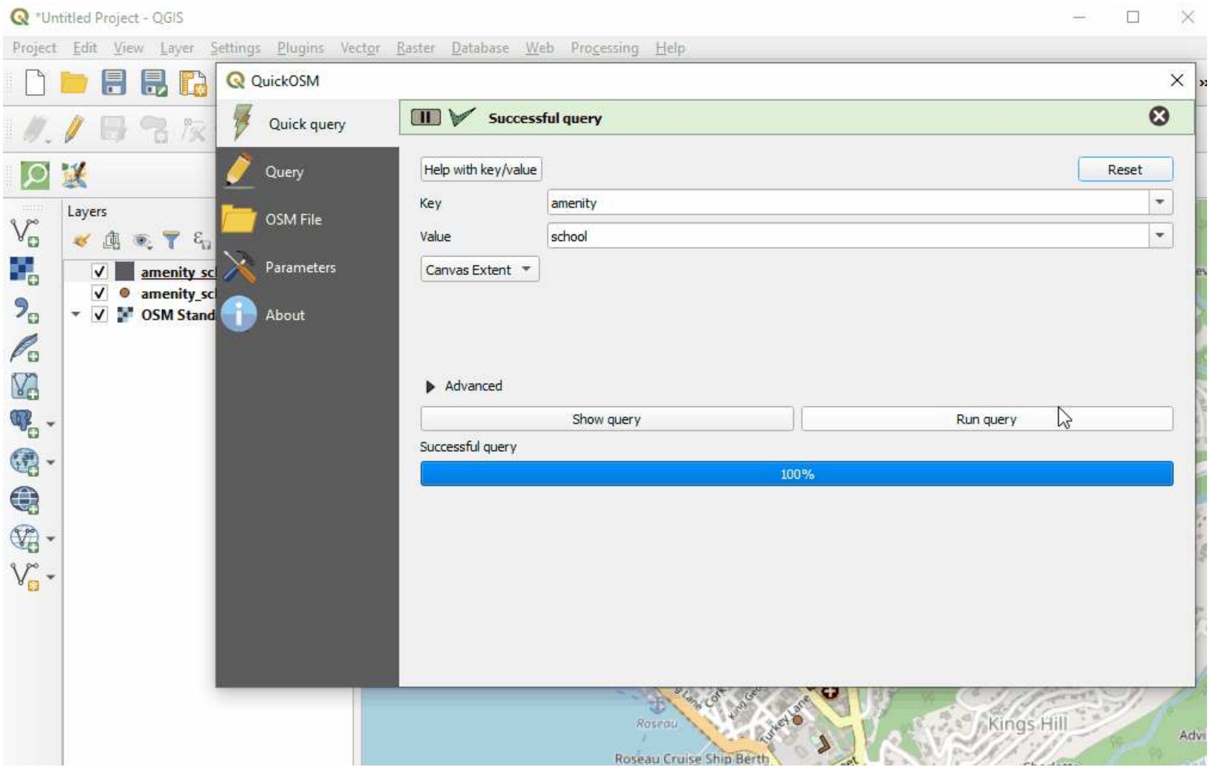
In the pop-up QuickOSM window, at a minimum, you will need to fill in: key, value, and select the extent. This

Tips:

- **Key**: For resources, on keys and values to use, see OSM Tagging and Data Models.
- **Value**: Multiple values can be strung together by separating with a comma (for example: amenity=school,hospital). To download all possible values of a key (i.e. amenity=*), leave the value field blank.
- **Extent:** Selecting the extent chooses the area QuickOSM will search for and download data from. There are multiple options you can select from when choosing the extent:
  - *In*:

– *Around*:
– *Canvas Extent*:
– *Layer Extent*:
– *Not Spatial*:

Extent of the map canvas is best suited when you do not have a shapefile/geojson that covers your area of interest (i.e. administrative boundaries) and/or a small area of interest. To base your extent on a layer, use the drop down menu on the right to select the appropriate layer.



Once providing your key and value, and selecting your extent, click ‘Run Query’.

If your query is not working:

- Did you use capital letters in your keys and values? Make sure keys and values are in lowercase. For example: key=amenity value=school NOT key=Amenity and value=SCHOOL
- Did you use the correct spelling in your keys and values? Make sure keys and values are spelled EXACTLY as they are in OSM guides. Otherwise QuickOSM will be looking for the wrong tag. For example: key=amenity NOT key=amenities

Note: To large of an area, or too much data to download, can overload the API or will be too much for a slow internet connection. If you are having difficulty downloading data, try reducing the area or limit the data download by changing your tags. For example, downloading all buildings in Africa, even some cities, is too large for QuickOSM. Instead try downloading a smaller area or restricting to all building=school.

Creating a New Print Composer

Open the ‘Project’ menu from the main toolbar, and select ‘New Print Composer’. In the pop-up window, create a title for your map. This can be a unique name to describe your map’s purpose such as “Political Map of Liberia” or simple such as “Map 1”.

A new window will be created with a blank page. This shows how your map will look printed out.

You will need to add the common elements of a map to the map canvas:

- Map
- Title
- Legend
- Scalebar

Each of these elements can be added by opening the ‘Layout’ menu on the top toolbar.

Practice:

- Add your map by selecting ‘Add Map’ from the ‘Layout’ menu. You will need to draw the box by clicking and dragging the corners.
- Add a title to your map by selecting ‘Add Label’ from the ‘Layout’ menu. Like the map, you will need to draw the box by clicking and dragging the corners. The default text is ‘QGIS’. This can be changed in the ‘Item Properties’ panel.
- Change the font and size of your title.
- Add a legend to your map by selecting ‘Add Legend’ from the ‘Layout’ menu. Like the map, you will need to draw the box by clicking and dragging the corners. You can add or remove legend items in the ‘Item Properties’ panel.
- Add a scale bar to your map by selecting ‘Add Scalebar’ from the ‘Layout’ menu. Like the map, you will need to draw the box by clicking and dragging the corners.
- Move these items around your Map Canvas until you are pleased with the layout of your map. Think of your audience: will they understand the information you want to convey?
- Compare your map with your neighbor’s map.
- Save your map as a PDF by opening the Composer menu and selecting ‘Export as PDF’.

7.1.5 Creating an Atlas in QGIS

Creating an atlas in QGIS allows users to create a series of maps for geographic regions with a set template. This atlas template allows for a large number of maps to be generated for areas of interest, such as districts, wards, and other administrative areas, with the same style and layout.

HOT Project Examples:

- Ramani Huria (Dar es Salaam, Tanzania)
- LEGIT (Liberia)

Training Activity

Presentation:

Estimated time:

Skills and technology needed:

- Installation of QGIS
- Navigating QGIS and adding data
- Creating maps in print composer
- GIS data files (i.e. shapefiles, geojson)
  - Example shapefiles zip

This activity covers the process of generating and configuring an atlas in print composer. Example shapefiles are provided for this activity but can be followed with shapefiles provided by the user.

Contents

[TOC]

1. Preparing map data

Before creating an atlas, you will need to add and style layers. While styling layers, you will need to consider how the layers will look in print composer. As maps in the atlas may be at varying scales, it may be necessary to return to styling after generating the atlas to make adjustments.

Practice:

- To follow along with the practice steps, add the following vector data to your map:
  - Dar_sub-wards_EPSG_4326
  - Dar_wards_EPSG_4326
- Change the background color of the project. Open the 'Project' menu from the top toolbar, select 'Project properties'. Under general settings, change the background color to blue.
- Style the ward layer (Dar_wards_EPSG_4326) by right-clicking on the name in the Layers Panel and selecting 'Properties'. In the pop-up window, select 'Style' from the side menu. Style as described below:
  - Select 'Simple Fill' from the upper left window.
  - Change 'Symbol layer type' to 'Outline: Simple Line'
  - Change the color to purple.
  - Change the 'Pen style' to 'Dash Dot Line'
  - Select 'Apply' and then 'OK'.
- Duplicate the ward layer (Dar_wards_EPSG_4326) by right-clicking on the name in the Layers Panel and selecting 'Duplicate'. Right-click on the copy layer and select rename. Rename this layer as 'Ward_grey_background'.
- Style the 'Ward_grey_background' layer by right-clicking on the name in the Layers Panel and selecting 'Properties'. In the pop-up window, select 'Style' from the side menu. Style as described below:

- Select ‘Simple Fill’ from the upper left window.
  - Change ‘Symbol layer type’ to ‘Simple fill’
  - Change the color to the html code #edeae2 (or select a light grey color).
  - Change the ‘Outline style’ to ‘No pen’.
  - Select ‘Apply’ and then ‘OK’.
- Style the sub-ward layer (Dar_sub-wards_EPSG_4326) by right-clicking on the name in the Layers Panel and selecting ‘Properties’. In the pop-up window, select ‘Style’ from the side menu. Style as described below:
  - Select ‘Simple Fill’ from the upper left window.
  - Change ‘Symbol layer type’ to ‘Outline: Simple Line’
  - Change the color to yellow.
  - Change the ‘Pen style’ to ‘Dot’.
  - Select ‘Apply’ and then ‘OK’.
- After styling the sub-ward layer (Dar_sub-wards_EPSG_4326), select ‘Labels’ from the side menu in ‘Properties’.
  - In the top drop down menu, change the option from ‘No Labels’ to ‘Show labels for this layers’.
  - For ‘Label with’, select the option ‘Vi_nam_N’ from the drop-down menu.
  - Change your ‘Text’ options such as font, font size, font color, etc.
  - Select ‘Apply’ and then ‘OK’.
- After styling all layers, ensure that your layers are in the following order in your layers panel. (To adjust layer ordering, left-click and hold on a layer and then drag up or down in the list.)
  - Dar_wards_EPSG_4326
  - Dar_sub-wards_EPSG_4326
  - Ward_grey_background

2. Creating a Map Layout in Print Composer

Open the ‘Project’ menu from the main toolbar, and select ‘New Print Composer’. In the pop-up window, create a title for your map. This can be a unique name to describe your map’s purpose such as “Dar Sub-Wards”.

A new window will be created with a blank page. This shows how your map will look printed out.

At minimum, you will need to add the following common elements of a map to the map canvas:

- Map
- Title
- Legend
- Scale Bar
- North arrow

Each of these elements can be added by opening the ‘Layout’ menu on the top toolbar.

Practice

- Add your map by selecting ‘Add Map’ from the ‘Layout’ menu. You will need to draw the box by clicking and dragging the corners.
- Add a title to your map by selecting ‘Add Label’ from the ‘Layout’ menu. Like the map, you will need to draw the box by clicking and dragging the corners. The default text is ‘QGIS’. This can be changed in the ‘Item Properties’ panel.
- Change the font and size of your title.
- Add a legend to your map by selecting ‘Add Legend’ from the ‘Layout’ menu. Like the map, you will need to draw the box by clicking and dragging the corners. You can add or remove legend items in the ‘Item Properties’ panel.
- Add a scale bar to your map by selecting ‘Add Scalebar’ from the ‘Layout’ menu. Like the map, you will need to draw the box by clicking and dragging the corners.
- North arrow can be added by selecting ‘Add Image’. Like the map, you will need to draw the box by clicking and dragging the corners. In the ‘Item Properties’ panel, open the ‘Search Directories’ option to select from a choice of symbols.

- Move these items around your Map Canvas until you are pleased with the layout of your map. Think of your audience: will they understand the information you want to convey?

3. Atlas Generation

After completing the layout for your map, you are ready to generate the atlas. In the right-hand panel, select the tab for ‘Atlas generation’, near the ‘Composition’ and ‘Item properties’ tabs. If this tab is not appearing, select the ‘View’ menu from the top toolbar, then select ‘Panels’ and check ‘Atlas generation’.

In the ‘Atlas generation’ panel, check the box next to ‘Generate an atlas’ to begin configuring your atlas.

4. Atlas Toolbar and Navigation

Once the atlas is generated, you will be able to preview and navigate through the atlas with the atlas toolbar. To navigate, first select the ‘Preview atlas’ button. Changes can be made to the atlas layout while in preview mode.

5. Configuration

The configuration options in the atlas generation panel controls how the atlas is generated.

1. The ‘Coverage layer’ is the layer that contains the geographic areas of interest for your atlas. For example, for an atlas showing maps of each district you will need to select your district layer.
2. ‘Page name’ allows you to name pages by either selecting an attribute from the coverage layer or building an expression from attribute table values.
3. If you do not want to show all areas included in your coverage layer, ‘Filter with’ allows you to filter out geographic areas that you do or do not want to include in your atlas. This option requires an expression to be built.
4. ‘Sort by’ allows you to order your atlas by an attribute of your coverage layer.

Practice

- Select ‘Dar_sub-wards_EPSG_4326’ as the coverage layer.
- For page name, select ‘Vil_Mtaa_N’.
- Check the box for ‘Sort by’ and select ‘Vil_Mtaa_N’.
- In the atlas toolbar, select ‘Preview atlas’ and navigate the pages to see the changes.

6. Building expressions for data-driven text

Expressions allow for text such as labels and titles to be data-driven, or generated from attributes. When working with an atlas, expressions take attributes from the coverage layer.

1. Text that is not data driven should be written within single quote marks. Example: ‘Map’
2. Spaces between words should be indicated with a space within single quote marks. Example: ‘Map of’
3. Selected values and plain text need to be separated by the operator ‘||’. This operator can be typed or selected from the ‘Operators’ list. Example: ‘Map of’ ||
4. Data-driven text, or text that is generated from attributes, can be selected from the ‘Fields and Values’ list. Example: ‘Map of’ || “Ward_Name”
5. An ‘Output preview’ will generate at the bottom of the expression builder window.

Practice

- Select or create your title box and select “Insert expression” in the ‘Item Properties’ panel.
- Use the ‘Fields and Values’ list to generate the following expression:

  “Vil_Mtaa_N” || ‘,’ || “Ward_Name”

- Check the output preview to make sure the expression was typed correctly.

7. Inverse polygon layer

Adding an inverse polygon layer can focus the map by shading out or completely covering features outside your area of interest.

1. Return to the main QGIS window.
2. Select the layer used as the coverage layer in the Print Composer. Right-click and select 'Duplicate'
3. Right-click on the layer copy and select rename. Rename the layer.
4. Right-click on the layer and open properties. Select 'Style' from the side menu.
5. In the top drop-down menu, select 'Inverted polygons'.
6. Under 'Sub renderer:', select 'Rule-based' from the drop down menu.
7. In the rules list window, double click on '(no filter)' to open the 'Edit rule' window.
8. In the 'Edit rule' window, select the '…' button to create a filter. An expression builder will open. In the expression window, type or build from the Variable list: $id=@atlas_featureid
9. In the 'Edit rule' window, make sure that the symbol type is Simple Fill.
10. Change the transparency to 50%.
11. Change the color to dark grey.
12. Click 'Ok' to exit all option windows.

Practice:

- Complete all steps above.
- For step 2, this will be the "Dar_sub-wards_EPSG_4326" layer.
- For step 3, rename the file "Sub-wards_transparent".

8. Adding overview maps

Overview maps allow the audience to understand the map's focal location within the context of a larger area. For example, an overview map may show a ward's location within the city. In QGIS, an overview map can be created that will automatically show the map location for each atlas page.

1. In the main QGIS window, select the layers you would like to have in the overview map. These should typically be layers that can be viewed easily on a small scale (i.e. boundaries, highways, waterways). Multiple layers can be selected at a time by holding Ctrl on your keyboard while selecting.
2. Right-click on these layers and select 'Duplicate'.
3. Select all of the copied layers. Right-click and select 'Group Selected'. This allows for better data management and makes it easier to turn groups of layers on and off depending on the map needs.
4. Right-click on this group and rename it 'Overview Map'
5. Turn on all grouped layers and turn off all others by clicking the check boxes next to the layer names.
6. Return to your Print Composer.
7. Open the 'Layout' menu from the top toolbar and select 'Add map'. Draw a small box for your overview map.
8. Go to the 'Item Properties' panel for the second map and open the 'Overviews' options.
9. Click the green '+' button to add an overview.
10. For 'Map frame', select 'Map 0' from the drop down menu.
11. 'Frame style' will allow you to change the color, outline, and transparency of the map frame.
12. In the 'Items Properties' panel, open the 'Layers' option and select 'Lock layers'. This will keep the limited layers while allowing for the main map to show all layers.
13. Return to the Main QGIS window. Turn off all grouped overview layers and turn on the other layers.

Practice

- Follow all steps above.
- For Step 1, select the layers 'Dar_wards_EPSG_4326 copy', 'Dar_sub-wards_EPSG_ 4326 copy', and 'Ward_grey_background copy'.'

9. Atlas Review

After completing the layout and atlas generation, it is important to check each page of the atlas for correct expression generation (i.e. all pages are correctly titled) and that the appearance of layers and labels in each map appear correctly. If there is a large difference between map scales for different pages, styles, labels, grids, and other factors may need to be adjusted to best suit all map scales.

Practice:

- Use the ‘Atlas toolbar’ to navigate through your atlas pages.
- For each page, check:
  - Map layer visibility
  - Label visibility
  - Expression-driven text (i.e. title, additional text boxes)
  - Scalebar size and placement

10. Output filename expression

Prior to exporting the atlas, an output filename expression needs to be built. This expression will determine the name for each page of the exported atlas files. See ‘Building expressions’ for instructions on building expressions.

The default expression is ‘output_’||@atlas_featurenumber which will produce a filename such as “Output 3”. This can be changed to create a more accurate filename for your maps.

Practice:

- Select the expression builder button
- Build the expression: “District_N” || ‘’ || *“Ward_Name”* || ” || “Vil_Mtaa_N”
- Check the output preview at the bottom of the expression builder to make sure that the expression has been built correctly.

11. Exporting Atlas

To export the atlas, select the ‘Export Atlas’ button in the Atlas tool bar. Select the appropriate file type (Export as Images, Export as SVG, or Export as PDF) and select the folder where the files will be exported to.

12. Atlas Templates

Atlas templates can be saved and added to other QGIS projects. To save a template, open the ‘Project’ menu from the top toolbar and select ‘Save as Template’. This will save as a Composer Template (*.qpt* .QPT) file.

