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Welcome to the HOT Toolbox

The HOT Toolbox is designed to provide OSM Communities and HOT teams with step-by-step guides of technical processes as well as a repository of training materials developed by HOT from setting up mobile devices for mapping to exporting OSM data.

Many pages in this wiki will contain Training Materials produced by HOT. These materials are uploaded under CC by 4.0 which means they are free to use and be modified - we simply ask that you credit HOT and maintain a Creative Commons License. Learn more about Creative Commons and free use here.

In addition to providing HOT materials, this toolbox curates a large amount of resources that already exist for the various components of mapping projects, from software guides to running mapathons.

How to Use the Toolbox

The Toolbox is designed to take a project manager or community from the start of a mapping project to use and analysis. However, not every mapping project is the same. Some projects might use Open-MapKit for data collection while others might simply use Maps.ME. Even others might not even conduct field mapping activities but run digitization projects instead. For this reason, HOT has provided example workflows in **Getting Started** that guide a reader through example projects to identify which tools and processes are right for your project. Additionally, this section provides an overview of the HOT tools, including those we have developed and those we have adopted for our projects. **If you are not sure where to begin a project** use this section to find a workflow that best suits a project's goals or resources. Each of these example workflows will guide through the exact steps used in the project by linking to the relevant sections in the Toolbox. **If you are looking for specific guidance** on a phase of a mapping project, a tool, or a process, use the left-hand navigation or the search bar to look for a particular guide.

Overview of the Toolbox Sections

Designing and Coordinating a Mapping Project provides readers with an introduction to the components that project managers should consider and take into account before beginning their mapping projects.

Digitization and Editing provides project managers with training materials and guides on managing the digitization process and which remote mapping tools are best for a project. **Field Mapping Technical Set-up** provides project managers with the technical steps for selecting which mobile data collection application is best for their project, setting up those applications (such as ODK and OMK) for use in the field, and whether or not data collection servers are necessary for their project. **Field Mapping Management** provides steps and guides for field mappers and supervisors to use mobile data collection applications, as well as providing tips for managing teams in the field. **Data Cleaning Upload and Quality Assurance** covers the process of taking field mapped data through cleaning and upload to OpenStreetMap while ensuring strong data quality. **Data Export Tools** covers the various tools used for exporting data from OpenStreetMap** and **which tools are best for different use cases**. **Data Use and Analysis**** provides an introduction to how data can be turned into effective maps for decision making.

Workflow Example - Field Mapping Buildings and POI

The following workflow showcases the tools and processes used in a long-term field mapping project to map buildings and points of interest using OpenMapKit with government and local partners.

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

1.5.1 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

2.2 Safety, Security, and Logistics for Field Operations

Overview

For projects requiring field work, you will need to take extra steps to ensure that logistics and security are effectively handled. The following are topics that project managers should consider and have plans for before entering the field. Work with donors, local partners, and stakeholders to fill information gaps and meet these needs.

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? Will you need to procure hardware?
- Does everyone on the team have access to computers/laptops? Or will the team plan to work in shifts?

Refer to Section 1.3 Hardware for guidance on selecting mobile devices, laptops and other hardware for your project.

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?

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.

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

2.3 Selecting 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 imagery: 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

When using mobile devices for data collection, ensuring that devices can remain charged throughout the day and be recharged is critical. HOT recommends procuring power banks when possible to ensure that devices are ready for mapping. Each project (and applications used) will have different drain on mobile devices, in general, HOT has found that consistently collecting surveys with OpenMapKit and running a GPS application in the background (i.e. OSMAnd, OSMTracker) will drain a typical device battery in 3-5 hours - requiring the need for power banks to work through the entire day. When selecting power banks, it is recommended that they are tested for compatibility with the mobile device used.

In addition to keeping devices charged during the day, project managers need to consider how all devices (including power banks) will be charged at the end of the work day. Will mappers have access to power at night? Does your team have enough outlets or power strips to effectively charge all of your devices? Will mappers need to find alternative options for charging devices?

Storage Devices: POSM & Hard Drives

When collecting survey data in the field, accidents can happen including lost, damaged, or stolen mobile data collection devices or laptops. For that reason, it is important to have a data storage strategy to ensure back-ups exist. It is much easier to recollect one day's worth of field data than to completely redo all of the work. Multiple laptops with duplicate back-ups, hard drives, or using a POSM are all effective ways of keeping back ups, even if your team is using a cloud server. Storage devices should have at minimum 1 terabyte of storage.

Street view imagery: 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 comparison 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 km ² | \$3-65k |
| Fixed Wing UAV | 45 minutes | 40-110 mph | 1-3 kg | <12 km ² | \$25-120k |
| Hybrid UAV | 60 minutes | 70-120 mph | 1-6 kg | <13 km ² | \$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

3.1.1 Opening OSM accounts

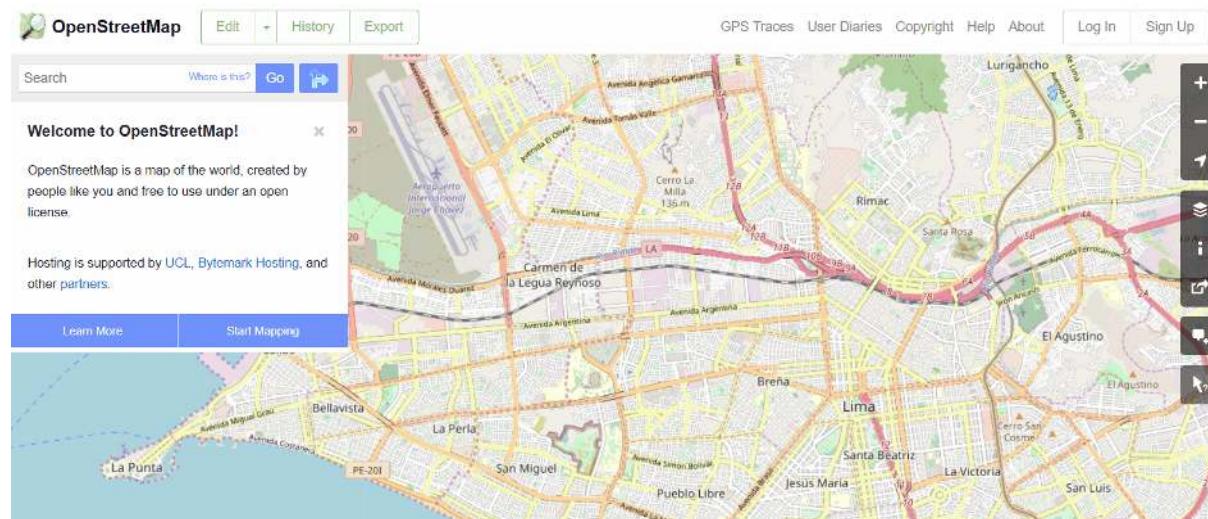
With OpenStreetMap (OSM) at the core of mapping activities, it is critical that all team members and participants have activated OSM accounts. This will be necessary before using many mapping tools such as HOT Tasking Manager, JOSM, and HOT Export Tool.

Skills and Technology Needed

- Computer
- Activated email account
- Internet connection

Creating an OSM Account

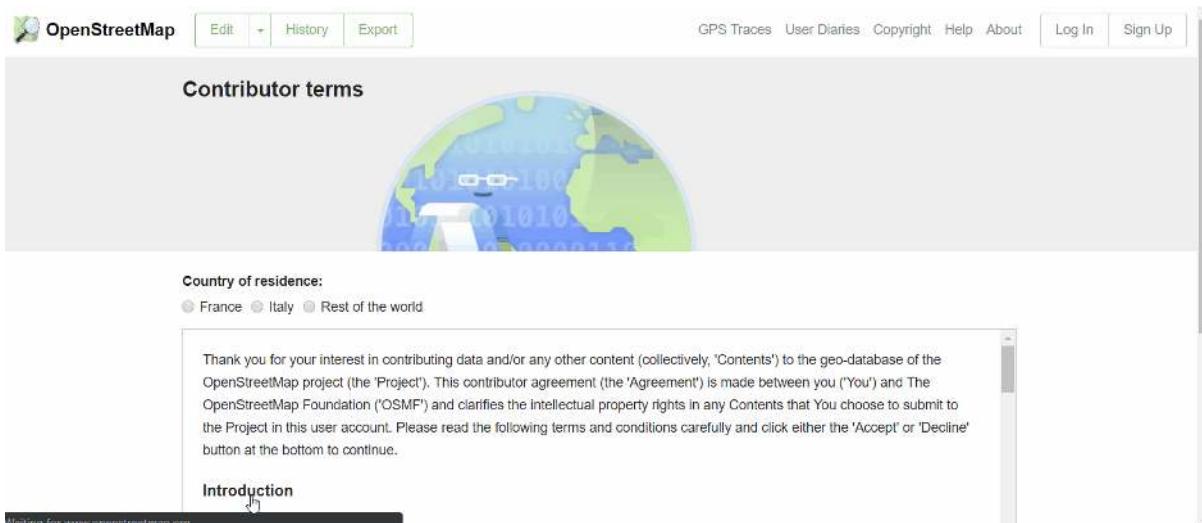
To get started, you will need to create an account on www.openstreetmap.org. Please use the “Sign Up” tab in the top right corner to begin.



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.

A screenshot of the 'Sign Up' form on the OpenStreetMap website. At the top, there is a navigation bar with links for 'Edit', 'History', 'Export', 'GPS Traces', 'User Diaries', 'Copyright', 'Help', 'About', 'Log In', and 'Sign Up'. Below the navigation bar is a large 'Sign Up' button. To the right of the button is a cartoon illustration of a globe with a smiling face and binary code (0101010...) on its surface. The form itself has several input fields: 'Email Address:' and 'Confirm Email Address:', both with placeholder text 'Enter your email address...'. Below these fields is a note: 'Your address is not displayed publicly, see our [privacy policy](#) for more information.' To the right of the email fields is a note: 'Free and editable: Unlike other maps, OpenStreetMap is completely created by people like you, and it's free for anyone to fix, update, download and use.' Further down the form are fields for 'Display Name:' and a note: 'Sign up to get started contributing. We'll send an email to confirm your account.' At the very bottom of the form is a large blue 'Agree' button.