To add the template to another project, open a new print composer. Open the ‘Project’ menu from the top toolbar and select ‘Add items from Template’. Note: items will be sized to the original document page size. Item sizes may need to be adjusted if the new project is using a different page size.

7.4 OSM Analytics

OSM Analytics allows users to understand more about how and when editing took place, or assess quality within OSM, use the OSM Analytics suite of tools. You can view how data has changed over time within OSM, understand quality within an area, or analyze what type of data is available.

More information about OSM Analytics can be found here and here.

Data Use and Analysis

There are a handful of free tools available to extract and utilize OSM data for decision-making. By either using OSM data in conjunction with free population data sets from, for example, World Pop or other thematic datasets from the Humanitarian Data Exchange or even combining it with your own generated data, various tools can be used to clean, analyze and visualize information to inform project planning and decision-making.

This section covers:

1. **QGIS -** a cross-platform desktop geographic information system (GIS) software that allows you to analyze and edit spatial information, as well as compose and export geographic maps.

   Level: Advanced

   qgis.org

2. **uMap** lets you create maps with OSM layers quickly. The platform features sample maps to inspire your use of layers, points of interest, design and licensing.

   Level: Beginner

   umap.openstreetmap.fr

3. **Overpass Turbo Query** is a web-based data filtering tool for OSM. You can run queries and analyse the resulting OSM data interactively on a map. There is an integrated Wizard that makes creating queries easy.

   Level: Beginner/Intermediate

   overpass-turbo.eu

Additional tools not detailed in this section:

1. **MyHeatMap** allows you to view your geographic data interactively. Combining geospatial data with a colour-coded gradient makes it easier for your audience to quickly interpret your information.

   Level: Beginner/Intermediate

   openheatmap.com

2. **Data Wrapper** allows you to quickly create beautiful and responsive charts **-** in seconds. It is a three step process: copy/paste your data, visualize your data by choosing from many charts and map types and then publish your final creation into your format of choice.

   Level: Intermediate

   datawrapper.de

6. Data Export Tools

Overview

Data Export Tools allow users to download OSM data for use and analysis programs such as QGIS. The following are Data Export Tools commonly used in the HOT workflow. For more information on how to use these tools, use the training materials linked below.

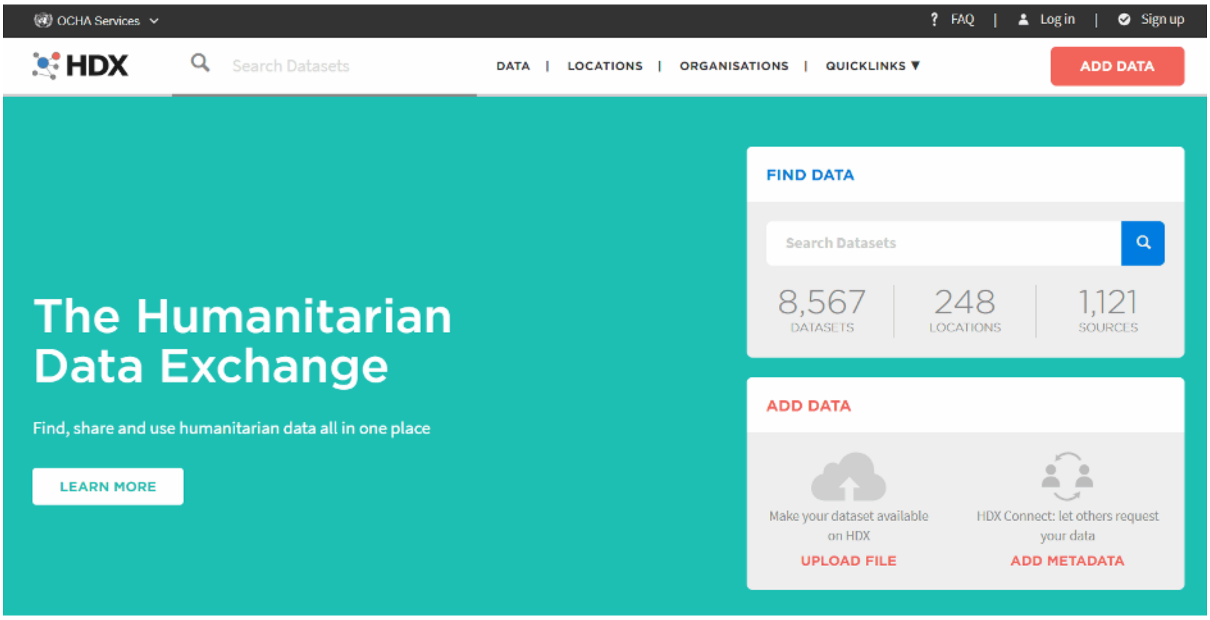
Presentation: Data Export Tools Presentation - English

HOT Export Tool

HOT Export Tool allows users to download OSM data by specifying tags, area of interest, and file type.

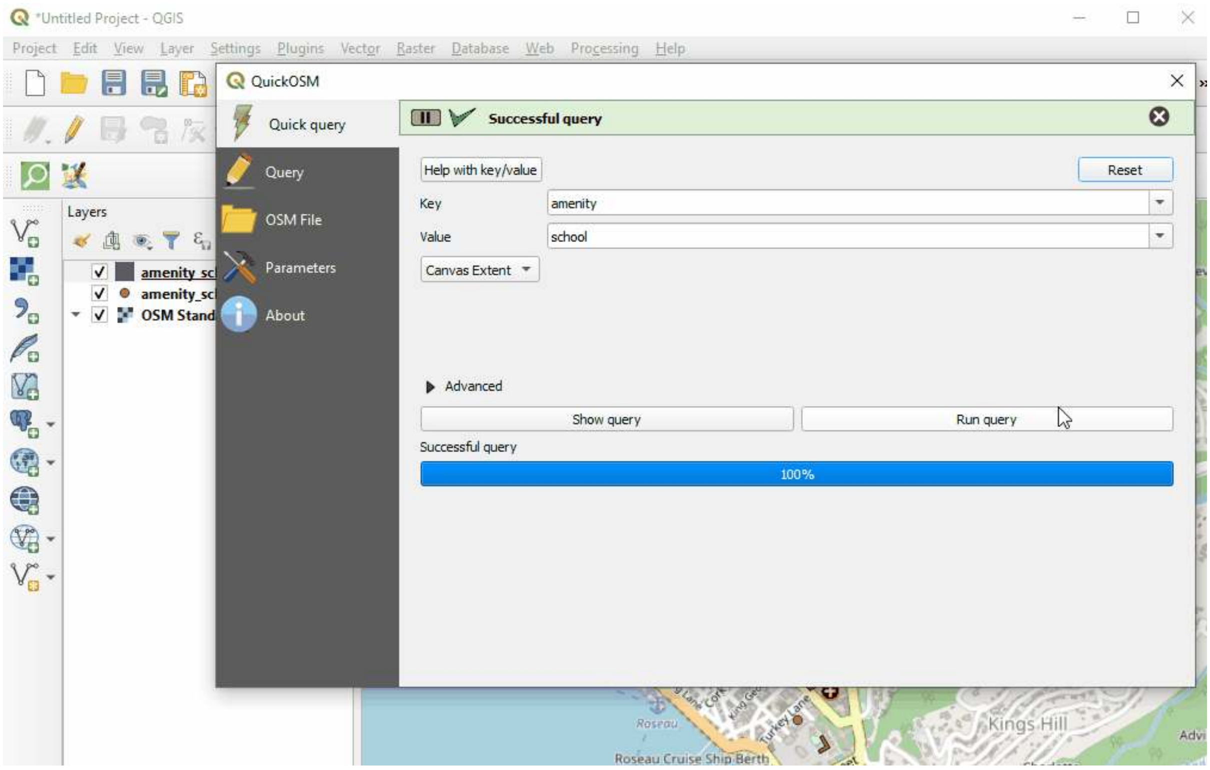
Humanitarian Data Exchange (HDX)

Humanitarian Data Exchange (HDX) is a data platform for storing and sharing humanitarian data managed by OCHA's Centre for Humanitarian Data.



QuickOSM

QuickOSM is a QGIS Plug-in that allows users to directly download OSM data for specific tags into QGIS.
Instructions for using and installing QGIS Plug-ins including QuickOSM can be found in here.



Designing and Coordinating a Mapping Project

There is no one way to collect data in the field and it will vary by context – but the following section covers the essential areas you should consider when designing a mapping project.

[image]

3.1 Deciding what to map

Once the partners have been assembled, the next step is deciding what to map. This involves answering the following questions about what the project is attempting to accomplish.

1. **Purpose and audience:** All data collected needs to fulfill a specific purpose with an intended use case and/or audience. This not only defines the scope of the project and data collected but helps ensure that the data collection process is ethical and limits the burden on individuals and communities being surveyed, even if indirectly. A helpful way to think about this to ask, what problem is this project seeking to address or what question(s), or SDG indicator(s), are we hoping this data will answer once it has been collected?
2. **Geographic extent:** Does this mapping project involve gathering information about a city, a neighborhood, a whole country? Do the questions that the project needs answering logically connect to a particular administrative scale? Or another sort of boundary?
3. **Features:** What, within the geographic extent, needs to be mapped? Roads? Buildings? Particular kinds of buildings such as schools or health facilities? Is there other information such as land-use or natural features like rivers and forests that will also require mapping?
4. **Attributes:** What information about each feature will the team collect? For example, is knowing the width or surface of roads important to the questions the project seeks to answer? The number of stories of each building? The number of beds in each hospital?

The answers to these questions will help determine if there are any existing datasets that could be used and the amount of time and resources necessary to complete the project. In some cases, it can be helpful to run a small pilot project in order to determine the best approach to data collection and develop an estimate of the level of effort required.

To collect good data you need to employ a well-defined data model. A data model reflects the information you want to capture. Example SDG data models for OpenStreetMap can be found in Part 4. After establishing a solid data model, it is important to create logical Field Data Collection Forms that capture the data you are looking for in the best way.

3.2 Planning and Preparation

Before laying the groundwork for a field mapping project, there are several factors that you and your team should consider. Below are a selection of factors and questions that should be asked in preparation for dealing with them.

Political Climate:

- **Government support -** If a non-governmental organization, does local, regional, and national government support humanitarian activities in the area? Governments may either support or oppose humanitarian organizations within their country.
- **Hostile activity -** Is the area experiencing violence or hostile events? Is this activity involve groups similar to your own? Is this a secure environment to conduct your work? A hostile climate can make it extremely difficult to carry out operations.

Communication

- **Infrastructure** – Is there a foundation of technology that supports an organization? This can be related to actual hardware, software, networks, data centers, or the presence of electricity.

- **Imagery Available** – Is there good quality, high-resolution imagery available, from satellites or other sources? Using aerial imagery as a background layer is considered to be the easiest way to map, particularly when many buildings need to be digitized.
- **Internet Access** – Is there an Internet connection? What is the amount of bandwidth or level of connectivity? Many tools rely on Internet access. If you don't have an Internet connection, a POSM may be a potential solution.
- **Smartphones** – Does the community have smartphones? Though not essential by any means, mobile data collection is a recommended method of field mapping and is done using smartphones.

Literacy

- **Map Literacy** – Are communities aware of the basic conventions of maps, can they read them, and do they use them?
- **General Literacy** – Does the community have the ability to read and write? Higher educational levels can assist the mapping process.

Accessibility

- **Terrain Accessibility** – Are areas you want to map physically accessible?
- **Transportation** – How will you reach the site? Is there public transportation or do you need to hire vehicles?

[image]

3.3 Coordinate with the local administration of the area you will be mapping

In many cases, mapping teams will need to carry an authorization letter or another form of permission from local officials to show credibility and to reduce potential conflict that could arise during the field data collection. We recommend that organizations and communities should request this letter from the appropriate authorities well ahead of planned mapping activities to reduce the risk of delay.

Identifying and contacting partner organisations working locally in the area that you are planning to map is critical to ensuring local buy-in, project success, and sustainability. While contacting these can be done via email or a letter detailing your intent, in-person meetings have more weight and provide opportunity to develop a stronger relationship.

3.4 Building a Mapping Team

In most cases, non-governmental organizations and governmental agencies will draw mappers from within their own teams. However, organizations should consider the benefits of bringing in mappers from partner organizations and local communities. When working within refugee environments, it is especially important to consider incorporating refugees (and host community members) into the mapping process. By incorporating local communities, beneficiaries, and partners in the mapping team, participatory mapping activities:

- Increase local buy-in and representation
- Allow communities to directly represent their needs and values
- Incorporate local knowledge and perspectives that might not otherwise be accessed
- Empower local community members with skill development

When deciding what individuals to work with, the following factors should be considered:

1. **Community** – Active participation by the affected population is essential to providing assistance that best meets their needs. The first criteria for participant selection is being from the local community. Non-governmental organizations should also consider integrating local and/or national government staff to increase buy-in and data use. Government organizations conducting mapping and survey activities should consider incorporating staff typically outside of geospatial activities as well as staff from non-governmental partner organizations. Regardless, participation from the affected population should be of the highest priority.

2. **Motivation** – Participants should have strong reasons for working. Motivations vary, but one of the strongest factors is being emotionally invested in a project. Feeling like you are making progress in meaningful work is a powerful motivator.
3. **Non-Discrimination** – no one should be discriminated against on any grounds of status, including age, gender, race, color, ethnicity, sexual orientation, language, religion, disability, health status, political or other opinion, national or social origin. None of these should be criteria in determining participants. Take into consideration pre-existing social, cultural and political dynamics or practices that may marginalize or exploit certain groups
4. **Payment** – As a general rule it is good practice to cover costs of active participants. For example, if volunteers join your team as field mappers they should be paid per diems to cover transportation and food. Projects rely on the data these volunteers collect, so it is an integral part of the work and should not be treated lightly. Of course unpaid volunteers can and should also be active participants, but organizations must judge when the line is crossed into work to avoid exploitation. Lastly, be mindful that even seemingly small payments can affect power dynamics in refugee communities and households.
5. **Gender** – Organizations should be sensitive to gender but avoid using it as criteria to determine participants, aligned with the non-discrimination principle. Within families, paying one member but not another can have unintended consequences **-** either positive or negative.
6. **Training Your Team -** Questions to consider when training your team:
   - **What is the technical literacy of team members?** Certain groups will require longer lengths of time to learn an application or tool than others.
   - **What tools will you be using?** The tools you use will determine the length of time and skill level demanded of your team. Additionally, the number of tools you plan to train team members in impacts the length of training and time necessary to master a skill or tool.
   - **Will you be able to have hands-on and field training?** Training teams in tools using hands-on approaches, including conducting trial fieldwork greatly increases the success rate of mastery and improves data quality. All trainings should incorporate a practical session if possible.
   - **Will you have consistent access to internet and electricity?** Some tools require internet and computer use for training.

[image]

3.5 Logistics

There are many components to managing logistics for field operations. The topics listed below are just a few components that we recommend all organizations and communities consider prior to starting field mapping activities.

Workspace / Meeting space

- Do your operations require a workspace or meeting place?
- Does your operations require a central base with full-day access and wi-fi?

Equipment

Different scopes of work will require different types of equipment. For example, ODK and Kobo software can run on most Android devices, but OMK software requires higher specifications.

- What type of mobile devices will you use to collect data? (Mobile phones, tablets, GPS devices, etc.)
- Does everyone on the team have access to data collection devices?
- Does everyone on the team have access to computers/laptops? Or will the team plan to work in shifts?

Transportation

- How will mappers move around in the field?
- Is the scope of work/area of interest large enough that mappers will need transportation beyond walking?

- What types of transportation are available?
- What types of transportation are safe for the context and circumstances?
- Will this type of transportation have associated costs? (i.e. driver fees, rental, fuel)

Safety & Security

Each context is so different that it is difficult to make specific recommendations for safety. Communities and organizations conducting mapping activities should establish contingency plans to address the different types of security incidents that may occur. Team members should coordinate all responses to such incidents so as to safeguard the rights and well-being of local community members, and ensure that staff members and volunteers are not put at risk.

For operations, the key to effective safety and security management is the creation of a culture of security. Each staff member and volunteer has a responsibility for their own safety and security, and that of other team members.

Please note: The below topics are suggestions for mapping teams to consider when building and discussing security plans for mapping activities, and is in no way comprehensive.

- **Personal Security -** What is the appropriate behavior, dress code, language, and forms of communication when interacting with local communities and other stakeholders? Does everyone on your team understand these factors?
- **Legal requirements -** Do you have a letter of permission to conduct field activities? Does your team understand local laws and customs?
- **Communications -** Do you know which communication networks are best for your area of work? Have you provided all team members with internal and external contact details? Have you developed and communicated contingency plans to your team? Does your team have a method for reporting incidents and do team members know how to use it?
- **Travel -** What types of travel will be required for this work? What attire, visibility, documentation is necessary for travel? What types of risks (i.e. crime, accidents) are teams exposed to?
- **Common Crime -** What types of crime are common in the area of work? What is the frequency and occurrence of crime?
- **Medical Emergencies -** Are managers and supervisors aware of team members' pre-existing medical conditions? Does everyone on the team know or have access to information on the location and contact information for local health facilities and emergency services? Do all teams have access to a first aid kit? Is someone on each team trained in first aid?

[image]

3.6 Community Entry

Community entry is the process of initiating, nurturing and sustaining a relationship in order to secure a community's participation and interest in a program. Whether preparing to engage with refugee and host communities in a settlement setting or local communities in a capital city, there are a few recommendations and practical questions that can guide your team in mindfully establishing a relationship with a given group and setting the stage for activity implementation in a community.

The most important thing to keep in mind is how individuals can be part of the work as members of projects. They must be given **ownership**. Before starting a project, objectives and strategy should be shared with community members. They should give feedback, and this should be incorporated. If certain members of the community are not given roles in the project, both in terms of strategy and implementation, you may face problems down the road.

In the context of working with refugees, for example, who are used to seeing new projects with skepticism, it is especially important that your approach to engage with and inform these groups of the upcoming work is prioritized over activity implementation and achieving results. Many organizations and individuals use humanitarian crises as opportunities to exploit people – whether deliberately or through incompetence. It is crucial to build **trust** and **respect** between the organization and community. Though protected under international law, refugees in host countries are subject to municipal and national authorities. The presence of refugees can put pressure on host communities, which often fuels prejudice. Therefore, the final aspect of successful community entry is taking into account the host community's concerns.

A few practical questions can guide us in appropriately engaging with local communities for the first time:

- Who needs to be informed about your intent to enter a community?
- What documents do you need before entering a community? Permission may include permits or a letter of permission from local authorities acknowledging your presence and activities in the community.
- How can specific groups or individuals in the community be involved in the project?
- What is the most appropriate way of communicating about roles and responsibilities for a project to these groups?
- Where can you seek information about the dynamics between groups in a given community? How do you ensure you understand tensions or conflicts between groups you intend to work with?
- What measures are in place to mitigate or manage - if any - conflicts arise?
- Example: In the context of working with refugee and host communities, are you confident there will not be any resentment between groups working on the same project?

Other practical recommendations to ease your organization's entering into a new community:

- Set up consultation meetings with relevant leaders and community members to gather feedback about proposed activities and timeline
- Articulate benefits of projects involvement to all who are involved
- Include a community member - who is familiar with local laws and customs - in your project team
- Establish relationships and work through partners already based in the community to ease activity implementation and enable integration into existing initiatives
- Create a Whatsapp group to enable direct and more efficient communication

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Further resources and reading

Several additional resources exist that provide further detail on navigating the mapping process:

- **Open Maping for the SDGs -** Humanitarian OpenStreetMap Team (HOT) published a guide for launching and growing open mapping initiatives at the national and local levels to achieve the Sustainable Development Goals (SDGs). This guide can be found at: https://hotosm.github.io/gpsdd-documentation/
- **Open Cities Project Guide -** the World Bank Global Facility for Disaster Reduction and Recovery (GFDRR) and Humanitarian OpenStreetMap Team (HOT) published a guide that can be downloaded at http://www.opencitiesproject.org/guide/.
- **Participatory Mapping Toolkit -** Humanitarian OpenStreetMap Team (HOT) published a guide for open mapping projects in the context of refugees. The full toolkit can be downloaded at https://www.hotosm.org/downloads/Toolkit-for-Participatory-Mapping.pdf

— title: Using ODK Collect Application weight: 2 bookShowToC: True —

Objective:

- Able to explain ODK Collect as one of the tools to collect infrastructure data
- Able to set the initial setup for ODK Collect
- Able to apply how to use ODK Collect for data collection survey

I. What is ODK Collect?

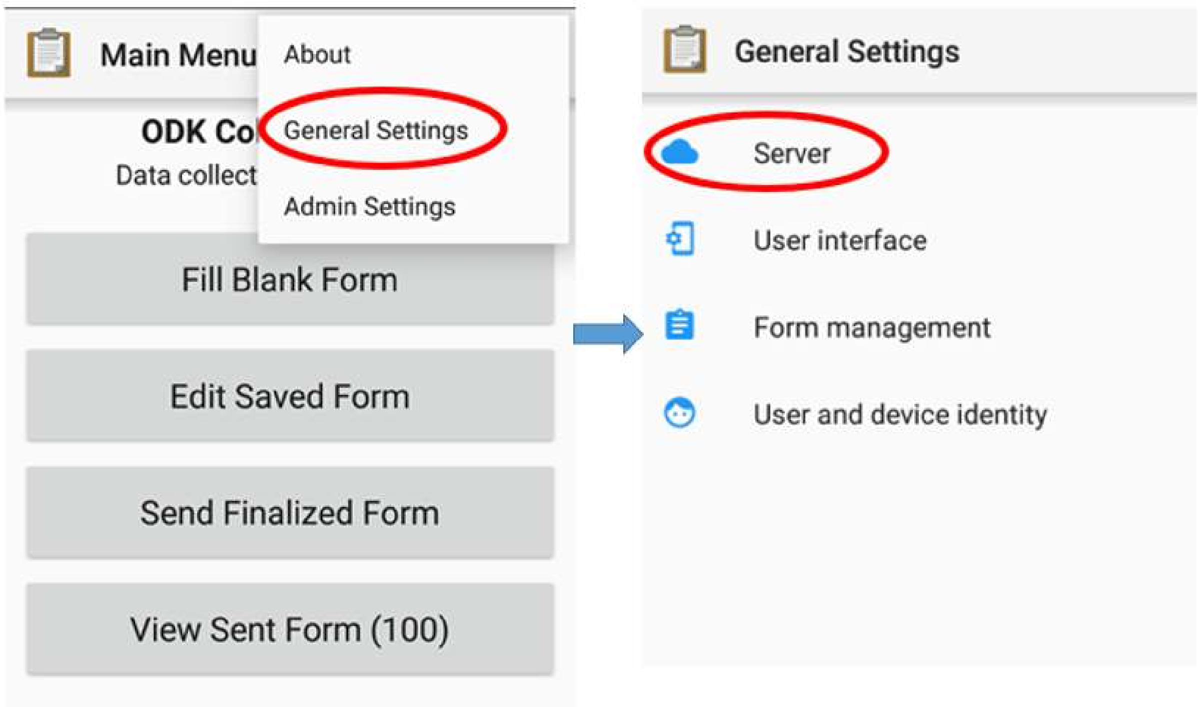
Open Data Kit Collect (ODK Collect) is a data collection application on Android. ODK Collect can replace form survey from paper to digital. Therefore, this application will help the mapping and data collection activities in the field which also allow to save the location and photo information at once.

II. Initial Setup for ODK Collect

1. Set the URL Server

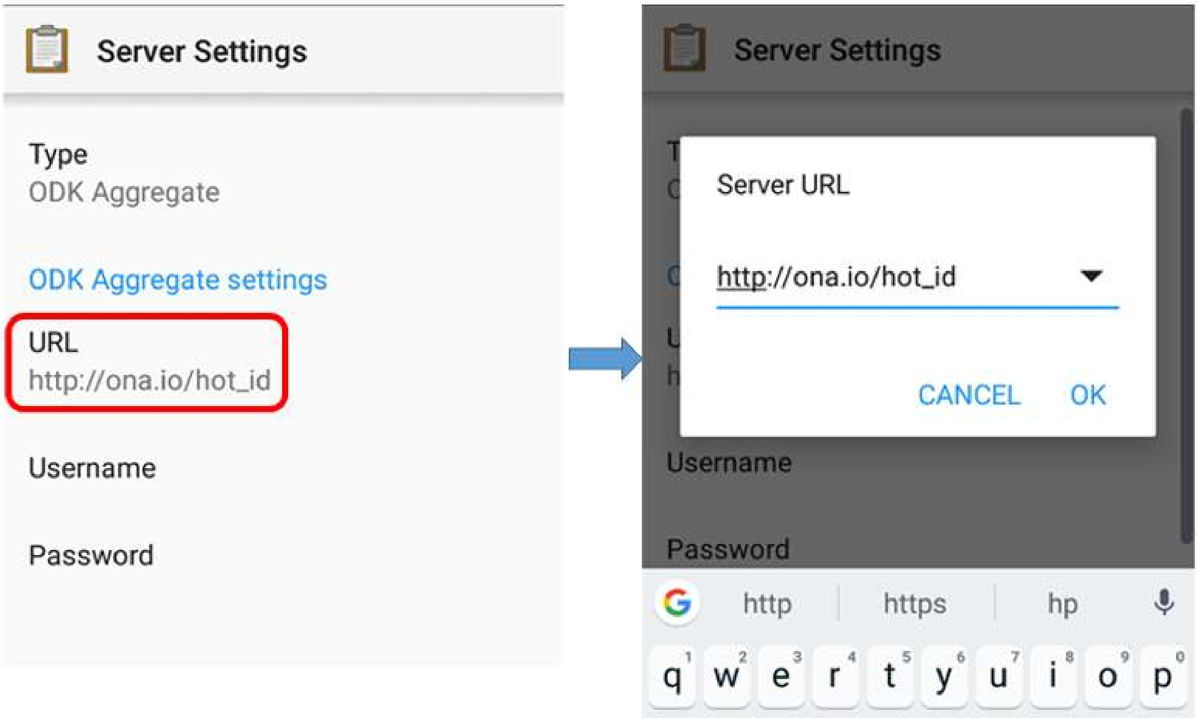
To take the form survey from the server for the first time, the user needs to set the URL server. There are the steps:

- Open ODK Collect and press the three point button in the upper right corner, select **General Settings → Server**



Option to fill the URL address menu in ODK Collect

- Type the URL address server in **URL → OK**

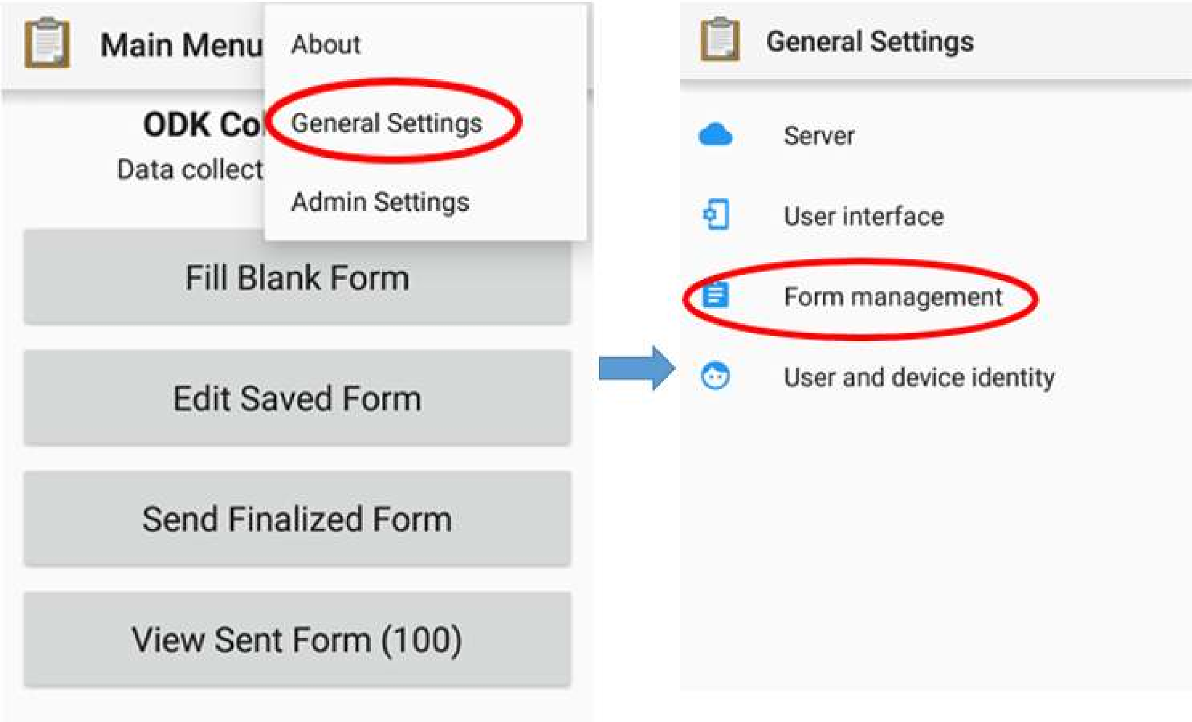


Step to fill the URL address in ODK Collect

2. Set the Image Size

In addition to the location point, you can also take a picture as additional information. You can set the picture resolution as desired. But, the picture resolution will also affect the amount of your phone memory or file which will be uploaded to the server later. It is recommended that you choose the smallest resolution of the image during initial setup. You can follow this step:

- Open ODK Collect and press the three point button in the upper right corner, select **General Settings → Form Management**.



Option menu to set image resolution

- Select **Image Size** then select the **Very Small (640px)** option.

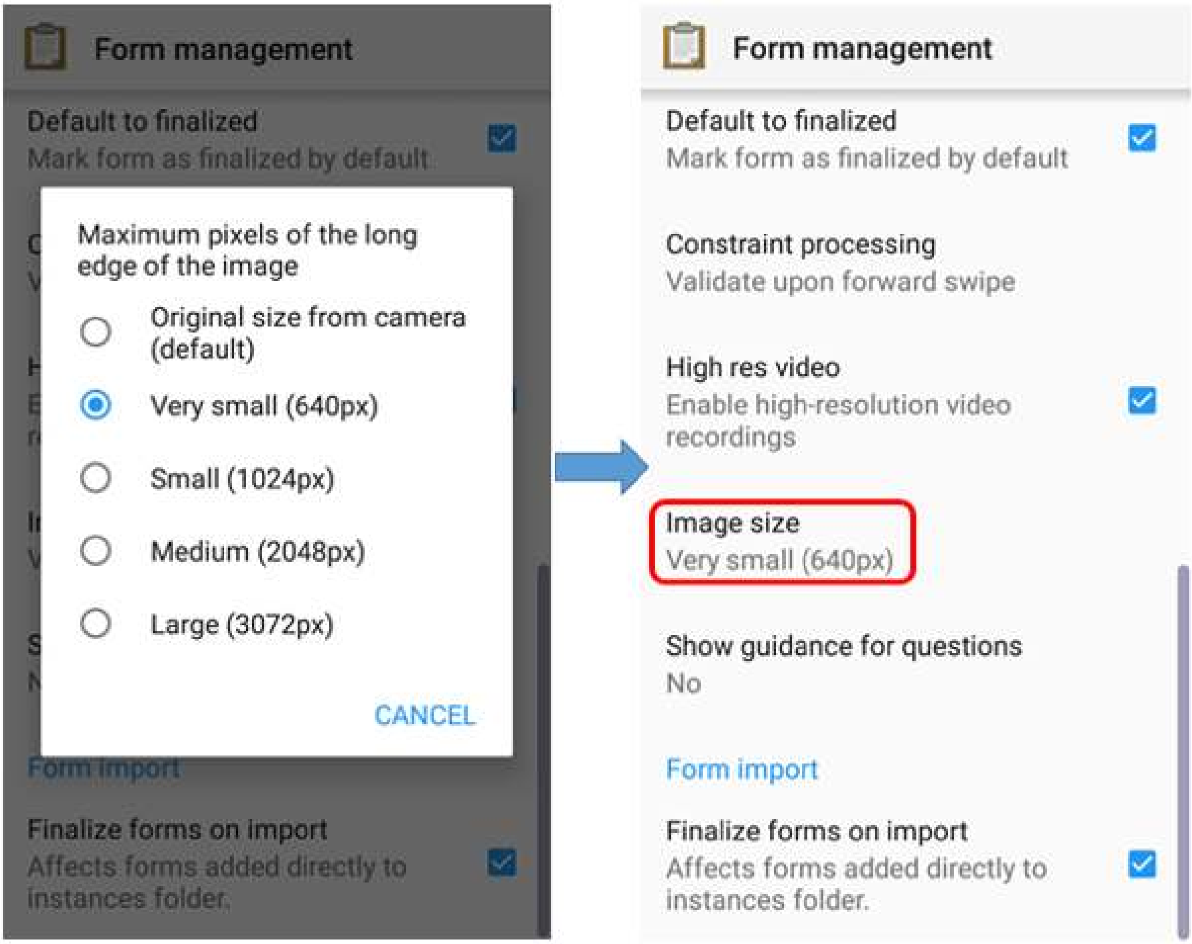


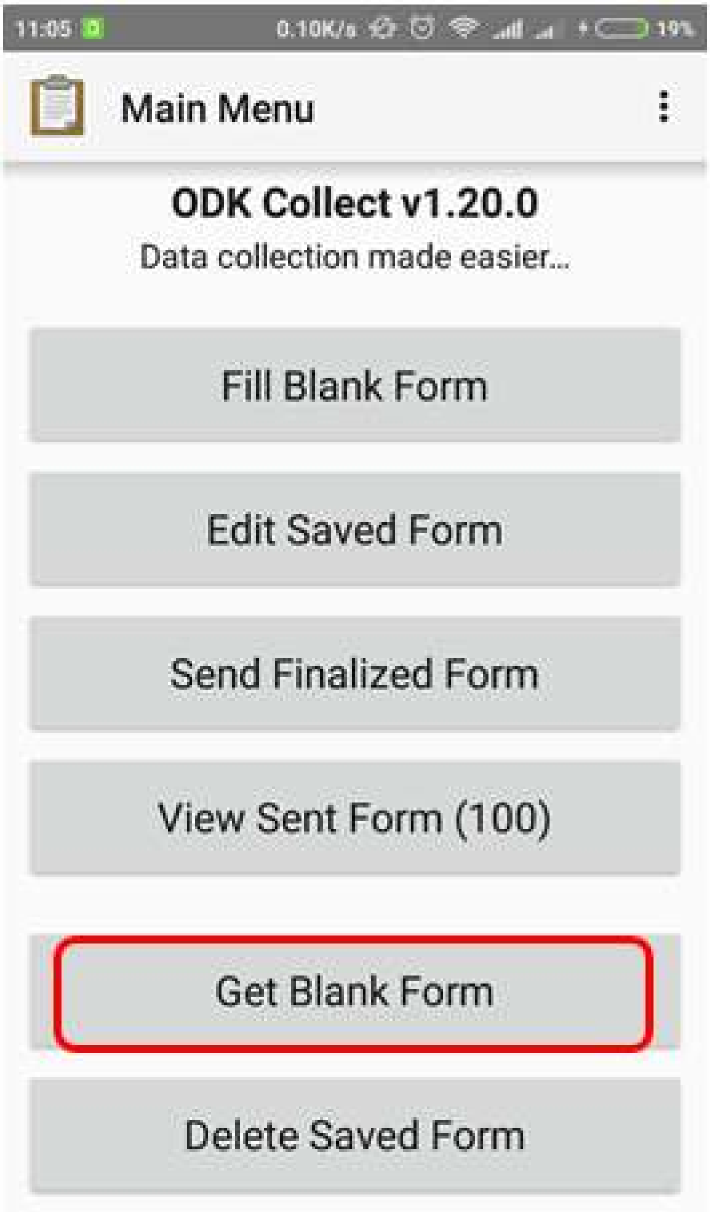
Image Size menu to set the image resolution