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

3.1.2 Getting started with OpenStreetMap

Objective:

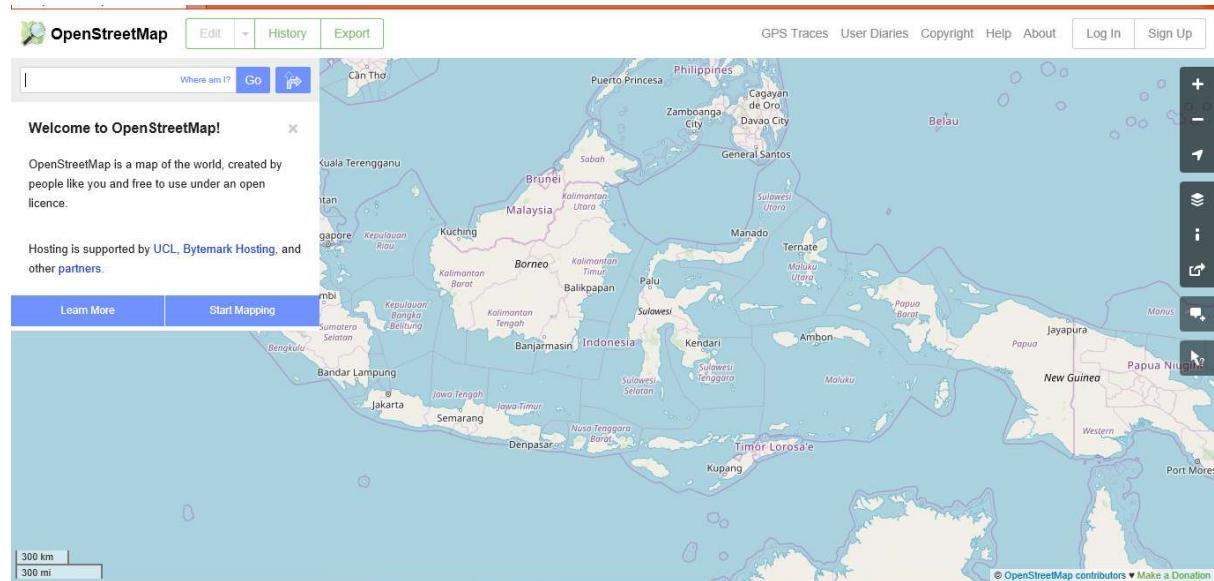
- To be able to operate and navigate the OpenStreetMap website
- To be able to see object information in OpenStreetMap
- To be able to create share link in OpenStreetMap
- To be able to save images from OpenStreetMap
- To be able to create user account in OpenStreetMap
- To be able to understand the basic concept of attribute in OpenStreetMap
- To be able to understand history in OpenStreetMap

After you understand the basic of OpenStreetMap in the previous module, you can immediately start using OpenStreetMap. In this module you will start to get to know the OpenStreetMap site, create an OSM account, and find out the menu buttons and how to use them.

I. Visit the OpenStreetMap website

To be able to visit OpenStreetMap (OSM) site, make sure your computer is connected to the internet network. The steps to visit OpenStreetMap site are as follows:

- Open the web browser in your computer such as **Mozilla Firefox, Google Chrome, Internet Explorer, Safari**, etc.
- Type www.openstreetmap.org in the address bar at the top of the window and press Enter.
- When the page has finished loading, you should see the page below:

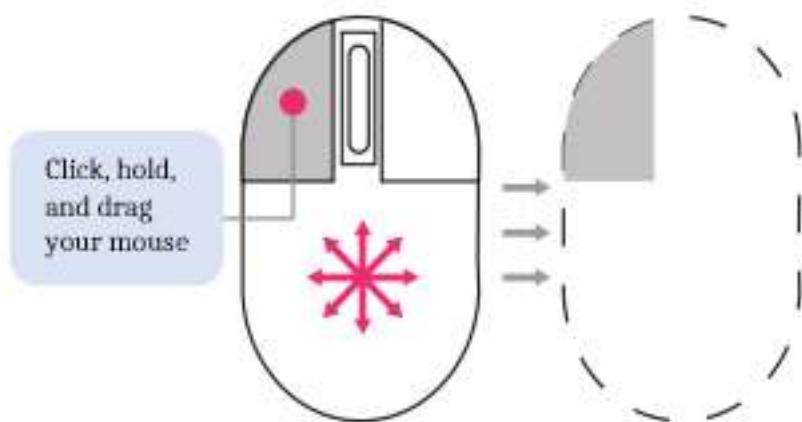


OpenStreetMap website (openstreetmap.org)

II. Navigate the map

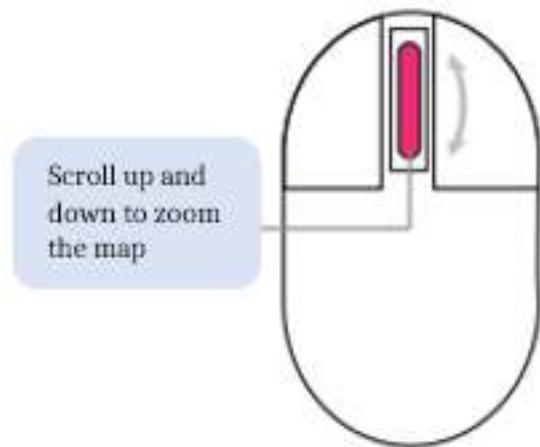
In the main view of the OpenStreetMap website, you will see a large map in it. You must be able to navigate the map so you can go to a location that you want. Here are the ways to navigate the map on OpenStreetMap:

- Use the left mouse to drag the map view. Left-click on your mouse, then hold and drag the map to the location that you want. If you don't have a mouse, you can press and hold the right touchpad and then move the cursor.



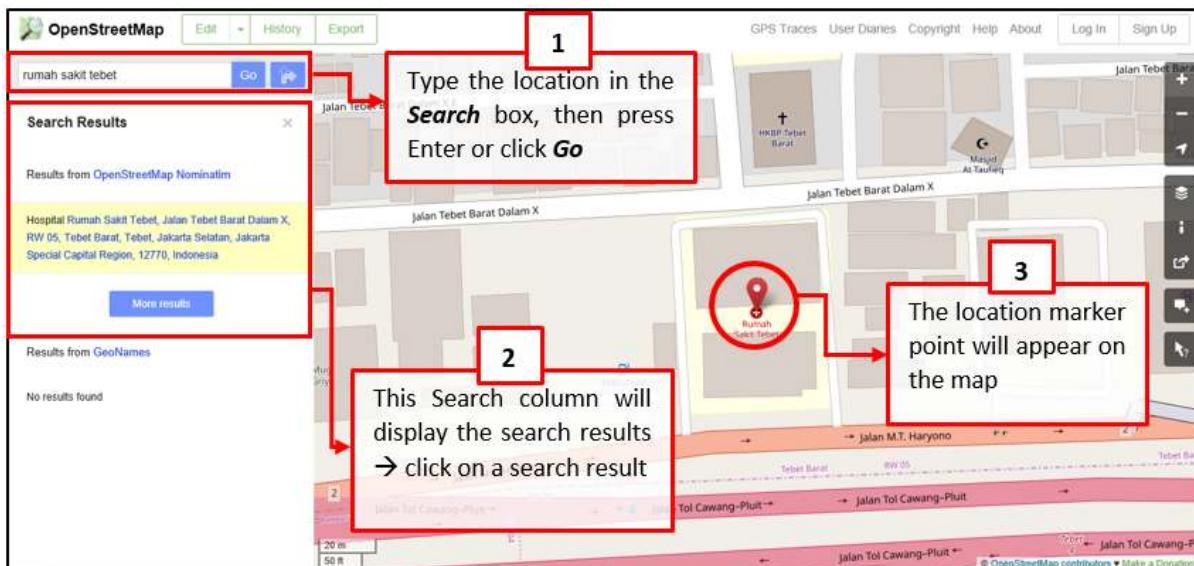
How to drag the map view

- Use (+) and (-) button in the upper right corner of the map to zoom in and zoom out the map view. You also can use your mouse scroll-wheel to zoom your map. Scroll your mouse up to zoom in, while scroll down to zoom out.



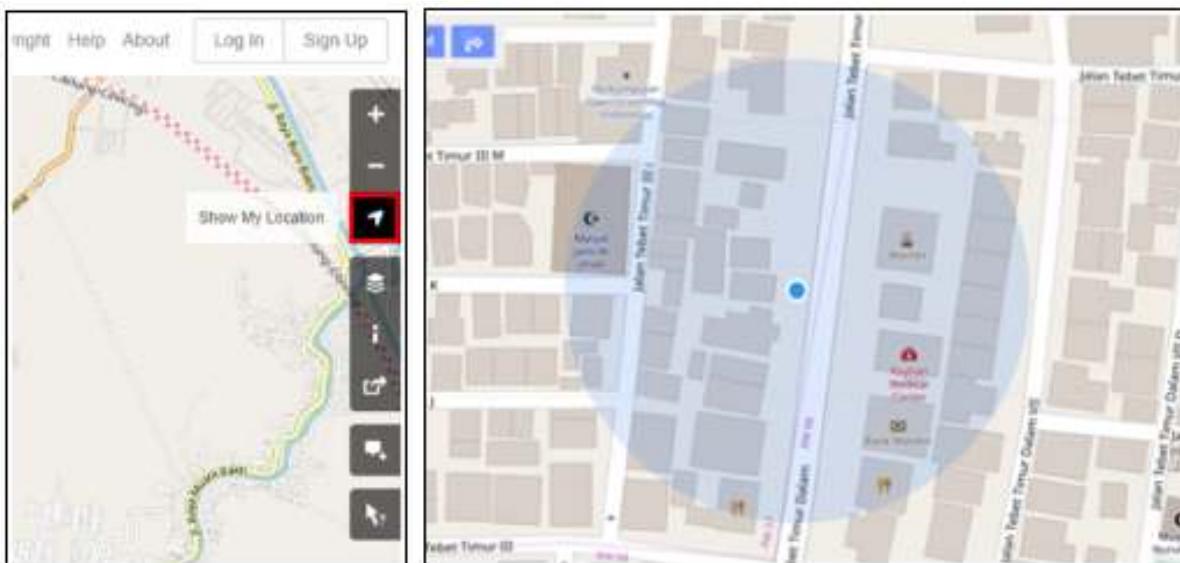
How to zoom in and out the map view

- To search the location based on the name, type the location name on the **Search** box in the upper left side on the screen. You can type it in the search column, then press **Enter** or click **Go**. After that a **Search Results** box will appear below the search column, then you can choose and click on the search. The map will automatically move to the location you chose.