III. ODK Collect basic operations

1. How To Get a Blank Form Survey From Server

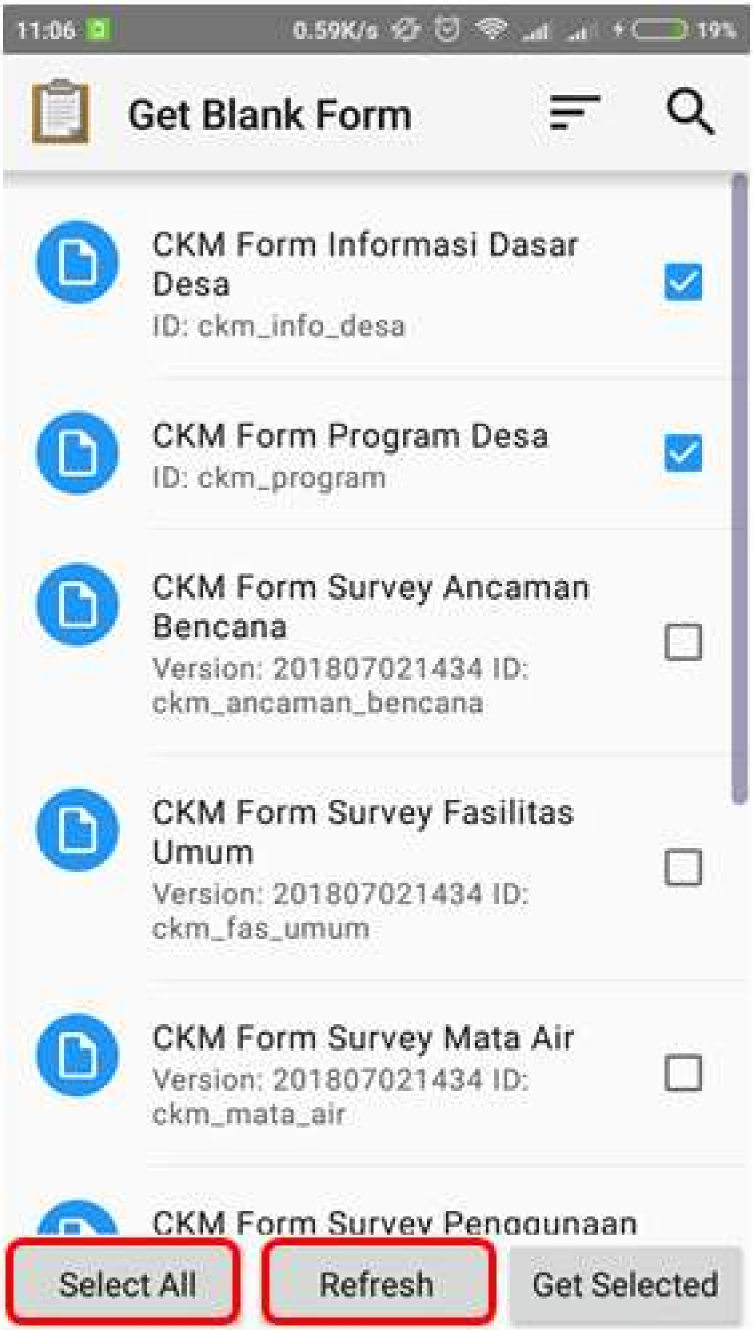
Before you fill-out the form survey that you made before, you need to download the blank survey form from specified server. For further explanation about create a survey form in ODK, you can learn in **Making Survey Form for ODK & OMK applications** module. You can follow this step to take a blank survey from the server:

- Press **Get Blank Form** and wait for the form to download from the server and make sure your internet is active.



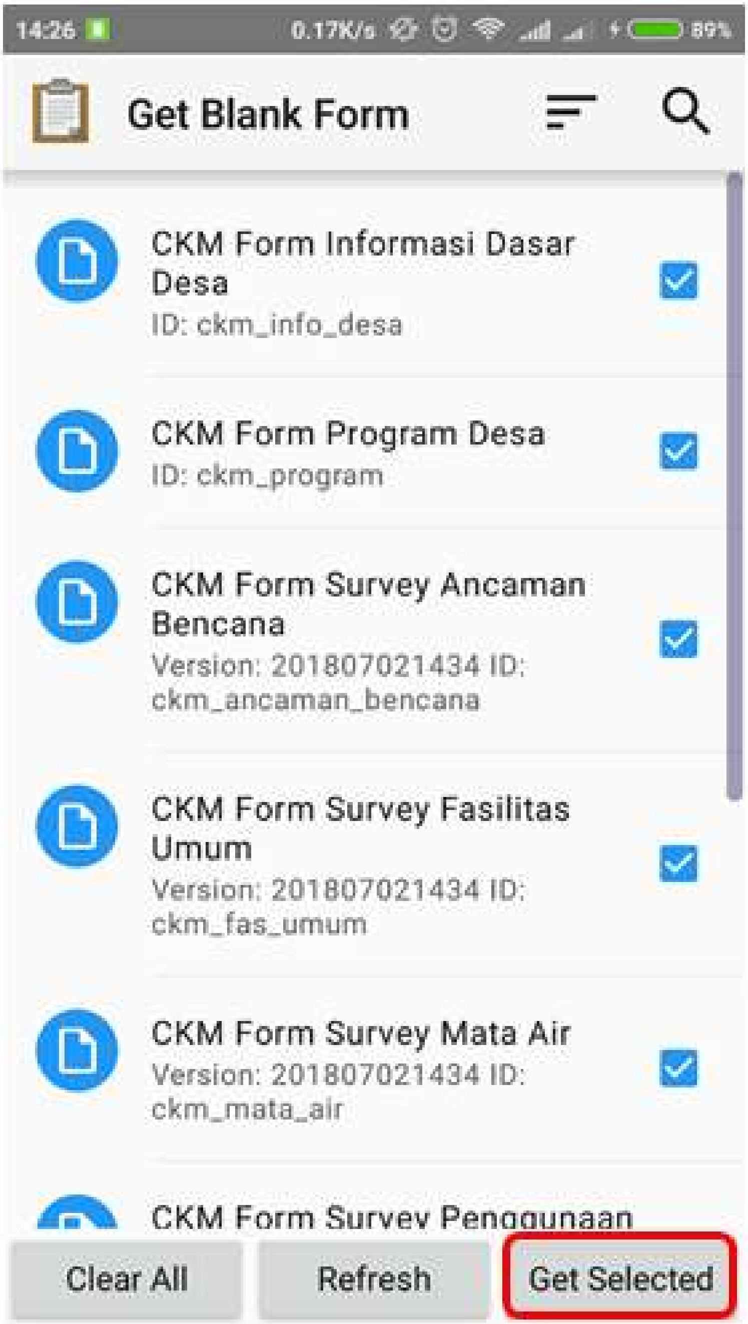
Get blank form options to take form on a server

- Select the available form, tick the check box or if you want to select all the form, you can **Select All**. If your form does not appear, can press **Refresh** to reload the page.



Page display on Get Blank Form menu

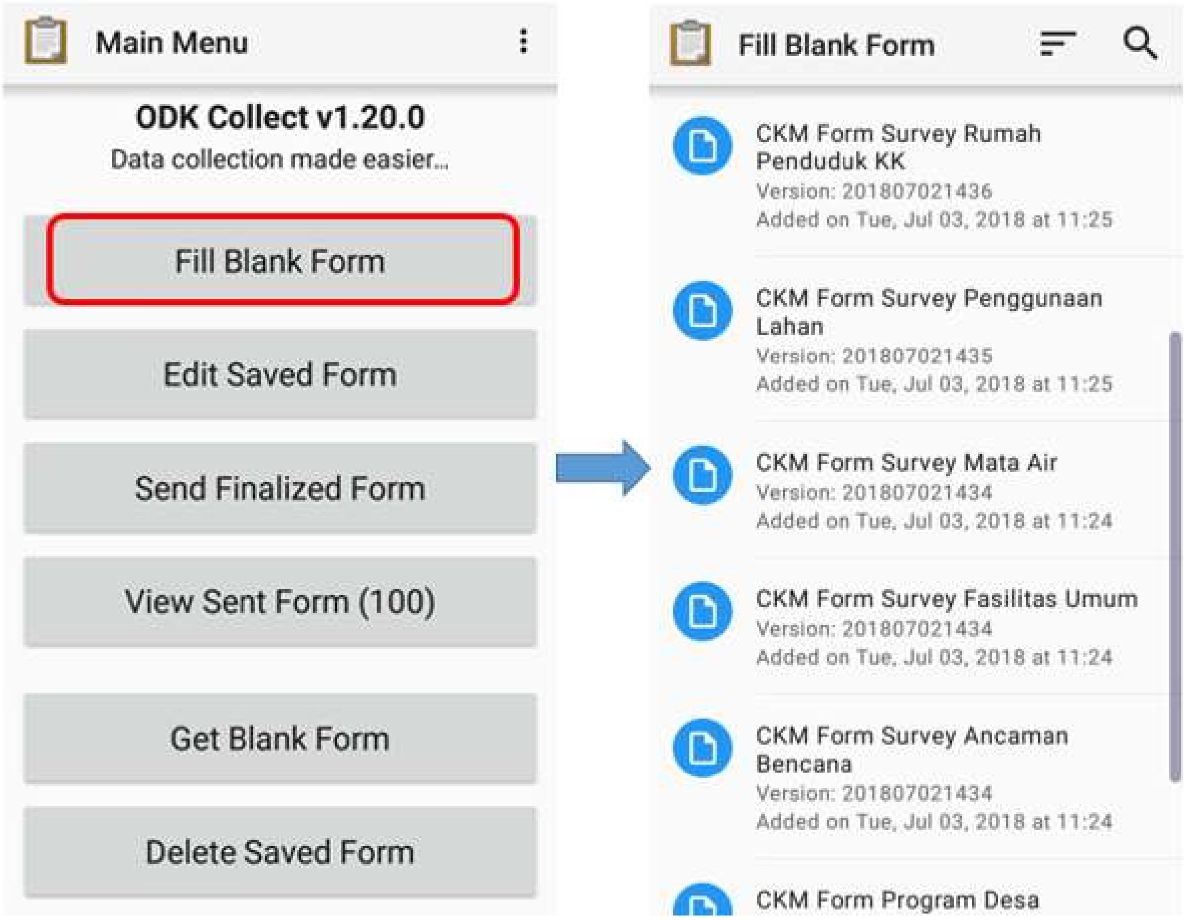
- After select the form, you can press **Get Selected** to download the selected form.



Page display on the Get Blank Form to get the survey form

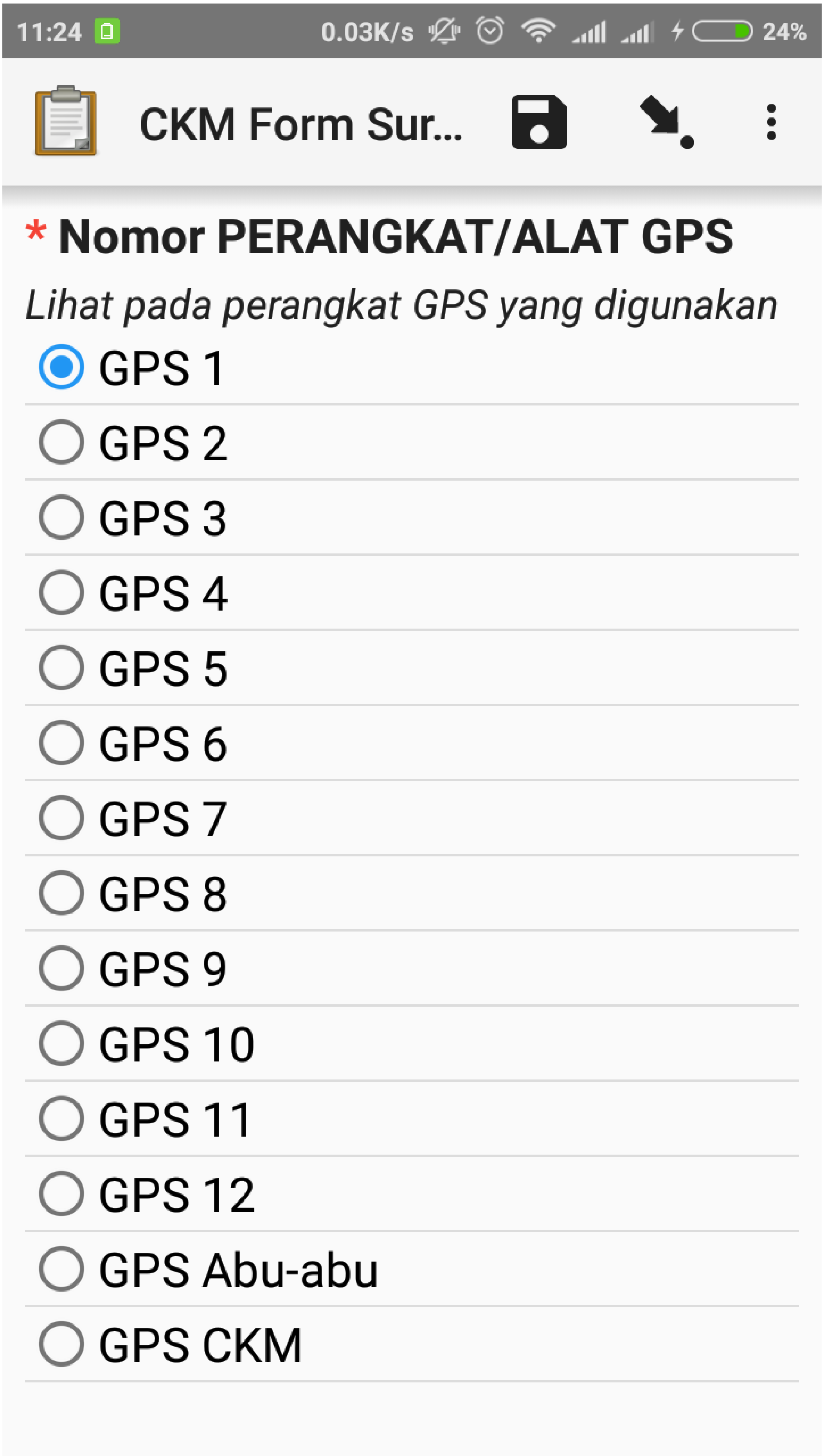
2. Fill the Survey Form

- To fill the form, back to the start page and select **Fill Blank Form** menu. And then select one form blank that you want to fill in the survey form list.



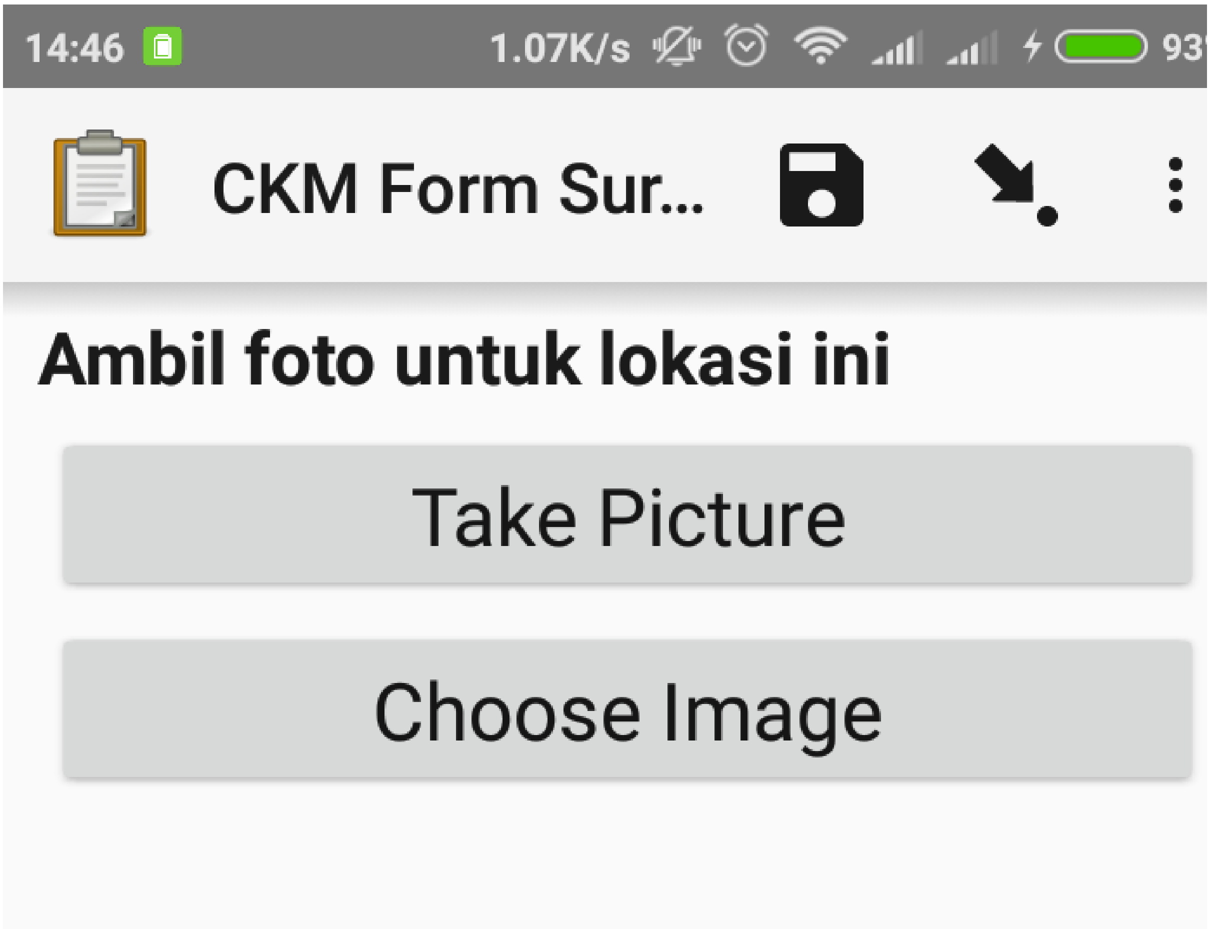
Fill Blank Form options for filling out the survey form and blank survey form list

- Swipe to right or left on the screen to move the next/previous page. Questions that have a red star in the top left are required and you can not go to next question if the answer is empty.


11:24
0.03K/s
24%
CKM Form Sur...
* Nomor PERANGKAT/ALAT GPS
Lihat pada perangkat GPS yang digunakan
GPS 1
GPS 2
GPS 3
GPS 4
GPS 5
GPS 6
GPS 7
GPS 8
GPS 9
GPS 10
GPS 11
GPS 12
GPS Abu-abu
GPS CKM

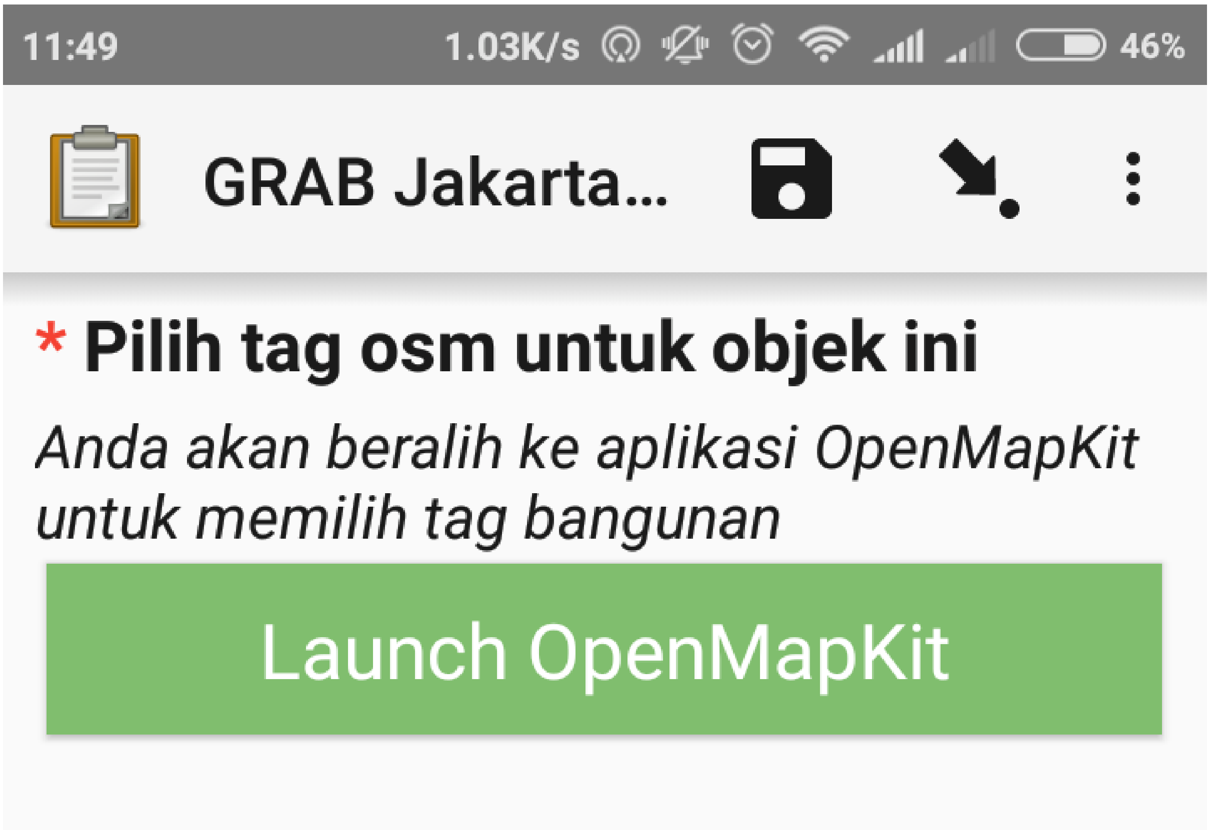
Examples of mandatory question (red star)

- You can take photos directly by choose **Take Picture** option or select a photo from your photo gallery by select ***Choose Image***.



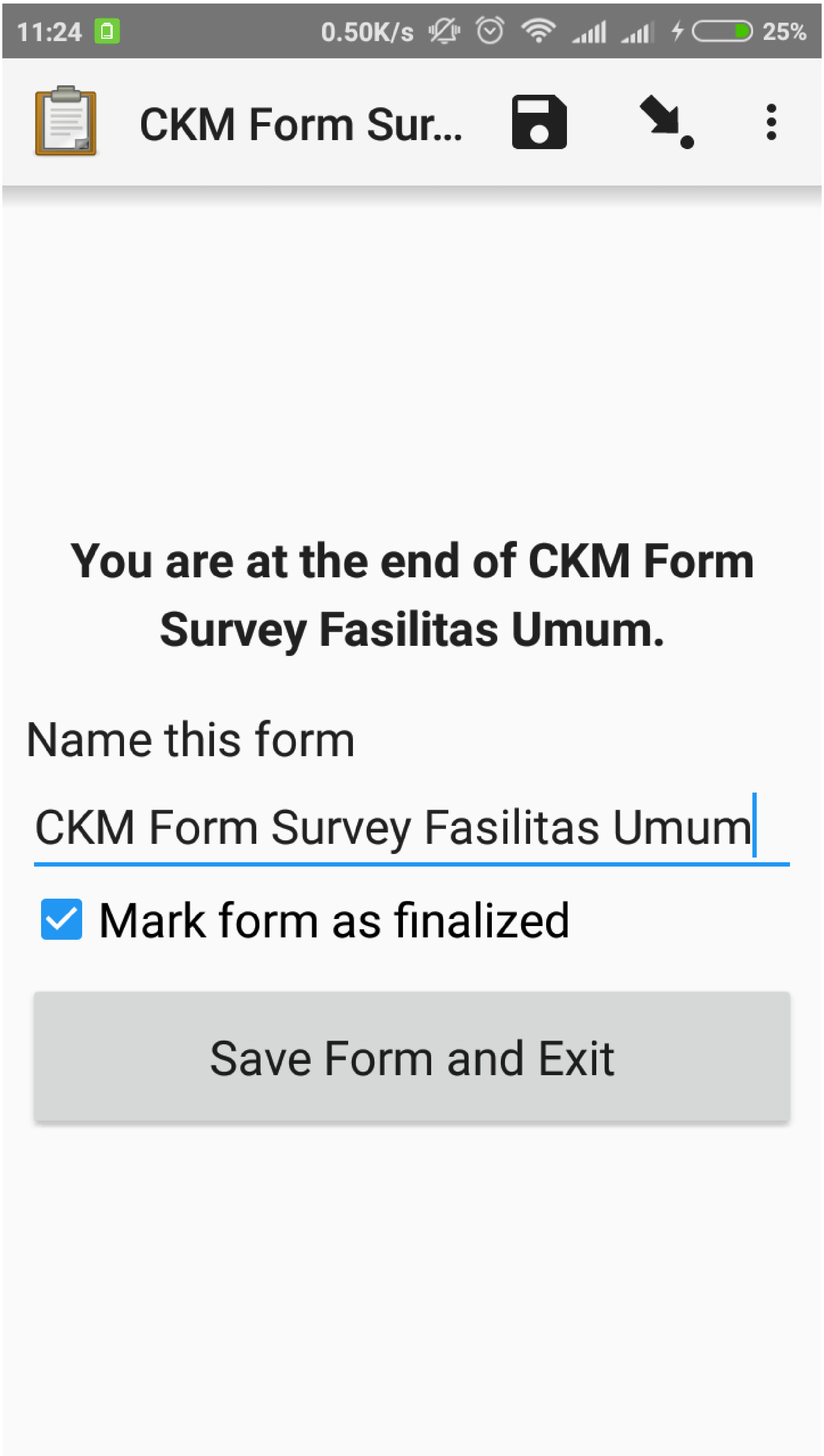
Take photo display in ODK Form

- To add object location points include OSM object tag, you can use additional application, that is OpenMapKit (OMK). You can immediately switch to OMK application by press **Launch OpenMapKit** on the form. You can learn about using OMK application in the module **Using the OpenMapKit**.



Launch OpenMapKit button on the survey form

- At the end, you can name the form, tick check **Mark form as finalized** and at the end choose **Save Form and Exit** to finalize the final form survey.


11:24
0.50K/s
25%
CKM Form Sur...
You are at the end of CKM Form Survey Fasilitas Umum.
Name this form
CKM Form Survey Fasilitas Umum
Mark form as finalized
Save Form and Exit

Finalization of page views on the survey form

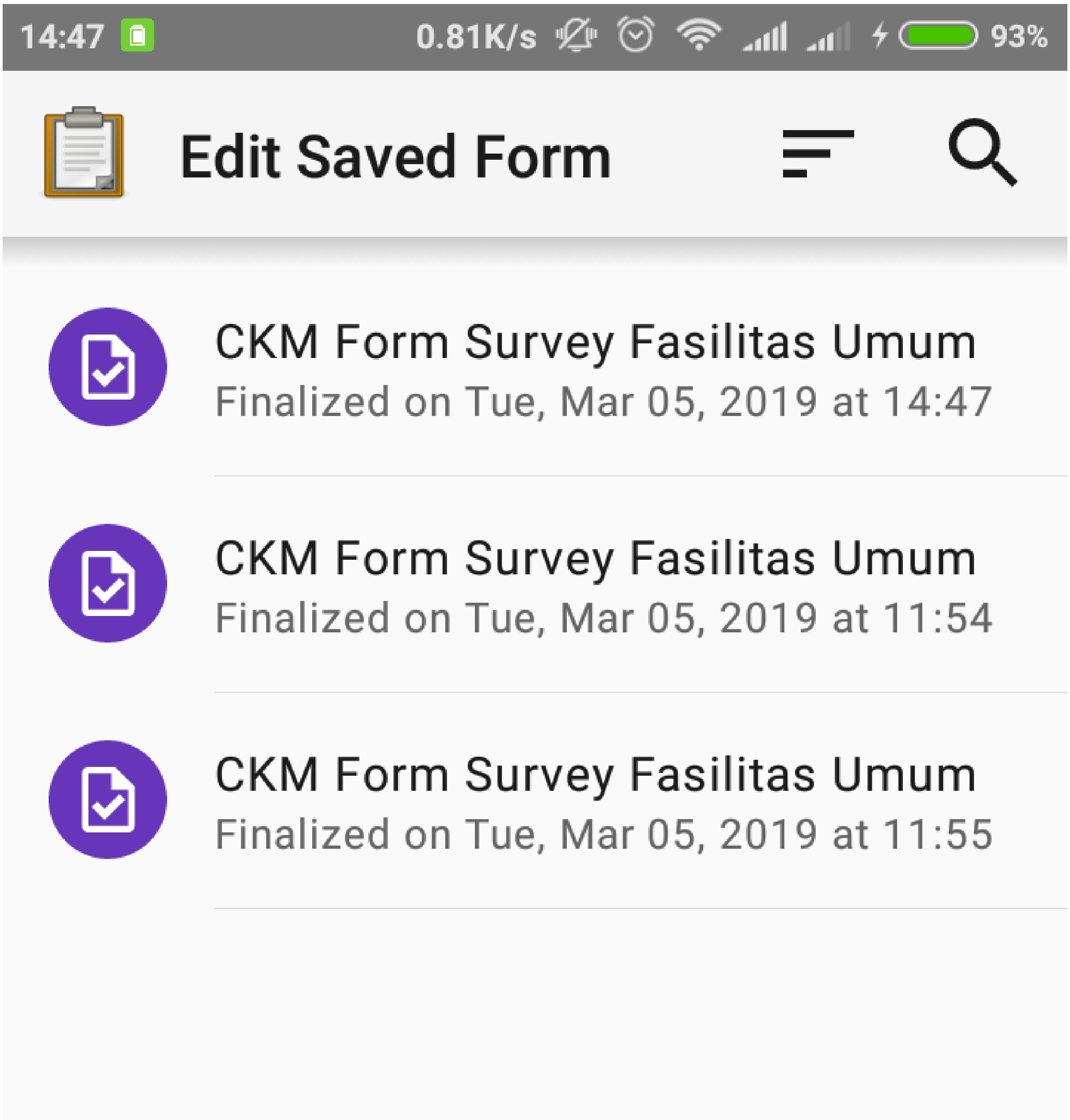
3. Edit the Completed Survey Form

The saved form automatically save in ODK Collect. If you want to edit the completed form, you can follow this step:

- You can back to start page and choose **Edit Saved Form**.

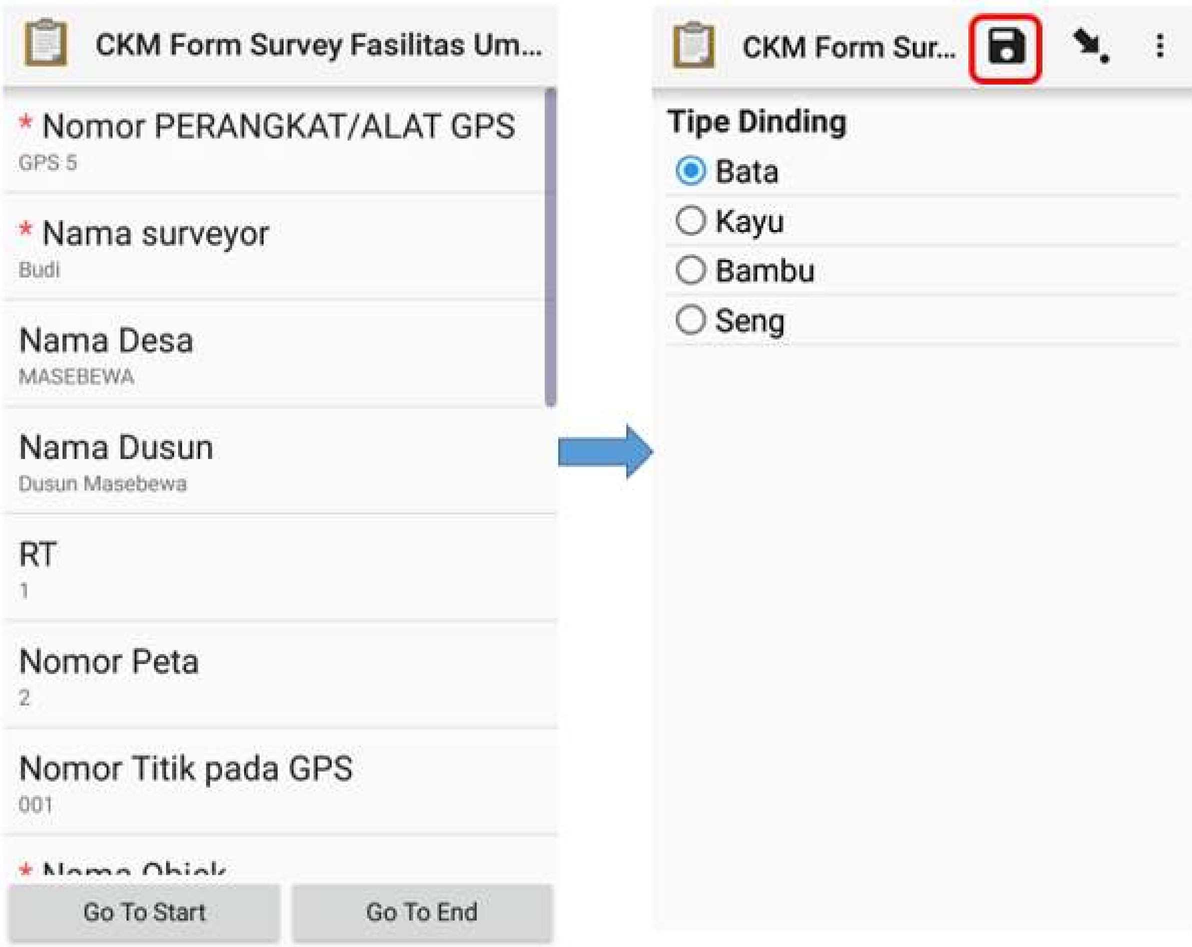
Edit Saved Form for edit the saved form

- Select the form that you want to edit by press the form and you can edit the form.