Steps to find location using Search box

- To display your current location, you can go to the map panel to the right of the map and click **Show My Location** button. Then, the map will automatically display your current location point (blue dot). Make sure to enable the GPS on your laptop or computer to allow OSM to get your current location.



The display of Show My Location feature

III. Change different style options for the map

OpenStreetMap contains geographic data from all over the world. Although stored in one database, the data can be displayed in several styles. The steps to change style map in OSM are as follows:

- Click **Layers** button in the right panel on the map.



The Layers button to change background layer

OSM has four types of layers with different functions, namely:

- *Standard*: This layer shows all the objects on the OSM map.



Standard Layer

- *Cycle Map* : This layer emphasizes cycling routes and pedestrian roads.



Cycle Map layer

- **Transport Map:** This layer emphasizes transportation routes on the map such as highways and bus stop.



Transport Map Layer

- **Humanitarian:** This layer emphasizes important objects or amenities on the map such as school, hospital, etc.

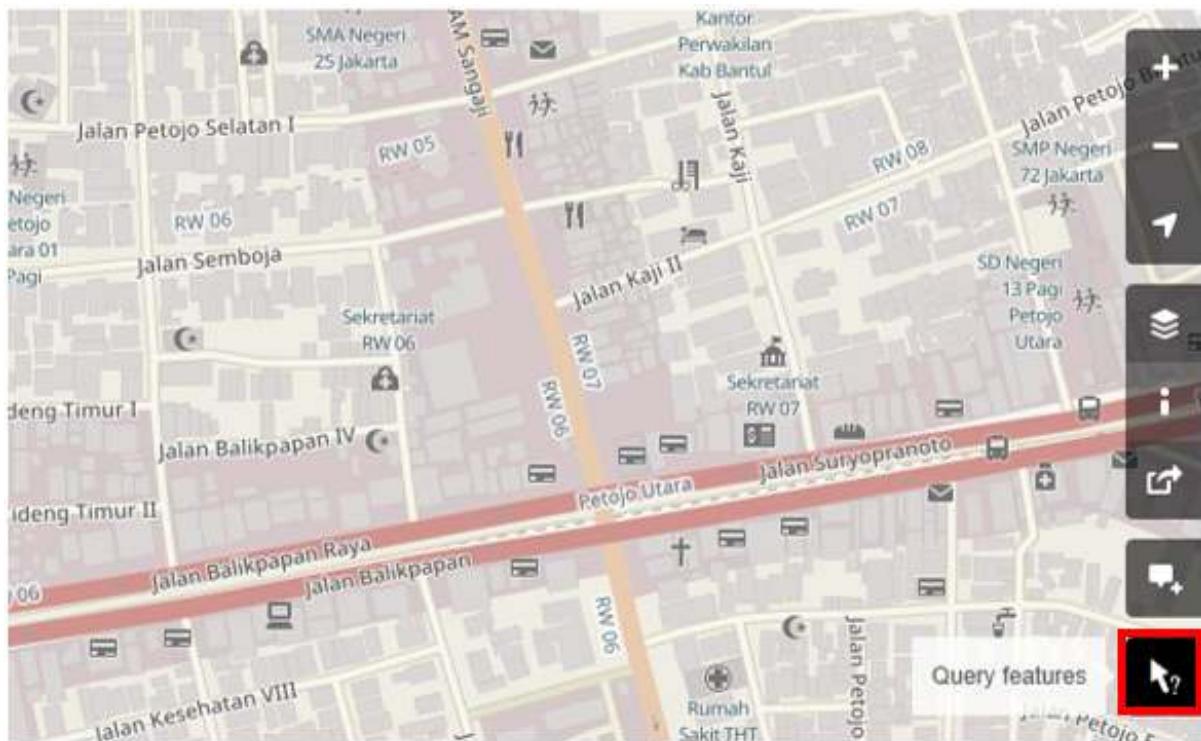


Humanitarian Layer

IV. See the object information in OpenStreetMap

In the OpenStreetMap page, besides see the current location and navigate the map, you also can see the feature information using Query Features. The steps to use Query Features are below:

- Click on **Query Features** button on the panel in the right. After you clicked it, you should see the question mark on your cursor. This indicates that the query features function is activated.



Query Features button

- Now you can choose an object or location that you want to identify. For this example, we click on a governmental office building (Dinas Kesehatan) in Jakarta.
- You should see a box appears in left corner that displays **Nearby Features** and **Enclosing Features** options. Nearby Features shows the description of any object that is closest to the location of your chosen point, while Enclosing features shows all the object information that have a close range location with your chosen point. Try to click one feature in the Nearby Features, click **Governmental office Dinas Kesehatan** for this example.

OpenStreetMap

Search Where am I? Go Export

GPS Traces User Diaries Copyright Help About Log In Sign Up

Query Features

Nearby features

Government office #494063985

Enclosing features

Governmental Office Dinas Kesehatan

Village Boundary RW 06

Administrative Boundary Petojo Selatan

County Boundary Gambir

Political Jakarta Pusat

State Boundary Jakarta Special Capital Region

Region Jawa

10 m
30 ft

© OpenStreetMap contributors. Tiles style by Humanitarian OpenStreetMap Team hosted by OpenStreetMap France

Nearby features dan Enclosing features in Query Features

- After you clicked it, the information detail about Dinas Kesehatan building will appear in the left box. The information displayed is a tag or object attribute regarding general information objects such as object names, addresses, building levels, and others.

Way: 494063985

#otosm-project-2751 #missingmaps
#PDCJakarta

Edited over 1 year ago by Akrimullah
Version #4 - Changeset #49684541

Tags

| | |
|--------------------|------------------------|
| addr.city | DKI Jakarta |
| addr.full | Jalan kesehatan No. 10 |
| backup_generator | yes |
| building | government_office |
| building:condition | good |
| building:floor | ceramics |
| building:levels | 8 |
| building:roof | concrete |
| building:structure | confined_masonry |
| building:walls | glass |

© OpenStreetMap contributors. Tiles style by Humanitarian OpenStreetMap Team hosted by OpenStreetMap France

Query Features result

V. Share with link in OpenStreetMap

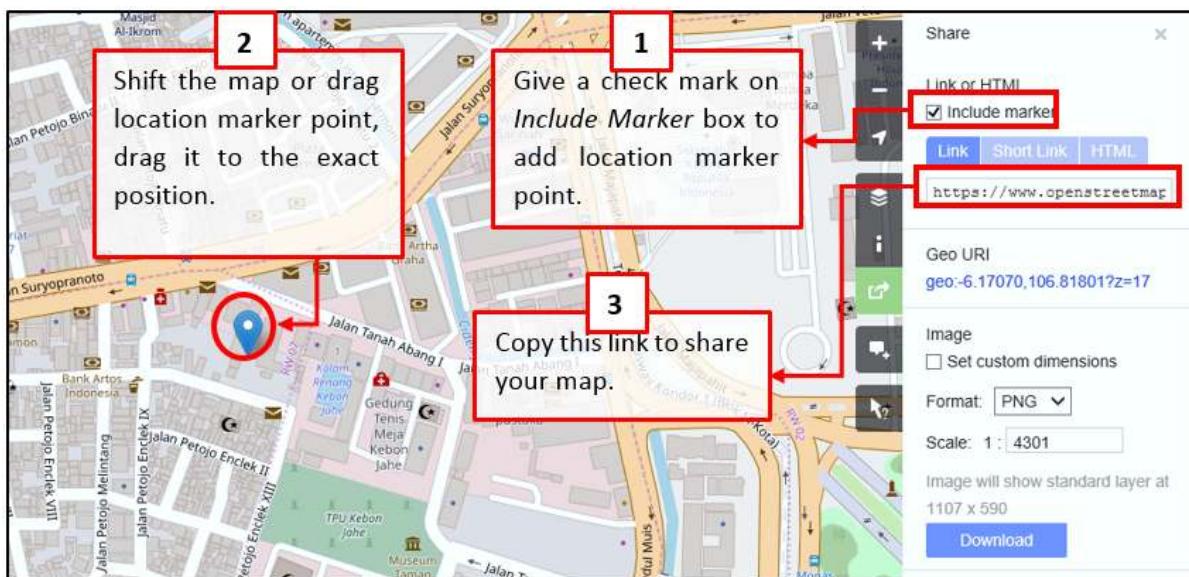
You can share links of your OpenStreetMap maps to others for various purposes, such as sharing the location of your current position with your colleagues and so on. To be able to share OpenStreetMap maps, the steps are as follows:

- Click the **Share** button on the right panel, then the Share column will appear.
- Check the **Include marker** to add the location marker point. You can move or drag the marker point to the desired location. Just click and hold the location marker then you drag to the desired location point. Another way is to shift the map so that the location marker is in the position you want.