Edit save form page to select the form that you want to edit

- Then, press floppy disk icon

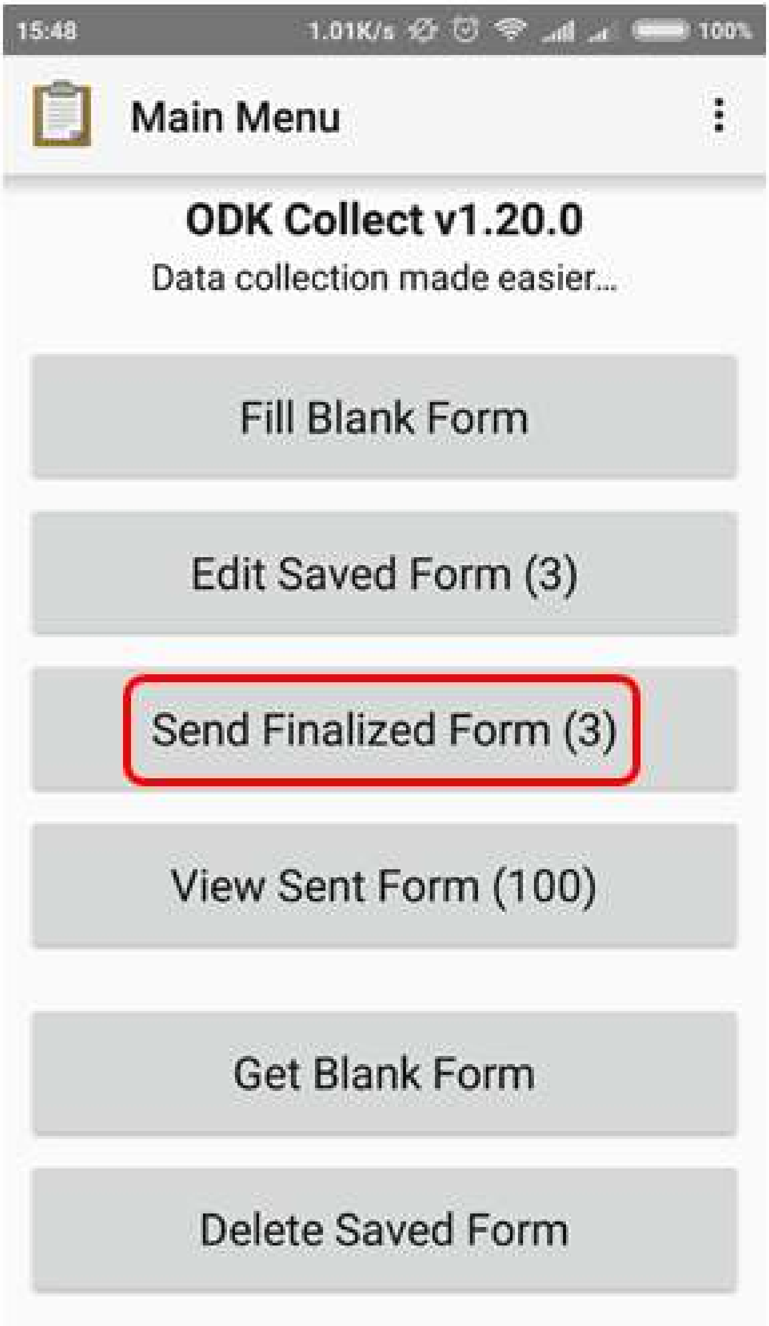


Edit save form page to select the form that you want to edit

4. Upload Survey Forms to Server

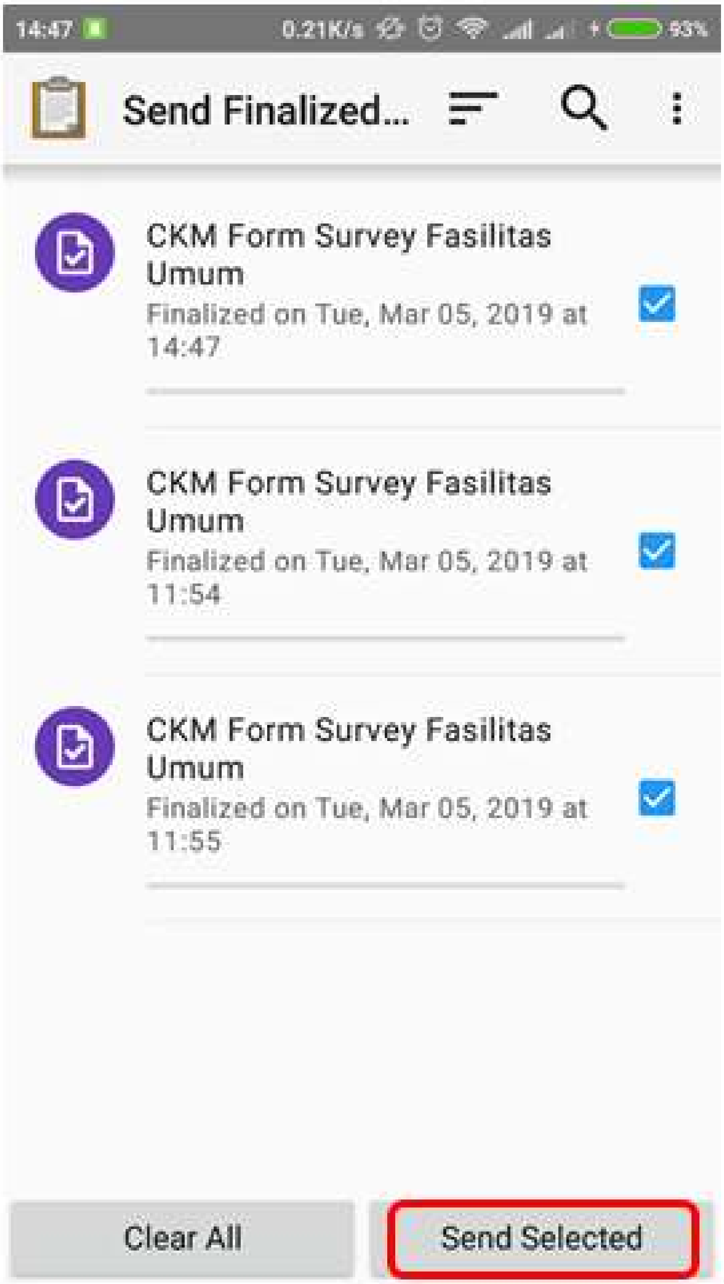
After you fill and save the form, the next step is upload form survey to server. You can follow this step to upload form to server:

- To upload the form return to the server, you can choose **Send Finalized Form**.



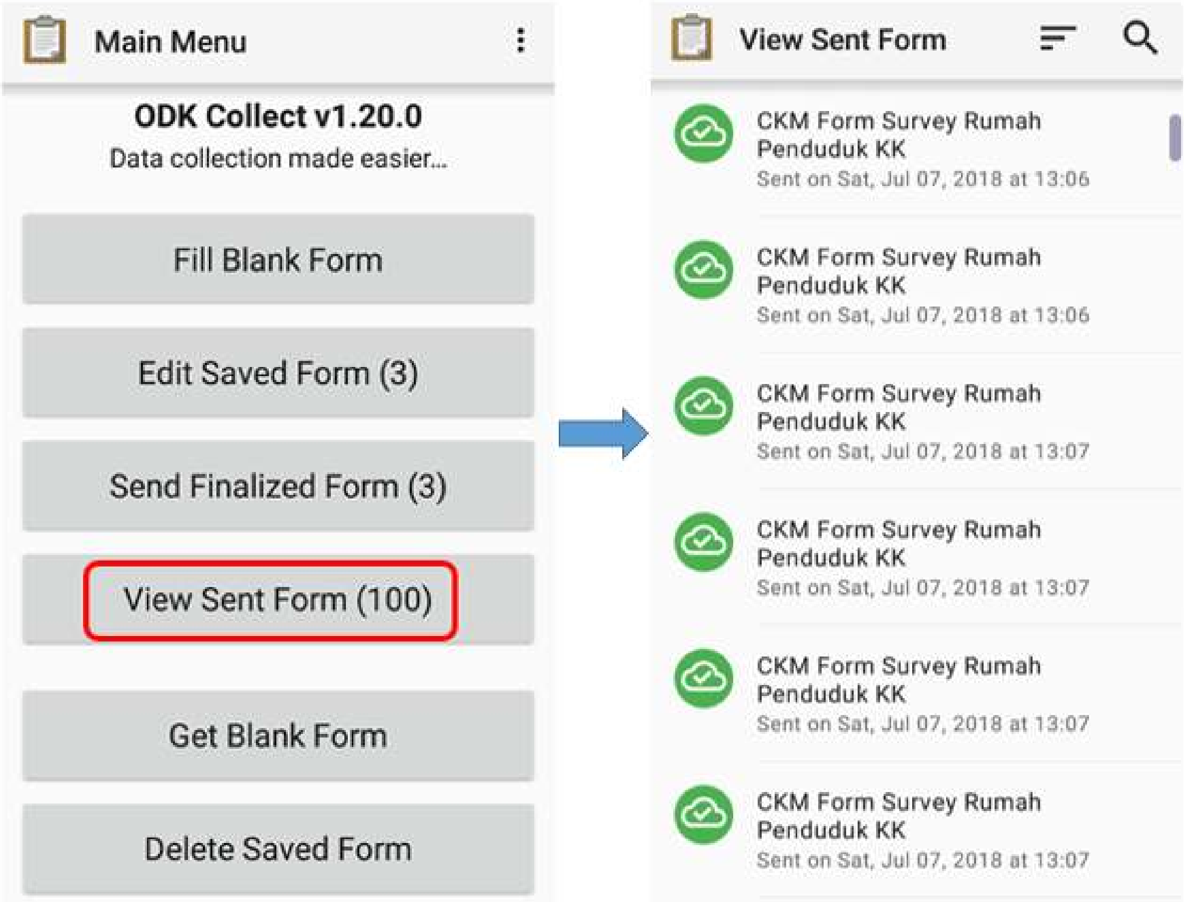
Send Finalized Form to upload a survey form to the server

- Form survey is saved on that page and ready to send. You can choose **Select All** to select all forms first.
- Make sure you are connected on the internet. Then press **Send Selected** and wait until the process_ upload_ the form is complete.



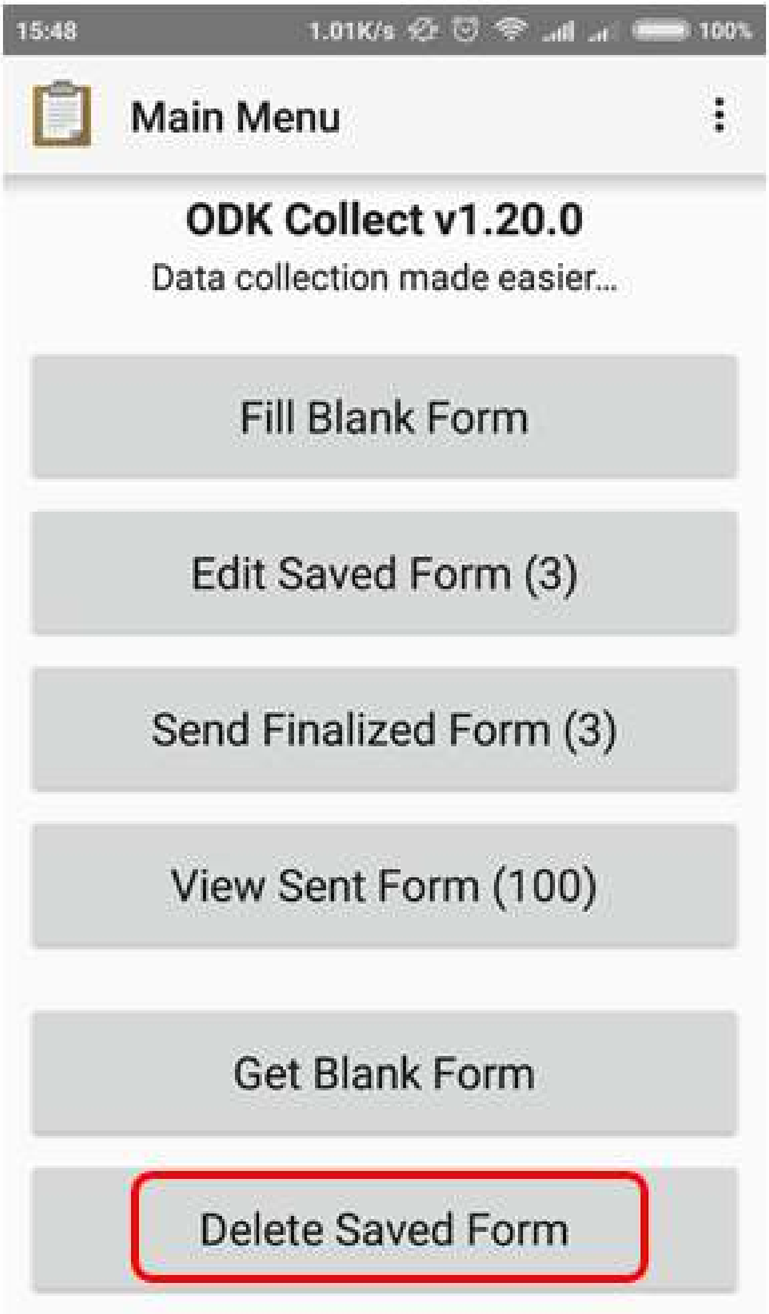
Survey forms that are ready to send in the Send Finalized Form

- All forms that have been successfully uploaded will be stored in **View Sent Form** menu and the icon turn into green.



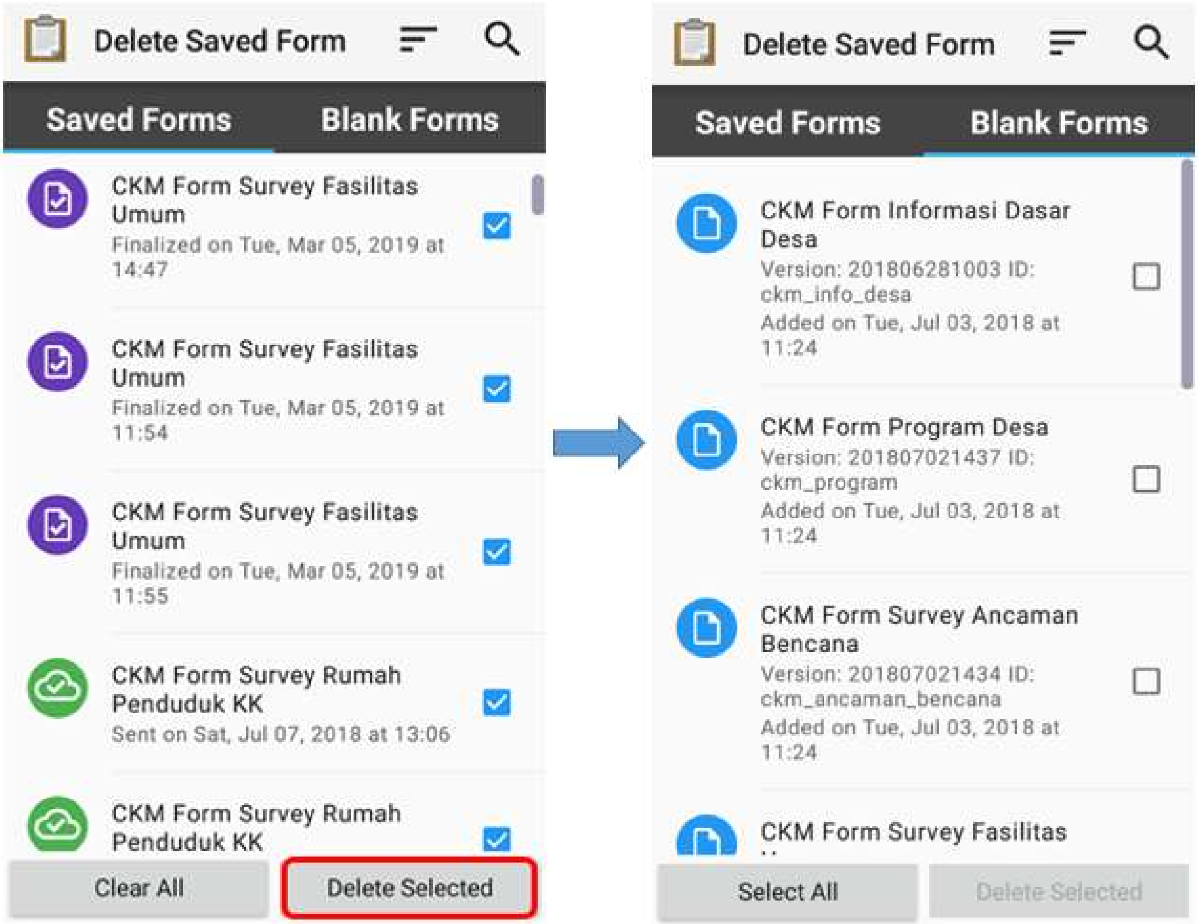
View Sent Form and survey form that have been successfully uploaded to the server

- After upload the form, you can delete the form in ***Delete Saved Form*** menu.



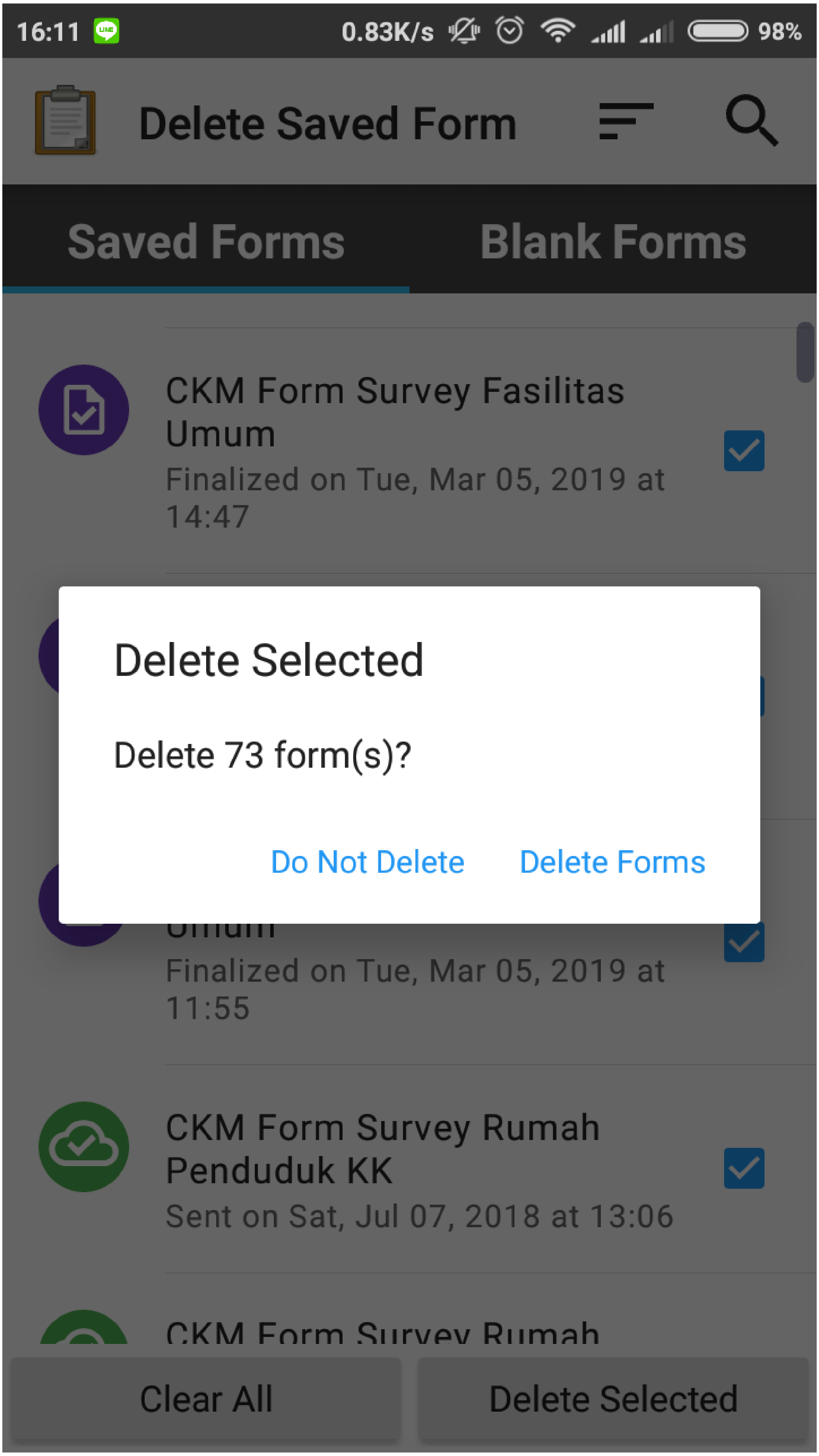
Delete Saved Form menu for delete the form

- You can delete the the filled form in **Saved Forms** option and delete the blank form in **Blank Forms** option. You should choose the form that you want to delete or **Select All** for delete all form.



Delete Saved Form option

- You need to confirm to delete the survey form by choose **Delete Forms**

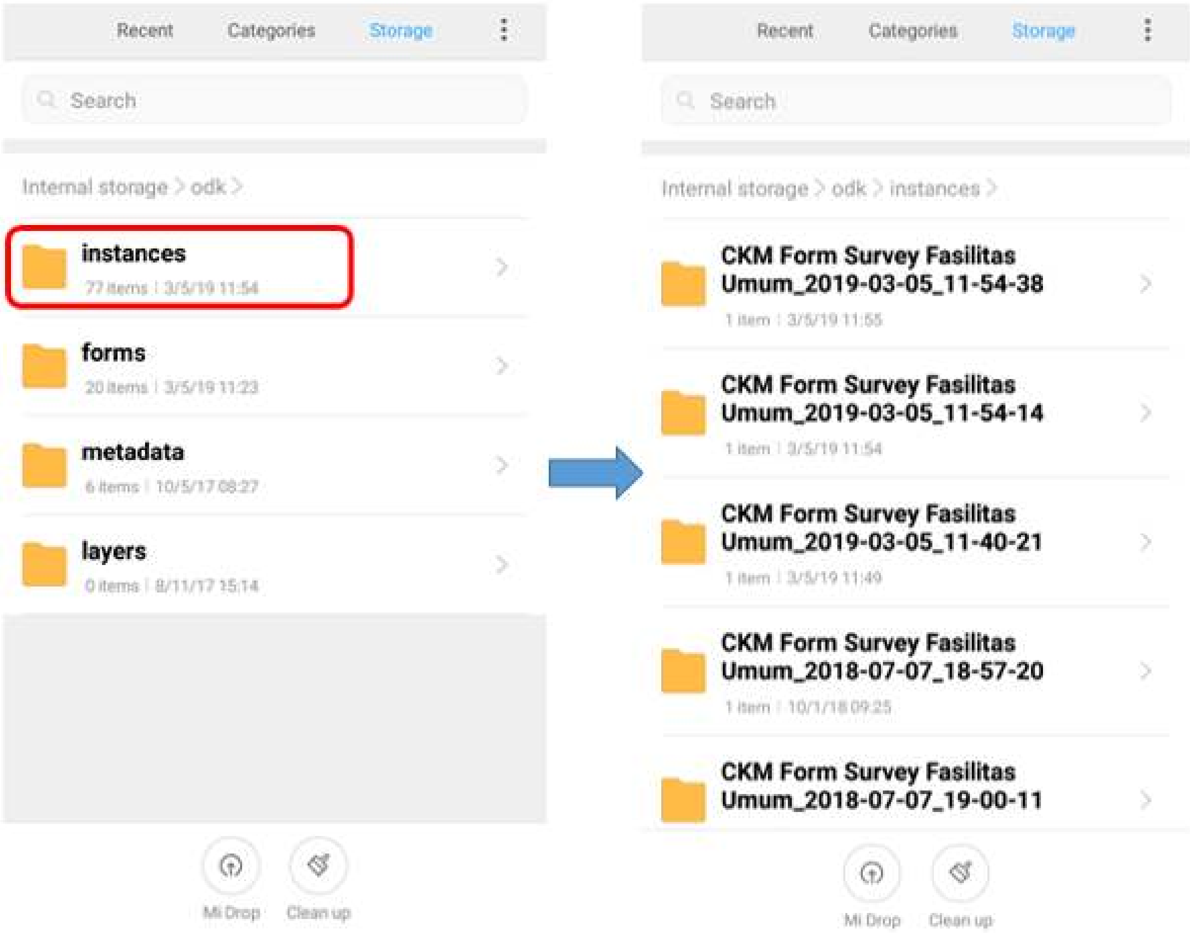

16:11
0.83K/s
98%
Delete Saved Form
Saved Forms
Blank Forms
CKM Form Survey Fasilitas Umum
Finalized on Tue, Mar 05, 2019 at 14:47
Delete Selected
Delete 73 form(s)?
Do Not Delete
Delete Forms
Finalized on Tue, Mar 05, 2019 at 11:55
CKM Form Survey Rumah Penduduk KK
Sent on Sat, Jul 07, 2018 at 13:06
Clear All
Delete Selected

Delete confirmation dialog box

5. Upload Survey Form to Google Drive

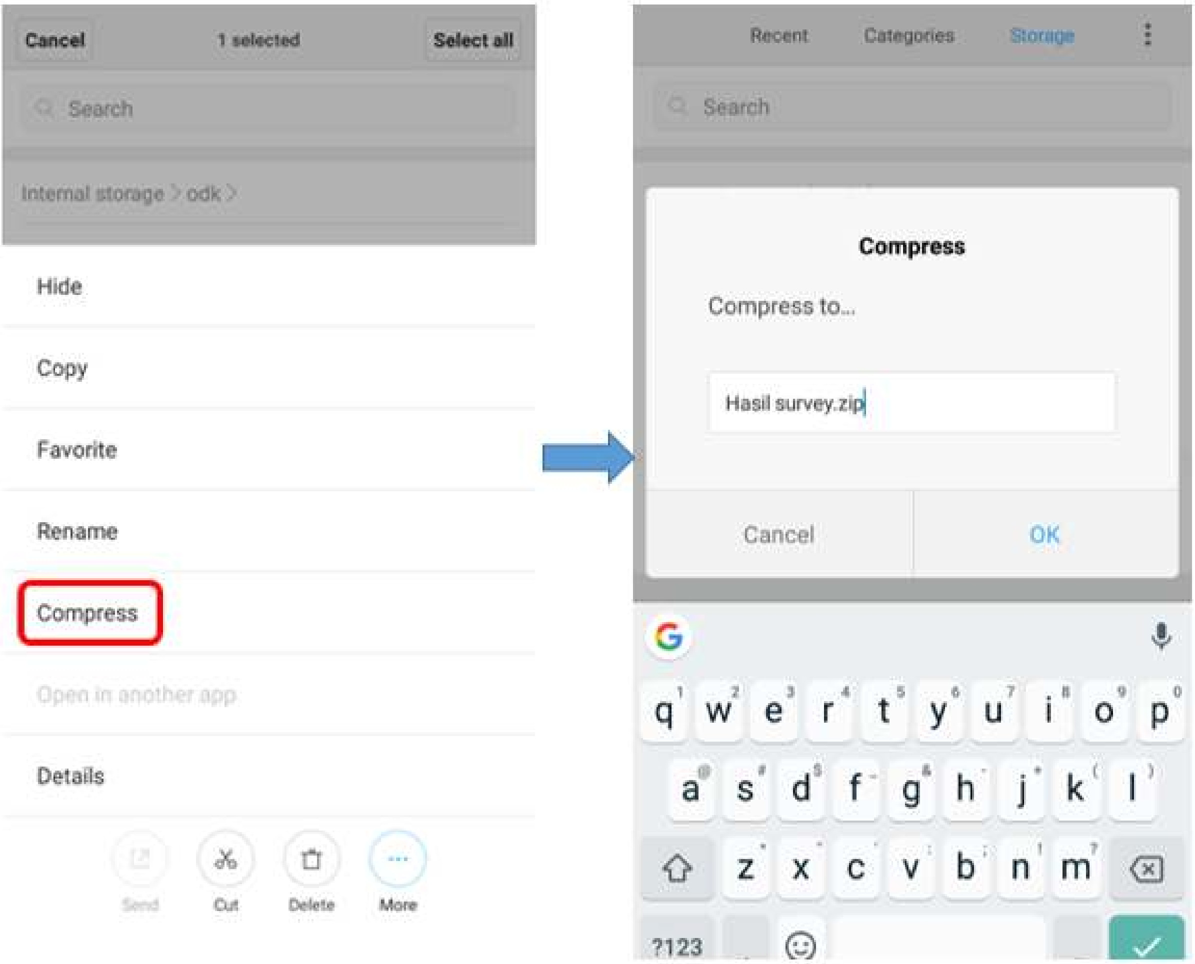
After you upload all the survey form to server, you need to save and upload the survey result file in .zip format in Google Drive folder that was created by your mapping supervisor. This is the step:

- Go File Manager or File Explorer on your smartphone and open your internal storage. Then open ODK folder. This folder contains all the survey result file which stored on ODK Collect application. Then select instances folder which contains *.osm file from object survey result.



Instances folder in ODK folder and the survey result in instances folder

- Before you move **instances** folder to your computer, you need to convert the folder to .zip format by pressing the **instances** folder and select **Compress**. You can change the .zip file name.

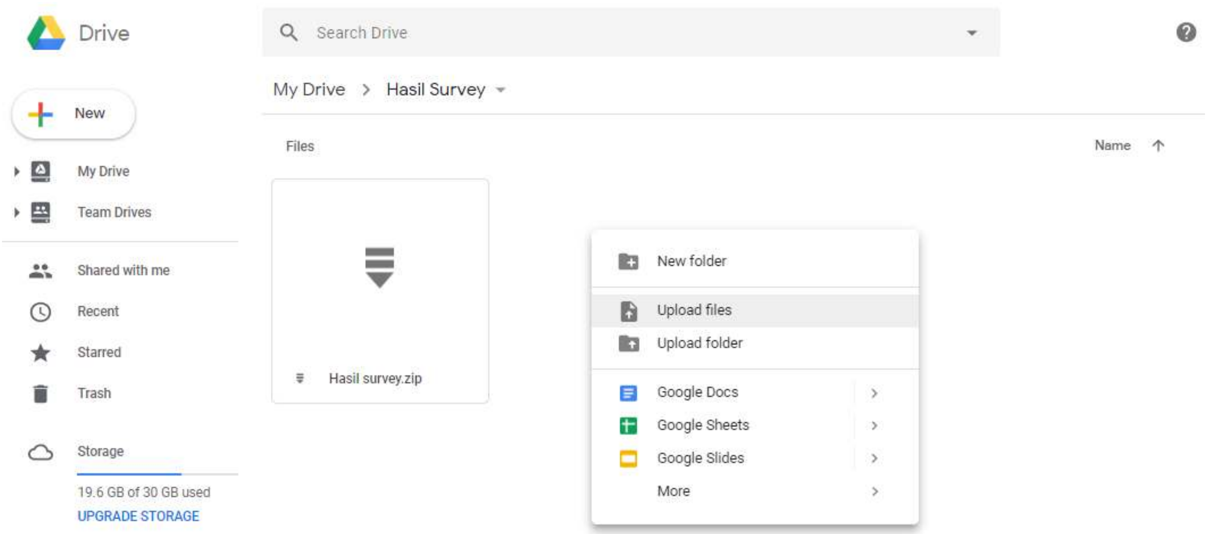


The step for convert to .zip format

- After you move .zip file to your computer, you can upload the file to Google Drive that already set by your mapping supervisor.

The .zip file that ready to move to computer

- You can upload the file to Survey Result folder (or another name that your mapping supervisor made) by click right on your mouse then choose **Upload Files** and choose the file that you want to upload.



The folder on Google Drive for upload .zip file

SUMMARY

If you can follow all the stages in this module, you already then you have successfully understood the use of ODK Collect as a tool for collecting data in the field. In addition, you have also successfully implemented the operation of the initial settings in ODK Collect and how to use ODK Collect to retrieve field data. Later, you will learn about other data collection tools in the field, OpenMapKit (OMK) application.

Using the OpenMapKit Application

Objectives:

- Able to explain *OpenMapkit* as one of the tools for collecting infrastructure data
- Able to operate the initial setup for *OpenMapKit*
- Able to operate how to enter offline basemap for *OpenMapKit*
- Able to operate *OpenMapKit*

Previously you already learn the *ODK (OpenDataKit) Collect,* an android-based application to replace paper form for surveys. *ODK Collect* has extension called *OpenMapKit (OMK)*. This extension is used to add information on the position or location of the object surveyed.

I. What is *OpenMapKit*

(OMK) OpenMapKit is an additional application that is used to support *ODK Collect* in determining the position of objects found during precise and precise field surveys. *OpenMapKit* can be run through *ODK Collect*, after you open and select one of the available forms. In determining the location of an object, *OpenMapKit* requires a map background in the form of a satellite imagery or OSM map. If you use the OSM as the map background, the thing to note is that the data must be available on the OSM server. Currently *OpenMapKit* only available on Android. You can download *OpenMapKit* for free through the *Play Store*.

OpenMapKit application on the Play Store

> Note: To be able to use OpenMapKit You have to install latest version of ODK (OpenDataKit) Collect, because the form filled in OpenMapKit is sourced from ODK Collect.

II.Initial settings *OpenMapKit*

Before you use *OpenMapKit*, you must first make initial setup. The following are step by steps of the initial *OpenMapKit setup*:

- On the home page of *OpenMapKit*, press **the settings button** located in the upper right corner.
- Select **OSM *User name*** OSM and enter your *User Name*

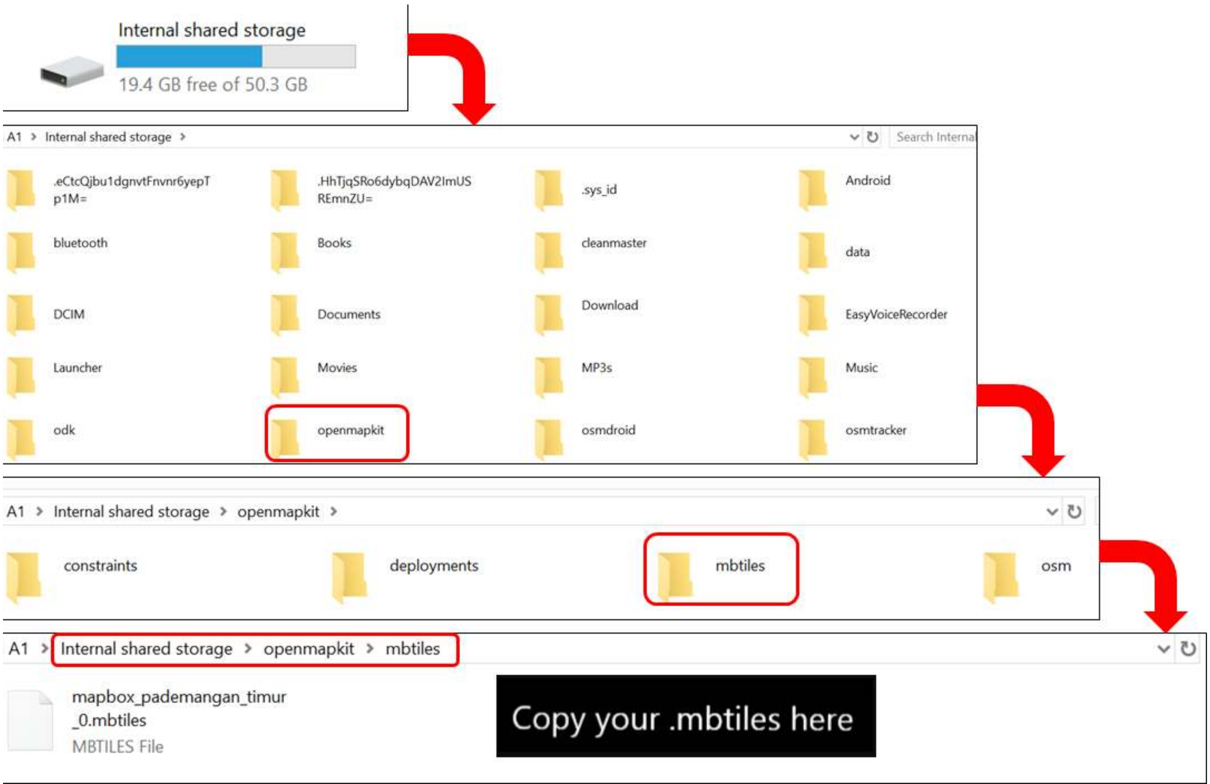
Display settings menu OpenMapKit

- By default, *OpenMapKit* will display the *Online Humanitarian OpenStreetMap*.

III. Import the offline *basemap* for *OpenMapKit*

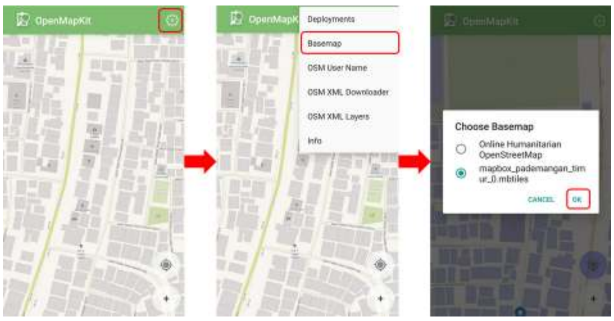
OpenMapKit provides an OSM map as a *basemap* that must be accessed using an internet connection. But don't worry, you can also enter offline basemap into *OpenMapKit* which is a map that can be opened without an internet connection. An offline basemap can make it easier for you to add information right at the location you are surveying. Here's how to add offline basemap:

- The format of the data used as a offline basemap in the application *OpenMapKit* should be formatted as .mbtiles. To create *.mbtiles* can be seen in the module **Make Mbtiles for OMK (*OpenMapKit*).** After you have the *.mbtiles* file, connect your *smartphone* to your computer / laptop. Open the folder containing *the .mbtiles* file that will be copied to your smartphone. Select the *.mbtiles* file then copy it to **openmapkit → mbtiles** folder your internal storage.