Add marker point

- Once the marker position has fixed, you can copy the link in the **Link** box and share the link according to your needs. You can also copy a shorter version of the link in the **Short Link** box or copy the HTML code in the **HTML** box.

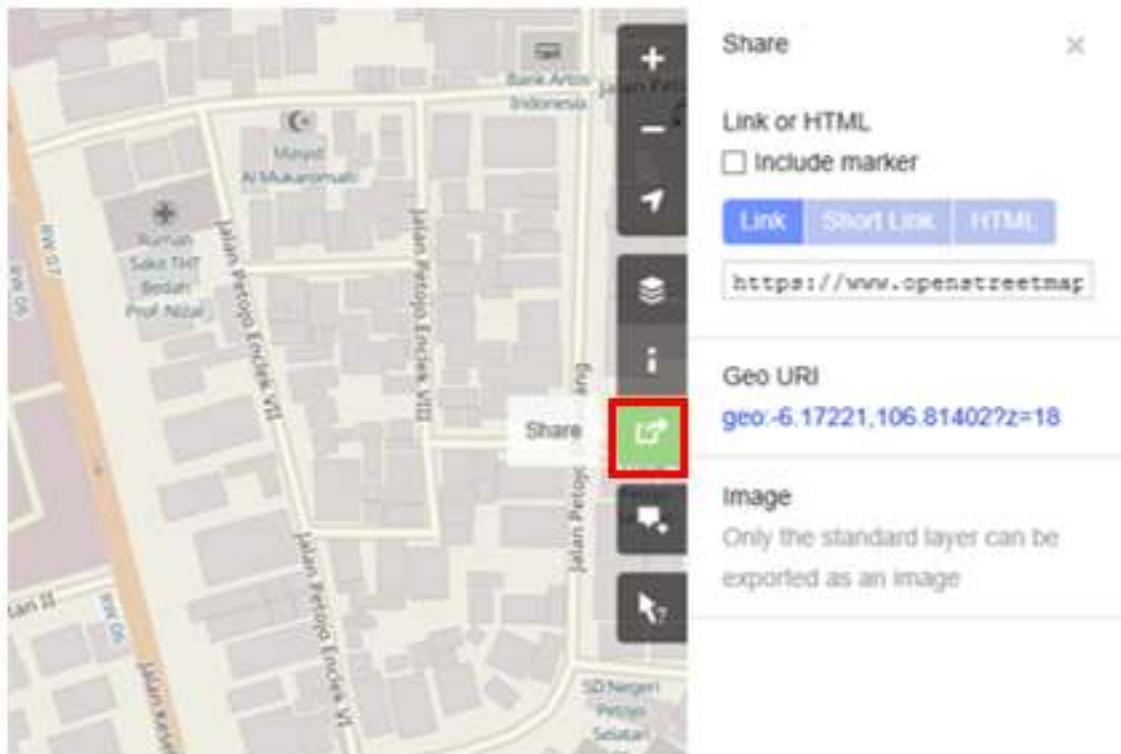


Share the link of the map in OpenStreetMap

VI. Export map as an image

Besides changing the layer map, you also can export the map as an image and choose the various format file such as .png, .jpg, .svg, and .pdf. The steps to export the map are as follows:

- Click on the **Share** icon in the right of your map. Then the Share column will appear on the right side of your screen.



Share button to export the map

- After that, specify the area on the map that you want to export as an image. Give a check mark on the **Set custom dimensions** box in the **Image** section, then adjust the size of the box or adjust the scale in the **Scale** section.

Note : You can only export map as image if you set the Standard Layer view. If your map does not use the Standard Layer, you need to change it first on the Layers menu.

- You can choose the format of the export image in the **Format** dropdown menu. After that, click **Download** button to download the image and save the image to your folder location.

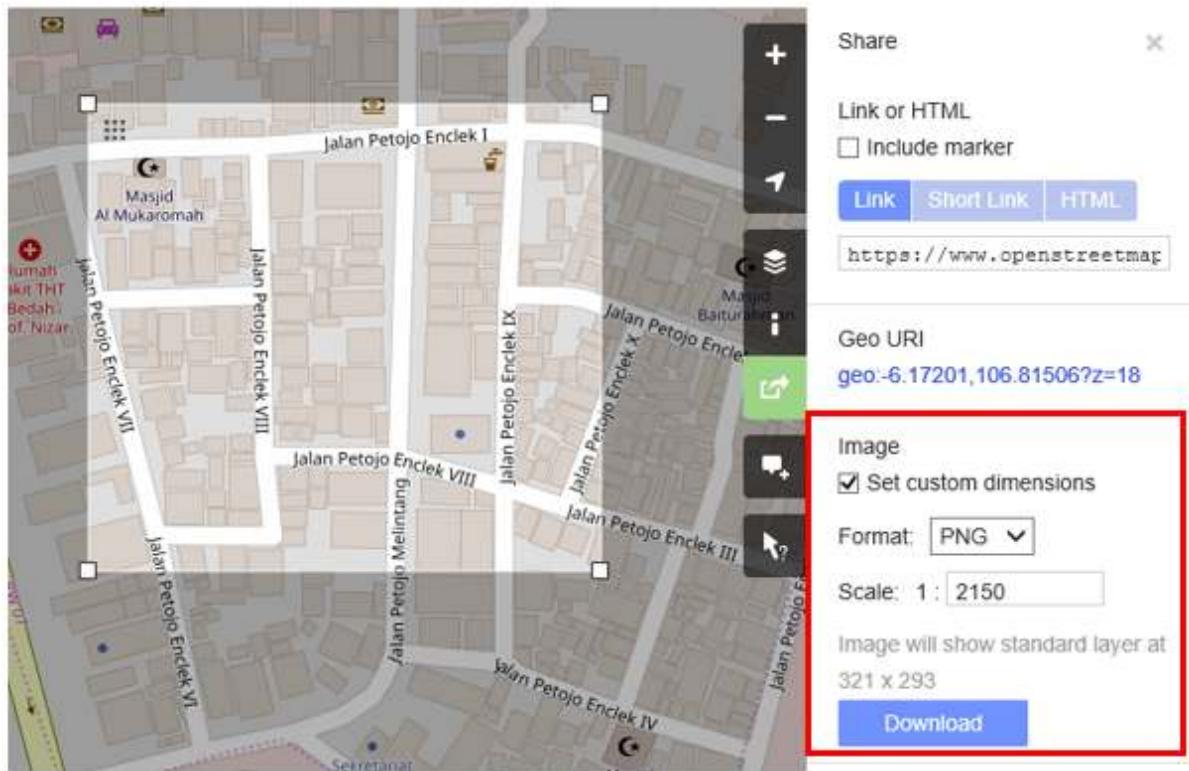
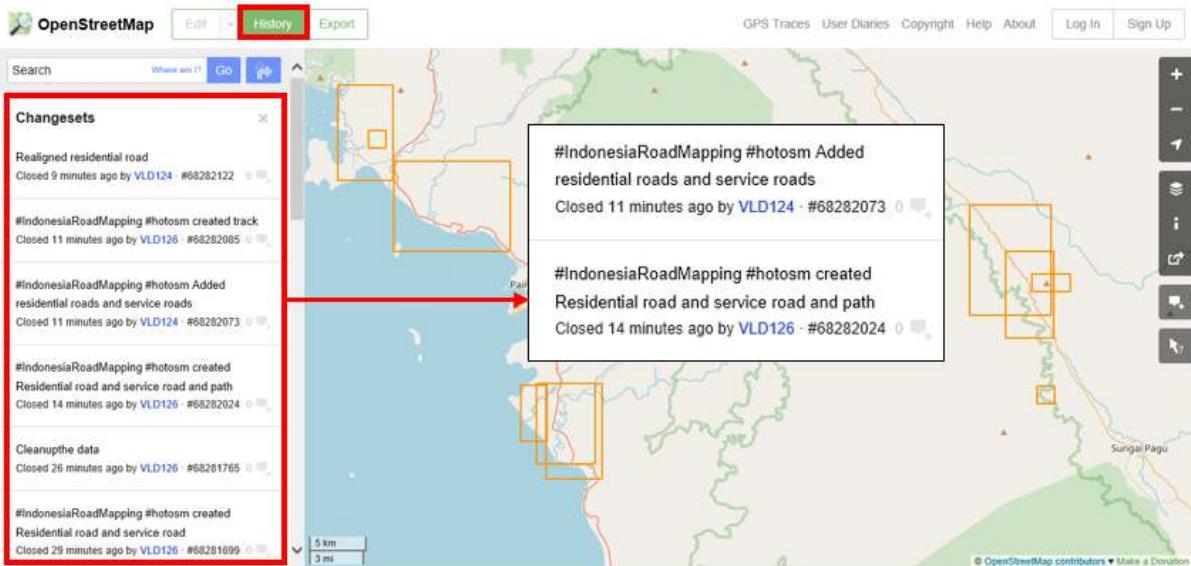


Image section to export the map

VII. See the editing history in OpenStreetMap

When you edit objects or make changes to OpenStreetMap, you can see the editing history of objects in that area. The steps to see editing history are as follows:

- You can see the information by clicking on the **History** menu button on the top left of the map.
- After that, the **Changesets** column will appear at the bottom of the Search box and orange boxes will appear on the map that indicates which areas have just been edited. Changeset is a version of every change uploaded by OSM users. The information that we can see in the Changesets column is as follows:
 1. Changeset comment. It is recommended that you write the short comment when uploading changes or changeset. Comments can contain information about any changes that you made or specific hashtags.
 2. Upload time information.
 3. OSM username.
 4. Changeset number. This number is a unique number as the changeset identity.



Changeset history in OpenStreetMap

- You can click one of the changeset on the changeset list or you can immediately select the orange box on the map. After you select one of the changeset, you will get details about the changeset.

Changeset: 68284024

#IndonesiaRoadMapping #otosm created residential road and unclassified road
Closed about 3 hours ago by VLD126

Tags

| | |
|--------------|--|
| created_by | ID 2.3.0 |
| imagery_used | DigitalGlobe Premium Imagery; OpenStreetMap GPS traces |
| locale | en-US |

Discussion
Log in to join the discussion

Ways (1-20 of 42)

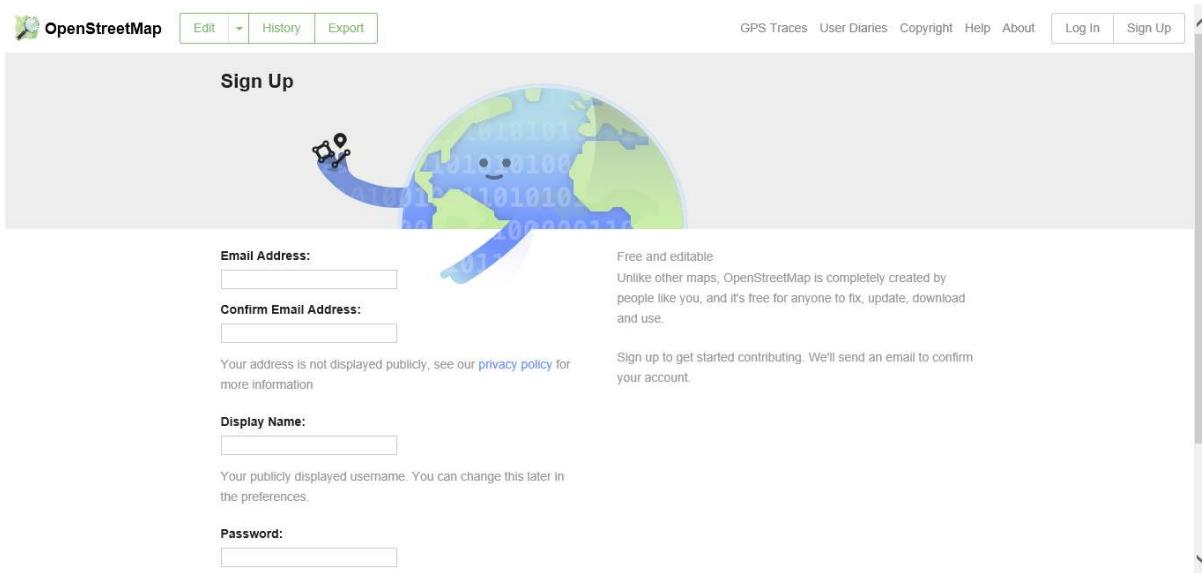
- Jalan Raya Air Haji - Painan (637842235, v3)
 - 677819421, v1
 - 677819420, v1
 - 677819419, v1

The changeset details

VIII. Create an OpenStreetMap Account

You have seen the display and main menus from the OpenStreetMap website, now you will learn how to create an account at OpenStreetMap and make the first contribution on OpenStreetMap. The steps are:

- Click **Sign Up** on the OpenStreetMap page. You should see a new page that look like this:

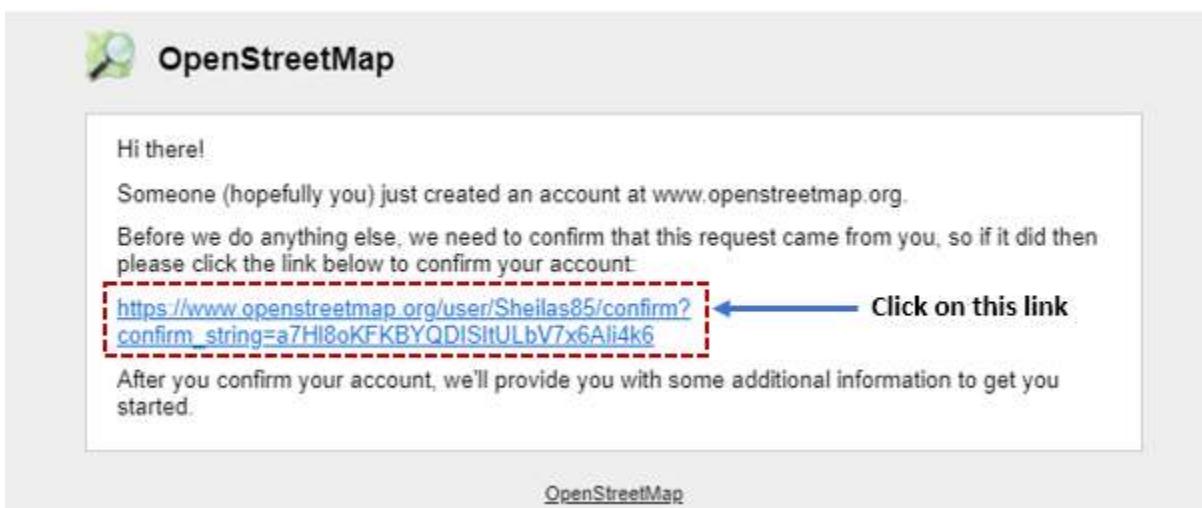


Sign up page

- There are five boxes on this page that you need to fill in to register an account with OSM. Firstly, enter your **email address** in the first two boxes. You should enter the same email address in both boxes. Later, you will need to open your email to confirm your account with OpenStreetMap.
- In the third box, enter the username that you would like to have. If you try to use a simple name, it is likely that someone has already claimed the name. You will not be able to choose a username that someone else has chosen before, so pick the available name for your username.
- Enter a new password in the fourth and fifth boxes. You should enter the same password in both boxes and the password. You should not use an important one such as the password for your email. After you have completed all the boxes, click **Sign Up** at the bottom of the page.

At this stage, you have successfully registered yourself on the OpenStreetMap site, but your account is still not active yet. To activate it, the steps that must be taken are as follows:

- Open the new tab on your browser and open your email.
- If everything was successful with your registration, you should see an email from OpenStreetMap in your inbox.
- Open the email. Click on the link that is identified below:



Notification of OSM registered account

- After that, a new tab of OSM page will appear in your browser. If everything went well, congratulations you already have an OSM account!

Note : If a problem occurs, a problem message will appear. Make sure that the email you entered is the same as in the first two boxes and your password. If the box for the user name is red then someone else has already used the name and you have to look for another name.

- On the OpenStreetMap page, click **Log In** in the upper right corner. Enter your OpenStreetMap username and password then press **Enter**. You should now be logged in and you will see your username on the top right of the OpenStreetMap site.

Congratulations! If you have done all the steps in this section, you already have an OpenStreetMap account and already know how to navigate the OpenStreetMap website.

IX. The basic concept of OpenStreetMap attribute

1. The attribute concept on object

When you draw an object as a point, line, or polygon in OSM, you still need to add information about the object such as object name, address, or other supporting information. This information will help other users when using OSM data for various purposes. Information provided by users on OSM objects is called an **attribute** or **tag**.

An attribute/tag is like a label that you can place on an object. For example, if you draw a square, this is only a square without any object information. But you can add attributes to describe that object, for example you draw a square that is a building; the name of the building is "Tebet Hospital"; 10 level building.

2. Components in OpenStreetMap attribute data

You can add as many attributes / tags as you want to an object. Attributes are stored as a pair of text, named **Key** and **Value**. **Key** is general information that explains the function of an object. In one key, it can consist of many values. For example schools, mosques, and hospitals have key=amenities (important facilities). Although the three objects have different types of functions, but all three objects have the same key. Whereas **Value** is information that more specifically explains the type of an object. Because this value describes specific information about an object, so that one type of value can only describe the type of the object itself. Not the same as a key that can explain general information about the object. In OpenStreetMap, an attribute is added by formatting a key-value pair that represents physical features on the ground, for example:

The screenshot shows a table interface for managing object attributes. At the top, there are buttons for 'Tags: 4 / Memberships: 0' and zoom controls. The table has two columns: 'Key' and 'Value'. The rows contain the following data:

| Key | Value |
|-----------------|-------------------|
| amenity | hospital |
| building | yes |
| building:levels | 10 |
| name | Rumah Sakit Tebet |

At the bottom, there are buttons for 'Add', 'Edit', and 'Delete'.

The example of object attributes

In the example above, there are four kinds of key & value attributes, including object amenities for hospital (amenity = hospital), building objects (building = yes), building level 10 (building:levels = 10) and object name 'Tebet Hospital' (name = Tebet Hospital).

3. World and Indonesian OpenStreetMap tagging guidelines

For providing information on the object that you mapped, you need to ensure that the information is correct and suitable with OpenStreetMap rules. You need to make sure the reference is cor-

rect if you want to describe features by tag. OpenStreetMap has provided a special Wikipedia page that you can refer to. You can see the page on the Map Features Wiki page at https://wiki.openstreetmap.org/wiki/Map_Features.

| Name | Template | Description |
|-----------|-------------------------------------|-----------------------------|
| 3D | {{Template:Map_Features:3D}} | The basic version (generic) |
| Aerialway | {{Template:Map_Features:aerialway}} | The basic version (generic) |

Main page of Wiki Map Features and list of feature table

Pages from Map Features that contain information about objects in OpenStreetMap are considered not enough to help especially for specific objects that usually only exist in a certain country, including Indonesia. Sometimes users do not get enough information about the object tag and they end up skipping the object because of different names.

Usually objects in Indonesia have their own local names such as Posyandu (health service for children and infants), Pesantren (Islamic boarding school), and others. You do not need to be confused in searching for and memorizing attribute lists because you can see a list of object attributes that you can see on the Wikipedia page https://wiki.openstreetmap.org/wiki/Id:Indonesian_Tagging_Guidelines

Indonesia Wiki OSM Tagging Guideline

The Wikipedia page was specifically created to provide references to OSM objects attributes in Indonesia. On that page, the objects will be divided into several categories which will be adapted

from the objects in Indonesia.