Process of adding .mbtiles files to OpenMapKit

- If you have successfully copied *.mbtiles*, you can change the *OpenMapKit basemap* by pressing **the settings button** located in the top right corner and pressing ***Basemap*** then select the *.mbtiles* that you just entered. Then press ***OK***.



Display basemap settings in OpenMapKit

IV. Basic Operation *OpenMapKit*

1. Download OSM data in *OpenMapKit*

```
Existing OSM data can be easier for you to add information about the building because you can choose
```

- Navigate the map to your current location (for example, you are already on the survey location) by pressing **the round button** in the lower right corner of the screen until the round button is colored blue. A black dot will appear at your current location.

```
![Navigate to the current location in OpenMapKit](images/using-omk/0305_omk_location.png)
<p align="center"><i>Navigate to the current location in OpenMapKit</i></p>
```

- Press the **settings button** in the top right corner
- Select ***OSM XML Downloader*** to start download OSM data according to the view on the screen of your smartphone (the duration depends on the size of the area). Make sure you are connected to an internet connection when downloading OSM data. Note the color of the building, the building on the OSM _basemap _have brown color and the building from ***OSM XML Downloader*** is purple.

```
![Building colors](images/using-omk/0306_warna_bangunan.png)
<p align="center"><i>Building color on the OSM basemap (left) and downloaded building color (right)<
```

- Your new downloaded OSM data will be saved in the format *.osm* which can be activated or deactivated via **the settings button → *OSM XML Layer***.

```
![OSM XML Downloader menu and OSM XML Layers menu](images/using-omk/0307_xml_layer.png)
<p align="center"><i>OSM XML Downloader menu and OSM XML Layers menu</i></p>
```

2. Add building information in *OpenMapKit*

```
If you have successfully downloaded building data from OSM, you can add the building information by:
```

- Select the building to which the information will be added. Make sure the building is purple which indicates that the building has been downloaded from OSM. If the building is selected, the color will change to orange.
- You can fill the building information in accordance with the form you have chosen before in the *ODK Collect* application, with press the information tag in the first row located below.

```
![Fill out building information using a form from ODK Collect](images/using-omk/0308_mengisi_form_om
<p align="center"><i>Fill out building information using a form from ODK Collect.</i></p>
```

- When done, at the end of the page select ***Save*** to save the form to *ODK Collect*. If you have completed filling in the form, the building that you fill in the information will look like this:

```
![The building that has been filled in the information](images/using-omk/0309_tag_bangunan_omk.png)
<p align="center"><i>Building that has been filled in the information</i></p>
```

```
If the building data for location of your survey is not yet available in the OSM, you can map the bu
```

- Use *.mbtiles* you have entered previously to help mark the object accurately click **Settings → *Basemap***
- Press **the plus (+) icon** in the lower right corner of your screen until it turns green. It will appear green marker with the words *Add Node* on it. Slide the map until the location of the marker is accurate with the object in the field.

```
![Add marker using plus icon](images/using-omk/0310_add_node_omk.png)
<p align="center"><i>Add markers using the plus (+) icon</i></p>
```

- Press ***Add Node*** if the point is accurate

```
![Add node button when adding a point](images/using-omk/0311_tombol_add_node.png)
<p align="center"><i>Add note button when add point</i></p>
```

- If the point you add turns out to be in a position that is not in represent with the object in the field, you can move the point that has been added by clicking on the point to move then press the two arrow icon in the top right corner. The color of the point will turn orange and above it will be appear *Place Node*.

```
![Swipe points that have been added](images/using-omk/0312_menggeser_node.png)
<p align="center"><i>Swipe points that have been added</i></p>
```

- Slide the map to the accurate point position, then press ***Place Node***.

```
![Place node button when shifting a point](images/using-omk/0313_place_node.png)
<p align="center"><i>Place node button when shifting a point</i></p>
```

- After the position is accurate as the object in the field, you can fill out the form the same as the previous step.
- Enter information that matches the conditions in the field. Swipe the screen right or left to change thepage questionon the form.
- At the end of the page, select ***Save*** to save the form to *ODK Collect*. If you finished to fill in forms, the marker that you fill in the information will look like this:

```
![the point of objects already loaded with informations](images/using-omk/0314_finished_tag.png)
<p align="center"><i>Point of objects already loaded with informations</i></p>
```

- Now you can see the form has been successfully saved on the *ODK Collect*.

SUMMARY

If you can follow and pay attention to all the stages in this chapter, you have successfully understood *OpenMapKit* as one of the field survey tools for collect infrastructure data. In addition, you have also successfully implemented the initial setup of *OpenMapKit*, how to enter offline *basemap* for *OpenMapKit* and how to use *OpenMapKit* to retrieve infrastructure data.

Using OSMTrackers

Objectives:

- Explain OSMTracker as one of survey tools for recording tracks and photos
- How to set up the OSMTracker for the first time
- Learn how to use OSMTracker

I. What is OSMTracker?

OSMTracker is an android application that allows us to record our survey data. Similar to GPS, OSMTracker is able to record waypoint and also track. If you want to learn more about GPS for field survey, you can see the **GPS Module**. What makes OSMTracker different with common GPS device is its capability to take pictures when you collect the survey data. With these images taken, it will make your mapping more easier because you can track back what object you have been taken and take a look into your pictures for more detail. Waypoint and track that you have collected can be converted into .gpx file so you can open your survey data using JOSM or you can directly upload your data into OpenStreetMap.

If you want to use OSMTracker you can download the application on your smartphone. Open your Google Playstore and search OSMTracker in search box.

You can download OSMTracker on Google Playstore

After the installation finished, open your OSMTracker application on your smartphone.

OSMTracker page display

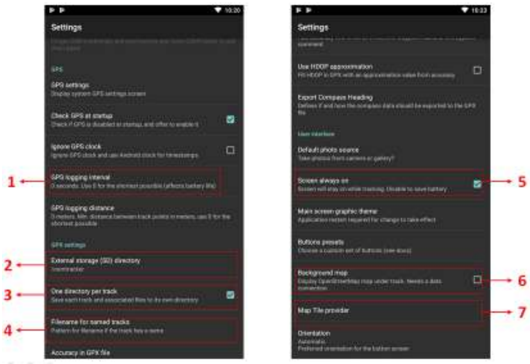
II. OSMTracker Setting

Before you can use the OSMTracker, there are few setting you have to do. Go to

⋮ button on the top right corner and then select **Settings**.

Select Settings menu on OSMTracker

On the settings page there are several things you have to look:



Several configurations on Settings menu

1. GPS logging interval

   This section will set how often your OSMTracker record the track. If you set the number smaller, OSMTracker will record the track more often. The default value for this setting is 0, which means that OSMTracker will always record your track. This will affect your battery life. You can change the number according to your need, for example 2 second.

2. External storage (SD) directory

   This section determine where you want to save all your survey data on your smartphone. By default, OSMTracker will create a new folder called “osmtracker” on your smartphone’s internal storage. If you don’t want to change this setting, you can ignore this section.

3. One directory per track

   If you activate this feature, each track you save will create a new folder in your internal storage.

4. Filename for named track

   This section will set the labelling of you survey data. By default, the labelling consists of track name, survey date, and survey time. You can ignore this setting if you don’t want to change it.

5. Screen always on

   If you activate this feature, you will let your smartphone always turn on when you use OSMTracker. When you using this setting, it will drain your smartphone’s battery fast. You can change it as you needed.

6. Background map

   Use this setting to show the background map on your track. Activate this setting so you can see your survey track with map as it’s background.

7. Map tile provider

   You can change your background map using this feature.

After all the setting is done, then you are ready to use your OSMTracker. Always remember to activate your GPS setting on your smartphone, then you can open your OSMTracker. If you are using OSM-Tracker for the first time, your home page will be empty. Later, all your survey data will show up on your home page.

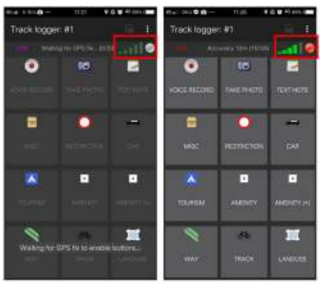
III. OSMTracker Basic Operation

1. Recording Survey Track

If you want to start your track recording, you can select the button **+** on your top right of your screen. You will see the Track Logger page.

Use + button to start recording your track

Remember to always check your GPS accuracy. All feature on OSMTracker will not available if you are not receiving a good GPS signal. Try to get GPS accuracy as best as you can (below 10 meter) to prevent a mistake when recording your current position. You can see your GPS signal indicator on your top right corner of your screen (look at the picture). The signal bar color will change to green and become full when you receive a good signal. Make sure you are in a good position to receive signal. Locate yourself on the open field and make sure you are not under the roof or tree.



Unable to activate track logger function because the GPS signal is not good enough (left); Track logger is activated if GPS signal is good enough (right)

When the GPS accuracy is good enough, then you can start to record your track. When you press the + button and the GPS accuracy is good enough, OSMTracker will automatically record your track.

2. Recording Object using Waypoints and Picture

When you open your Track Logger page, there are many buttons to access, but if you want to record waypoints and also picture, you only have to use this 2 button:

Track logger page on OSMTracker

1. Text Note

Use **Text note** to mark your current position as a waypoint. Just press this button and then fill

![Text note function to record waypoint on your survey](images/using-osmtracker/0409_Contoh_penggun
<p align="center"><i>Text note function to record waypoint on your survey</i></p>

2. Take Photo

Use **Take Photo** to take your object photos. You can straight use your smartphone camera or you ca

![You can choose to take the photos straight from your camera or select from your smartphone's gall
<p align="center"><i>You can choose to take the photos straight from your camera or select from you

3. Stop and Continue Track Recording

If you want to stop your recording, you can follow these steps:

1. On the Track Logger page, please go back to your home page, then find one file track you have collected before. Press on that file for a while until additional menu is shows up.

![Option to set stop tracking](images/using-osmtracker/0411_Pilihan_untuk_menghentikan_perekaman_ja
<p align="center"><i>Option to set stop tracking</i></p>

2. Choose **Stop tracking.**
3. You can also press button on the top corner on your Track Logger page to stop the recording and save your record.

If you want to continue your track record on your previous file, then you have to :

1. Press on your previous file until additional menu is shows up.
![Resume tracking](images/using-osmtracker/0413_Pilihan_untuk_melanjutkan_kembali_perekaman_jalur.p
<p align="center"><i>Select to resume tracking</i></p>

1. Then choose **Resume Tracking**

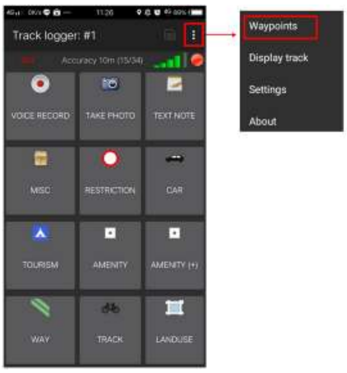
   Note :

Figure 1: Ikon

If your file has an orange color clock icon, it means that your file still on track recording mode. This icon will disappear after you stop and save your file.

4. Showing List of Objects Collected

You can see list of objects you have collected. On Track Logger page, press the button on the top right corner of your screen, then select **Waypoints**.



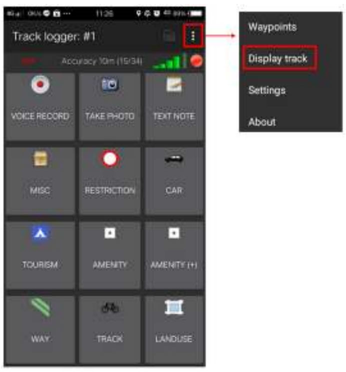
Button to show list of waypoints

You will see the list of objects and the photos you have collected on the Waypoint list.

Waypoint list to see list of objects you have collected

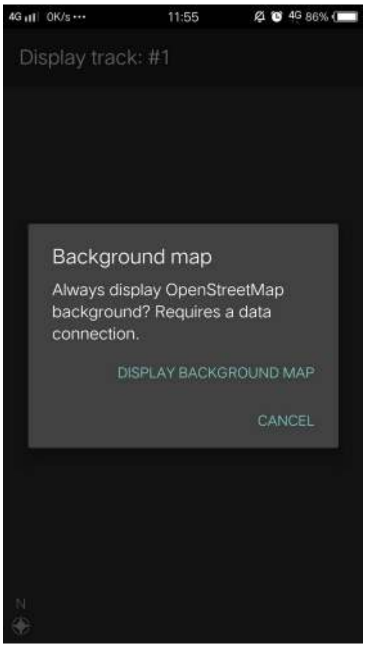
5. Showing Track and Waypoint Collected

You can also see your track and waypoints you have collected. On your Track Logger page, choose menu on the top right corner of your screen, then choose **Display Track**.



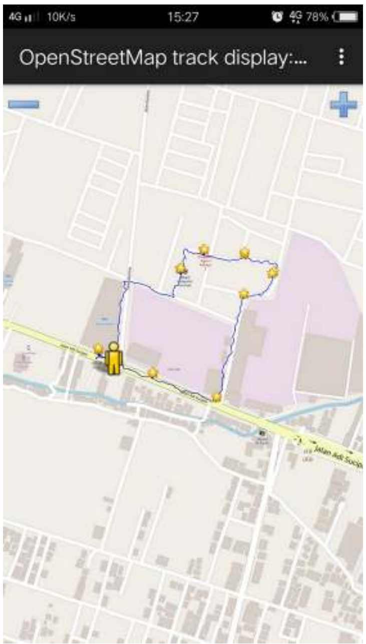
Display track button to see your track and objects you have collected

When you choose to display your track, OSMTracker will ask your permission to show the background map. Choose **Display Background Map**.



Option to display your background map

You will see the map with line, star, and people icon on the top of the map. The star icon represent the waypoints, the line represents the track you have collected, and the people icon shows where is your current position on the map.



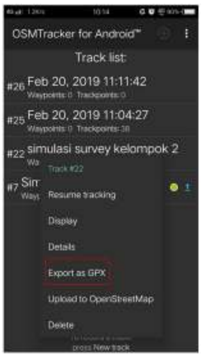
Track and object's collected on field survey

6. Saving the OSMTracker Data

After you collecting the data, you can save your data and use it for your mapping guide. In order to do that, you need to save your survey data as a .gpx data format. After that, you can upload it to OpenStreetMap server or you can move the data to your laptop.

7. **Saving Track and Waypoints as .gpx Data**

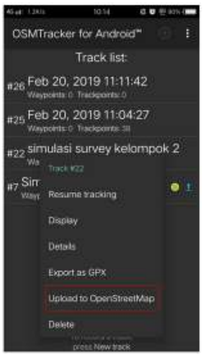
You can save your track and waypoint into .gpx data. You can open .gpx data with mapping software like **QGIS** and **JOSM**. On your survey file, select and press the file for a while, then select **Export as GPX**. If the process is successful, you can see the green dot on the right side of the file name.



Menu to save your survey data into GPX

8. **Uploading Track to OpenStreetMap Server**

You can upload your survey data to OpenStreetMap server. On your survey file, press and hold it for a while, then select **Upload to OpenStreetMap**.



Menu to upload your survey data into OpenStreetMap

On OpenStreetMap Upload page, you need to fill the form like name and file description. You can ignore on Tags section. On the bottom section, you can set the track for :

1. Private

```
Track will not shown up to the public. Trackpoints can be accessed on the time sequence using GPS AP
```

2. Public

```
Track will be shown to the public and available for download to the other user.
```

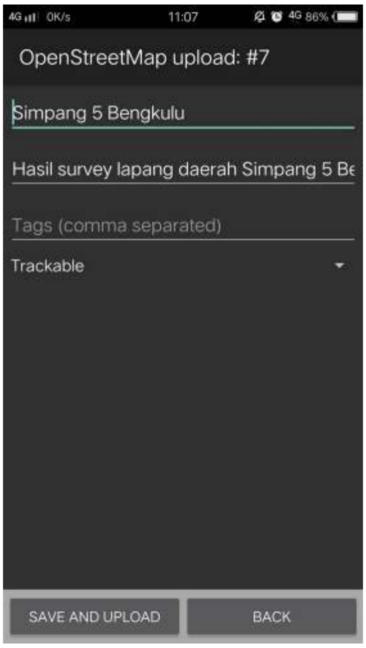
3. Trackable

```
Track will be shown to the public, but trackpoints still can be accessed by public GPS API. Other us
```

4. Identifiable

```
Track will be shown to the public. Other user can download your data and can refer your OSM username
```

For this option, you can choose Trackable or Public so another user can download your data.



Survey data is ready to upload into OpenStreetMap server

9. Copying Track and Waypoint to Laptop/Computer

All the .gpx data stored in your internal storage of your smartphone. You can search the file using your file manager. To copy the data, you can follow the instruction:

1. Connect your smartphone to your laptop using your smartphone cable and then find folder called “osmtracker” in your smartphone.

![OSMTracker folder on your smartphone’s storage](images/using-osmtracker/0423_Folder_OSMTracker_di_
<p align="center"><i>OSMTracker folder on your smartphone’s storage</i></p>

2. Inside of your OSMTracker folder, you can find a folder containing a .gpx data and photos. Copy the entire folder into your laptop.

![Example of OSMTracker data consist of .gpx file data and survey photos](images/using-osmtracker/04
<p align="center"><i>Example of OSMTracker data consist of .gpx file data and survey photos</i></p>

3. Open your JOSM, and then open your gpx data. Select menu **File → Open** and then open the .gpx data format.

![Open your file with .GPX format data on JOSM](images/using-osmtracker/0425_Silakan_Anda_buka_file_
<p align="center"><i>Open your file with .GPX format data on JOSM</i></p>

4. When you open your .gpx file, JOSM will automatically shows track and waypoint along with the photo as well.

![Field survey data when you open it on JOSM](images/using-osmtracker/0426_Contoh_hasil_data_survei_
<p align="center"><i>Field survey data when you open it on JOSM</i></p>

You can use your survey result as a guidance for your mapping using JOSM. The photos taken will help

SUMMARY

In this chapter you have learned how to do a field survey using OSMTracker. OSMTracker allows you to record your track, waypoint, and take a picture of your survey object. You also have learned how to do an initial setting and how to operating your OSMTracker. You can use OSMTracker as your alternative tools for your survey in case if you don’t have GPS.