OBJEK TITIK DAN POLIGON (BANGUNAN)

Dafar objek di bawah ini merupakan jenis objek yang dapat digambarkan sebagai titik ataupun bangunan. Untuk objek yang hanya digambarkan sebagai bangunan adalah yang hanya memiliki simbol [] dan objek yang hanya digambarkan sebagai titik/point adalah objek yang memiliki simbol [•]. Adapun penggambaran objek yang dapat digambarkan sebagai objek atau titik adalah objek yang memiliki simbol [•] dan []. Sebaiknya objek ini digambarkan sebagai bangunan jika terlihat jelas building footprint objek tersebut di citra satelit akan tetapi jika memang objek tersebut tidak terlihat jelas di citra satelit maka kita dapat mendandani objek tersebut sebagai titik saja.

Pendidikan

Ini merupakan objek-objek yang memberikan fasilitas pelayanan pendidikan khususnya pendidikan formal seperti sekolah. Berikut adalah objek-objek di Indonesia yang terkait dengan pendidikan:

| No. | Nama Objek | Jenis Objek | Deskripsi | Key | Value | Simbol di OSM | Foto Contoh |
|-----|--|-------------|---|--------------------------------|-------------------|---------------|-------------|
| 1. | PAUD | [•] [] | Tempat bermain dan belajar untuk anak di bawah usia lima tahun (belita) | amenity | kindergarten | | |
| 2. | Taman Kanak-Kanak | [•] [] | Tempat pendidikan untuk anak usia dini (5-6 tahun) | amenity | kindergarten | | |
| 3. | Sekolah Dasar (SD) / Madrasah Ibtidaiyah (MI) | [•] [] | Tempat pendidikan dasar. Biasanya ditempuh selama 6 tahun. | • amenity • school_type_idn | • school • sd | | |
| 4. | Sekolah Menengah Pertama (SMP) / Madrasah Tsanawiyah (MTs) | [•] [] | Tempat pendidikan lanjutan setelah SD. Lama pendidikan selama 3 tahun | • amenity • school_type_idn | • school • smp | | |
| 5. | Sekolah Menengah Atas (SMA) / Madrasah Aliyah (MA) | [•] [] | Tempat pendidikan lanjutan setelah SMP. Lama pendidikan selama 3 tahun | • amenity • school_type_idn | • school • ama | | |

List of Indonesia object attributes

SUMMARY

If you can follow and practice all the sections in this chapter, then you have succeeded in creating an OSM account, operating and navigating the OpenStreetMap website. In addition, you have also successfully shared OSM map images and shared links to other people. In the next chapter you will learn how to use Java OpenStreetMap (JOSM).

3.1 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 - About OpenStreetMap

Watch

- Two Minute Tutorial - What is OpenStreetMap?

3.2 Organized OSM Editing

Before starting any mapping project, it is important to assess, and if necessary, update the Open-StreetMap basemap through remote mapping. This remote mapping process helps ensure that the buildings and roads used during a field mapping phase are up to date, improving the quality and effectiveness of field mapping efforts. For example, using remote mapping, your team can identify buildings or entire villages that might have been missed otherwise.

While the anticipated project workflow influences the area to be remotely mapped, it is important to note that the budget and time available may place restrictions on what is feasible to be digitized. In this way, remote mapping can also influence the workflow, making the remote mapping plan an important part of the planning process.

No matter the scope of your project you will need to determine:

- Who will be digitizing for your project?
- How will you manage your organized OSM editing efforts?
- Do Organized Editing Guidelines requirements apply to you?

Sourcing your remote mappers

Remote mapping takes time and effort. This process can take several different forms ranging from being quickly completed with a few volunteer mappers for a small area to an organized, paid team working for several months to complete a region. The resources and time needed to map your area of interest depends on:

- **Size of your area of interest:** Are you mapping one city or an entire district?
- **Timeline:** Does the area need to be mapped in a few weeks? Months?
- **Resources needed:** Does your project have budget to pay digitizers and validators?
- **Quality:** What are your resources for ensuring that the mapped data is high quality? Does the data need to be immediately high quality, or is there room for new mappers to make mistakes?
- **Features and attributes:** Does your project require only buildings to be mapped? Roads? Will any features (such as roof:material) be added by remote mappers?

Sourcing Options

The following a few recommendations on how to organize and source your mappers based on our best experiences.

- **Global HOT/OSM Community:** The global community is a wonderful and FREE source of remote mappers. As of September 2019, 180,000 volunteers from around the world have mapped over 2 million tasks on HOT's Tasking Manager to support mapping efforts around the world.
 - **Size of AOI:** With a large pool of individuals to choose from, the global community can cover any size of digitization efforts, from a neighborhood to entire countries.
 - **Timeline:** While the global community is known for its rapid response in the wake of disasters and immediate humanitarian needs, other types of projects should not rely on the community to map areas within a controlled timeframe. Relying on the global community to map a district in Liberia, could take a week or several months depending on interest in the project and other urgent mapping needs.
 - **Quality:** The disadvantage of using the global community for remote mapping efforts is that it can be more difficult to control the quality of data being immediately mapped. While all remote mapping should be validated, the wide range of skills and experience (as well as understanding of the project needs) could mean that additional efforts will be required to review and fix any mistakes made by remote mappers.
 - **Resources needed:** As already stated, using the global community for mapping has the great advantage of being completely free!

- *Features and attributes:* Tasks best suited for the larger community are those that are simplest. Additional instructions beyond tracing buildings is feasible, but extra checks will be necessary for coverage as some mappers may miss detailed instructions.
- **Dedicated team of digitizers (5+ people):** Some projects may find that the best way to meet the needs of their project is to hire a small team of dedicated digitizers to systematically map an area. Typically this dedicated team works together in-person, which allows for consistent training and quality assurance. However, it is possible to use a paid team of mappers working remotely if mappers are experienced and do not require extensive training. We do recommend that when looking to hire a team of mappers that you reach out to the local OSM community with these opportunities.
 - *Size of AOI:* Like the global community, digitization teams can cover any amount of area with enough time. As team members are dedicated to the mapping task, digitization teams can handle larger areas over a shorter period than the global community.
 - *Timeline:* For meeting tight deadlines, a dedicated team of digitizers can be the best option as it ensures that the mapping task can be effectively planned and executed. Meeting that timeline does depend on the number of digitizers hired and their experience. HOT has found that newly trained teams of digitizers can map 500-1000 buildings a day depending on the imagery quality and density of mapping.
 - *Quality:* Having a dedicated and paid team means that it's easier to train and manage the data quality of the mapping efforts.
 - *Resources needed:* Budget for paying digitizers is required. Also recommended is providing a dedicated workspace and consistent internet connection, as well as laptops where needed if working with mappers on location.
 - *Features and attributes:* By working directly with individuals, you can ensure that all special features and attributes your remote mapping campaign requires are consistently added. Having local context (such as recognizing roof material) is also extremely helpful for adding unique features and attributes.
- **Mixed approach: paid digitizers and global community:** When there are timelines in place but the scope of the work is too large for your team, one option is to have a mix of paid digitizers and the global community.
 - *Size of AOI:* If you have a small team, combining efforts with the global community can help you achieve a much larger area.
 - *Timeline:* By including some paid digitizers, this method can help keep the project in development while relying on the global community.
 - *Quality:* Additionally, by including paid digitizers, your team can choose to focus on validating the efforts of the global community and increase the consistency of quality mapping edits.
 - *Resources needed:* Smaller budget than a full team, but will still likely need to provide a dedicated workspace and consistent internet connection.
 - *Features and attributes:* If there are unique features and attributes that rely on local context, you can rely on the global community to develop the basemap and then your paid team can add those features later. Or, you can use your small team to validate the special features and attributes added by the global community.
- **Hosting Mapathons:** Another option that blends utilizing volunteers with some of the benefits of a dedicated team is hosting a series of Mapathons. These mapathons typically bring together groups of volunteers (ranging from university students to corporate volunteer events) to map a task together in person.
 - *Size of AOI:* The amount of area that can be covered depends on the number of people attending the mapathons, the number of mapathons hosted, and the skill level of volunteers. In general, this option is only recommended for smaller areas.
 - *Timeline:* This option can be faster than relying solely on the global community, but slower than having a dedicated team of volunteers. Again, the speed of mapping depends on the skill level of the mappers, frequency and number of events, if the same mappers attend each event, and how much training will be required.
 - *Quality:* Since mapathons generally bring new or inexperienced mappers together, ma-

pathons have the possibility of requiring more effort on the validation side of mapping. However, if the same attendees regularly participate, this data quality will increase.

- *Resources needed:* Smaller budget than a dedicated in-person team, but event space, internet, and refreshments will need to be covered.
- *Features and attributes:* If your mapping project requires unique features and attributes, mapathons allow for better training and management of volunteers adding that information. However, similar to data quality, this will still require a heavier lift in validation than using a dedicated team.

Whenever possible, we recommend sourcing local mappers to be part of the digitization efforts. And remember, it is critical that no matter what plan you choose, that it includes a validation and quality control plan!

Managing your digitization efforts

Once you decide how you will source your team of mappers (paid or unpaid, local or remote), you will need to set up a plan and gather resources. Here's a checklist of some questions to consider:

- **What will be your team structure?** We recommend having one dedicated validator for every five digitizers.
- **Have you trained validators?** Our training materials for validators are available [here].
- **How will you track the progress of your mapping?** When setting up a large number of mapping tasks, it helps to set up a tracker to monitor the progress of all tasks. [insert example & blank task tracking]

Organised Editing Compliance Procedures

The OSM Foundation has set up Organised Editing Guidelines for documenting organized editing efforts. While it is not a requirement or policy, HOT highly encourages all groups to comply with these procedures when applicable. For simplicity and ease of understanding these guidelines, HOT has developed the following guide, however, HOT does not take responsibility for compliance.

HOT's suggested procedures for complying with the Organised Editing Guidelines (OEG) - as of June 2019 [1]

Purpose

What problem(s) does the OEG aim to address, and how can we best comply with, and address, these concerns?

- **Transparency** - the OEG attempts to make it easier for local mappers to know what organizations are editing in their area.
- **Communication** - the OEG attempts to make it easier for local mappers to communicate with organized editors and editing teams.
- **Conflict Resolution** - the OEG attempts to provide a basis for coordinating, as well as a mechanism for local communities to form a complaint against an organized editing activity.

Documentation

- The official OEG can be found here: https://osmfoundation.org/wiki/Organised_Editing_Guidelines
- The official OEG Activities page here: https://wiki.openstreetmap.org/wiki/Organised_Editing/Activities
- The HOT OEG Activities page here: https://wiki.openstreetmap.org/wiki/Organised_Editing/Activities/Humanitarian_OpenStreetMap_Team

Requirements

What exactly is required by the Organized Editing Guidelines (OEG)?

1. Project Documentation on the OSM Wiki:
 - Organisation and contact info
 - description and link to organization
 - a way to contact the project manager or team
 - Project details
 - *the goal and purpose of the activity*
 - *the timeframe for the activity*
 - *any non-standard tools and data sources used, and their usage conditions*
 - *links where the community can access any non-standard tools or data sources*
 - Standard changeset comment
 - specific hashtag for tracking
 - link to related organized editing activity
 - Team information
 - the accounts of participating persons *that wish to be identified*, with any details they wish to include
 - *if participants will receive training material or written instructions, a copy of, or link to, these materials*
 1. links to organized editing organization(s) and activity(ies) on user profile
 2. sufficient training for project (i.e. local tagging schemas, etc.)
 - *if the success or performance of participants will be measured in any way, a description of the metrics used for this*
2. Project Execution and Follow-up
 - Communication with the local community
 - 2 week notice for non-emergency projects, open forum/mailing list
 - 2 working day response for community inquiries throughout project
 - Plans for a “post-event clean up” to validate edits, especially *if the activity introduces new contributors to OpenStreetMap*.
 - *After the activity has completed, or at least once a month for ongoing efforts, a description of the results.*

Does this apply to me?

[insert graphic]

Common Elements:

Common elements of projects can be jointly-documented among projects.

For HOT, most projects fall under OEG compliance, and will share the following:

- The organization and contact information
- Instructions to a certain degree, i.e. basic mapping covered with LearnOSM materials
- A somewhat standard validation process; of course be explicit about any ground truthing
- Somewhat standardized tool set(s) (i.e. TM for Remote, ODK/OMK for ground)
- Reports/descriptions/news at a central location (i.e. HOT website)

Step-by-Step Process:

1. Project Pre-launch

- Have at least a skeleton wiki/web-page ready to share with local community
 - How to edit the wiki: <https://learnosm.org/en/intermediate/editing-the-wiki/>
 - See <https://wiki.openstreetmap.org/wiki/Template:Activation> for a template/example of Activation wiki-pages
 - How to create HOT Website projects

- Local contact made a minimum of 2 weeks prior of launch; through their open mailing-list, or forum, most likely to contact the key leaders in the community
 - Look here for mailing lists: <https://lists.openstreetmap.org/listinfo>
 - Search wiki by country as they may have other communication channels listed there, and sometimes individual points of contact
 - And try <https://github.com/osmlab/osm-community-index>
 - Only if you exhaust these options is it acceptable to assume no local community
- Set-up OSM User Profiles:
 - Consider registering team on OSM with designated usernames
 1. Can still be personalized, such as JaneDoe_Validator, JohnDoe_Mapper, etc.
 - Consider also using organization email account(s)
 2. Ideally, the Project Manager or Team Lead should get, or be able to access all messaging. If a mapper leaves, but then gets messages from the community, you will want to be able to reply
- 10. All profiles should at least have a link to the OEG project page, organizations website, or (for HOT) preferably a link to the individual's profile on the website

2. Project Launch

- Ensure the project has an entry in OEG activities page
- Have the required details of your plan in a wiki-page or (for HOT) a hotosm.org website project-page
- Appoint one or two people that will handle rapid replying to all community traffic (2 business day max)
- Periodic Reports are typically handled through blog (for HOT), but can also consider posting results on wiki's, etc.

3. Project Completion

- Make sure there is a plan to finish any remaining validation and that is communicated to the local community.
 - With constant communication with the local community throughout the project, it should be fairly easy and straightforward to determine when the project will be done and the Community is back on their own, with conduits to project org(s).
 - Before closing your project out, make sure there is a final blog-post or report documenting the closure.
 - Doc/report does not need to be full report requested by a donor, as example, but generally the results: successful or not, lessons learned
 - Last, move your row in the OEG Activities table from Active to Previous
-

Resources

- Campaign Management Guide- https://docs.google.com/document/d/1xsza0vqr_KKGFFuYW_kfRM5wNvxSh4EeEWZ7EA271Kk/edit#heading=h.tcis54iaj9t4
- HOT Organised Editing Compliance Procedures [1] - <https://docs.google.com/document/d/1IrrR75Cmy92giXLa9hC>

3.3 Working with the HOT Tasking Manager

Overview

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.

For information on Managing and Creating Projects on the HOT Tasking Manager, see [Managing Projects on Tasking Manager].

Skills and Technology Needed

- Computer
- Internet connection
- OSM account
- Optional: [JOSM]

Resources

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

Training Materials * Presentation: https://docs.google.com/presentation/d/1fpNA1qVn_FzeFnktdw6y3lal8gkY3vSkolaD/edit#slide=id.g51d3d58777_0_0

Getting Started

Head to the HOT Tasking Manager website: <https://tasks.hotosm.org/>. To sign in, click on the 'login' button in the top right corner of the page.

[insert image]

Once you click on the login button a new page will open on the OpenStreetMap website with a login form. Please enter your OSM username and password.

[insert image]

If this is the first time you are logging into Tasking Manager with your OSM username and password from the device you are using, an authorisation message will appear.

[insert image]

Click 'Grant Access' so that your OSM login details will sync to the Tasking Manager. Navigate back to the Tasking Manager page and click on the 'Start Mapping' button. You will notice that your username now displays in the upper right hand corner of the page.

Finding a Project

The 'Start Mapping' button will take you to the Contribute page of the HOT Tasking Manager. This page will display a list of current mapping projects. The Grid View will display tasks as shown below:

Each task listed will describe:

1. The urgency of the task
2. The task number and project name - this will often include the location of the task, the type of humanitarian response, and the focus feature being mapped
3. Any important information e.g. type of mapper needed / experience level
4. A description of the task
5. The organization requesting the task
6. The category of the task

7. The level of experience a mapper needs to contribute
8. The percentage of the task mapped so far
9. The percentage of the task validated so far
10. The current number of active users

If you have a specific task to contribute to, you can search for it in the sidebar to the left of your screen. You can search by:

- Project name or number
- Level of mapping difficulty
- Organization
- Campaign
- Type of mapping (features being mapped)

You can also view the list of projects in Map view. You can switch between Grid view and Map view by clicking on each option. The view you are currently in will display as underlined. If you select Map view, the list of tasks will display on a map of the world. Projects are clustered together into circles which display the number of projects in that particular area.

You can zoom into an area to view a smaller breakdown of projects in a particular region.

Selecting a Project

Once you have decided which task you want to map, you can click on the task to open the project page. The task page will provide specific details on the task objective and requirements.

[insert image]

Underneath the project description you will find instructions for the task. The instructions explain which entities to map (which features e.g. buildings, roads) and provides project specific guidelines (mapping notes) to follow. The Project Specific Mapping Notes section gives detailed instructions on the imagery to use, how to trace specific features, and how to tag features.

[insert image]

Mapping features which are the focus point of the task are explained in further detail underneath the Project Specific Mapping Needs. For example, if the type of mapping of a project is buildings and roads, the following instructions might appear:

These feature specifications will describe common tags used for each main feature and provide tips for mapping that feature.

The map on the right-hand side of the task you have selected is split into squares which are colour coded dependent on the completion of the mapping in that square. The colours represent the following:

- White: a tile is 'Ready' to be mapped and needs to be completed
- Yellow: a tile has been 'Mapped'
- Grey: a tile has 'Bad Imagery'
- Green: a tile has been 'Validated'. This means that the mapping in this area has been quality checked, edited if necessary, and approved. Validators will leave comments next to a tile to show the changes they have made
- Red: a tile has been 'Invalidated'. This could be because an area was not fully mapped or multiple errors need to be corrected
- Blue: a tile is 'Locked' by another user
- Blue with dark blue outline - a tile is 'Locked by You'. You are currently mapping this tile.

Click on a white tile to begin mapping an area that is in need of mapping. When you click on a white tile the outline of the square will be highlighted in yellow and two options will appear 'Start Mapping' and 'Select Another Task'.

[insert image]

If you click, 'Select Another Task', the map will zoom in to an alternative task which needs mapping. You may notice that some tasks have comments next to them under the History section. The History section

will display comments that have been left by other users e.g. if a task has been started but still needs someone to complete. It will also show when the tile was last locked for mapping by another user.

[insert image]

When you have selected the tile that you want to map, click 'Start Mapping'. You then need to select the type of editor you will be using. Select 'JOSM' or 'iD Editor' from the dropdown list and then click 'Start Editor'.

[insert image]

Next: [Editing with iD and JOSM editors]

3.3.2 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, contrast, 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

3.4 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

3.5 Validating with JOSM

Overview

Validation is the process of checking the work of previous mappers for accuracy, consistency, completeness and anomaly. Validation is important to maintain the quality of OSM data. While light validation can be completed using iD Editor, HOT recommends that detailed validation be completed using JOSM.

Skills and Technology Needed

- Computer
- Internet connection
- OSM account
- [JOSM]

Resources

Training Materials

- Presentation [1]
-

Practice Validation

The following activity covers the process of validating bad OSM data in JOSM. This activity uses an example file that can be downloaded here [2]. **Estimated time for completion:**

Full links

1: <https://docs.google.com/presentation/d/1p2IJJluFv25qIXTE8qTzHJQW5QNbWr6sULJ7N-gjTx4/edit?usp=sharing> 2: https://drive.google.com/file/d/13QgUDeoBA7uLSUkjsK8cEFsadmjpbNg_/view?usp=sharing

3.6 Resolving conflicts in JOSM

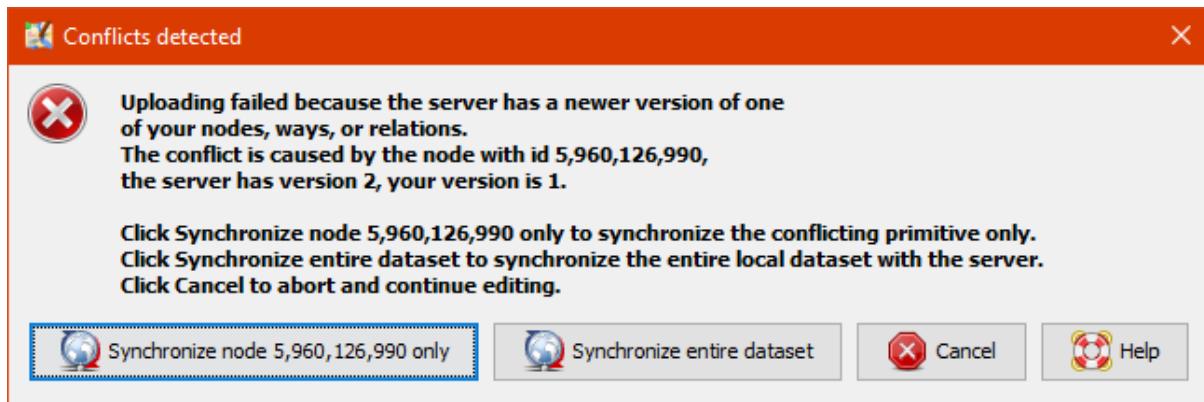
Objectives:

- Participants can explain what is data conflict on OpenStreetMap
- Participants knowing about types of conflict in JOSM
- Participants can fix data conflicts using JOSM
- Participants know to avoid data conflict in JOSM

When you are uploading your changes in JOSM, some contributors might also do editing in your area. This might occur data conflict in your uploading process. Therefore, in this module, you will learn about data conflict in OpenStreetMap, types of conflict, and how to fix it using JOSM.

I. Data Conflict on OpenStreetMap

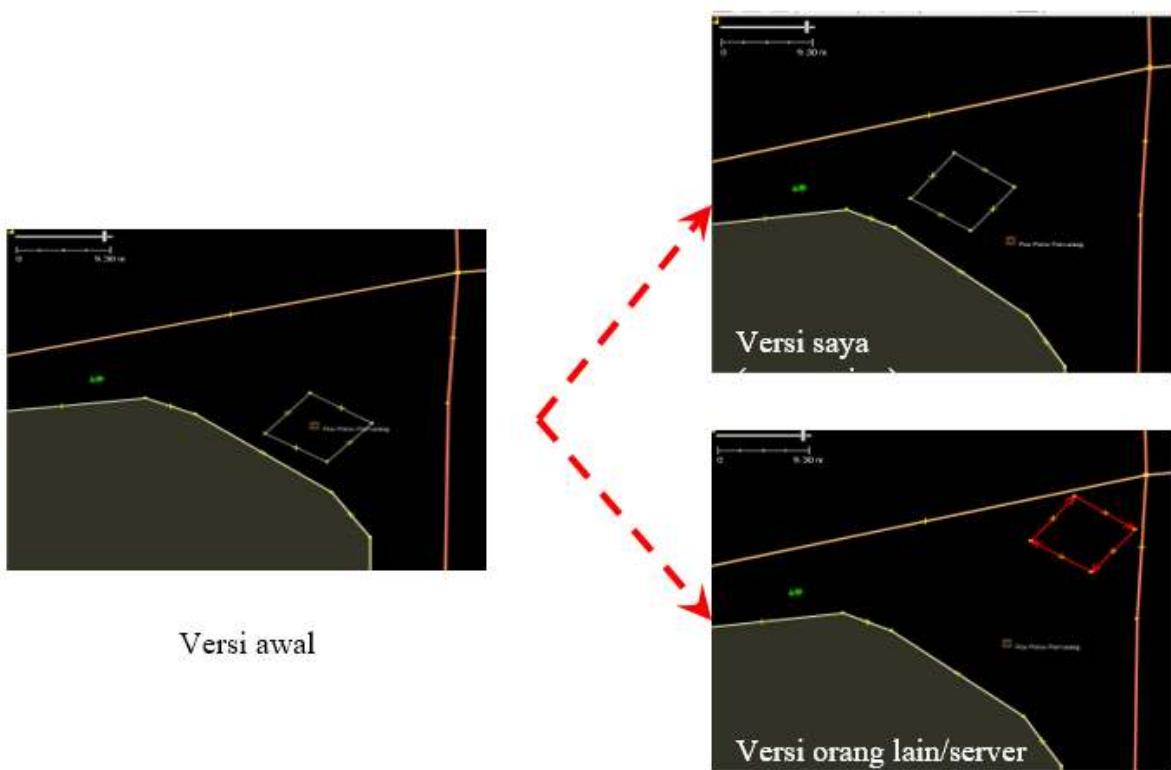
When you have edited your changes and were uploading them in JOSM (learn more about this in [Using JOSM](#) module), maybe you ever received a message like this:



Example of Conflict Detection Window in JOSM

The picture above shows data conflict in OSM. Why that could possibly happen? This conflict happens because when you edit your data in JOSM, you edit the same data/object(s) with the other contributor in the same time. Thus, the other contributor have uploaded the changes first and have received by OSM server. After that, you also want to upload the same data/object(s) with your own changes. Therefore, your changes will automatically rejected by the server because it causes confusion.

You will face with data conflict when you do changes in JOSM such as editing, adding, or delet some objects in OpenStreetMap, while the other contributor also do the same thing on the objects. The other contributor has uploaded their changes slightly before you. Therefore, when you try to upload your changes, it causes confusion for the OSM Server because it does not know which changes is correct and can be saved. If this happens, then the data conflict need to be fixed before you can continue to upload your changes into OSM server.



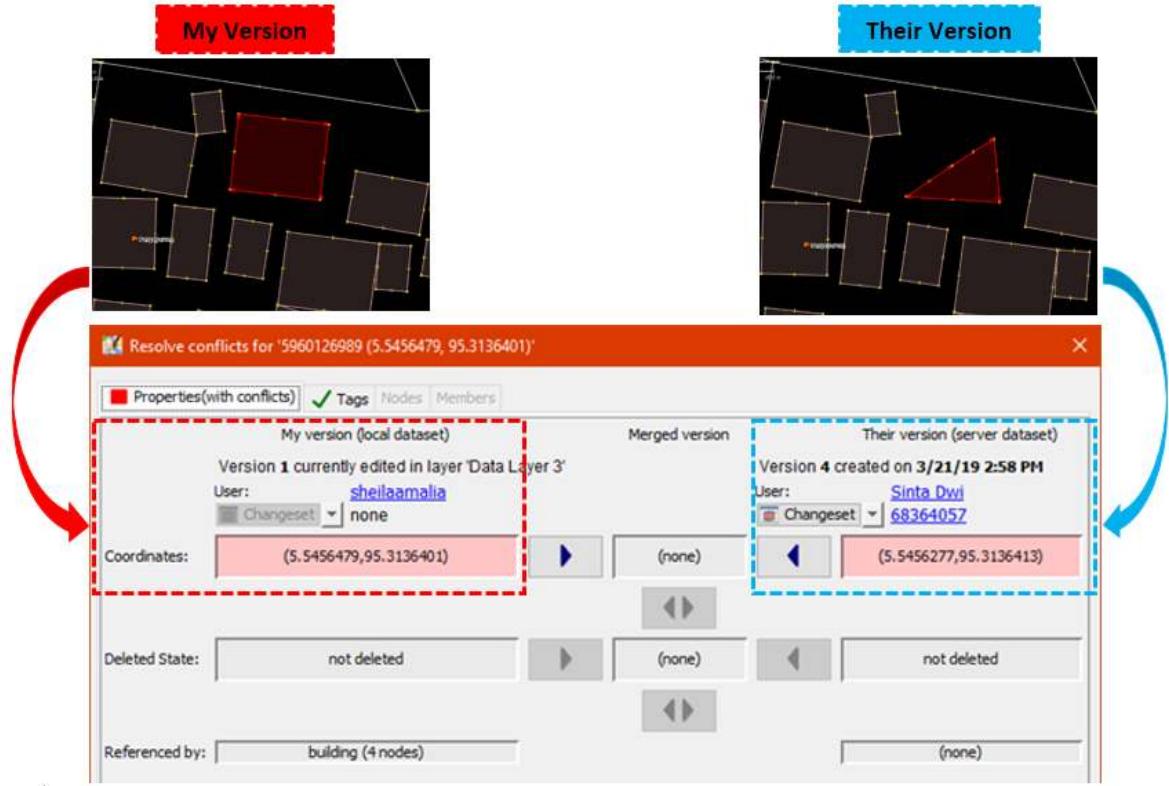
Example why conflict happens in JOSM

The picture above is example of conflict that could happen because of different position with the object between your version (my version) and version of the other contributor / have received by server (their version). To resolve this conflict, you have to choose one version between them (look chapter III. Fixing Data Conflict in JOSM).

II. Types of Data Conflict in JOSM

1. Conflict of Properties

Conflict of properties happens when an object(s) has been moved or deleted so one or more of its node has different location/position than the other version.

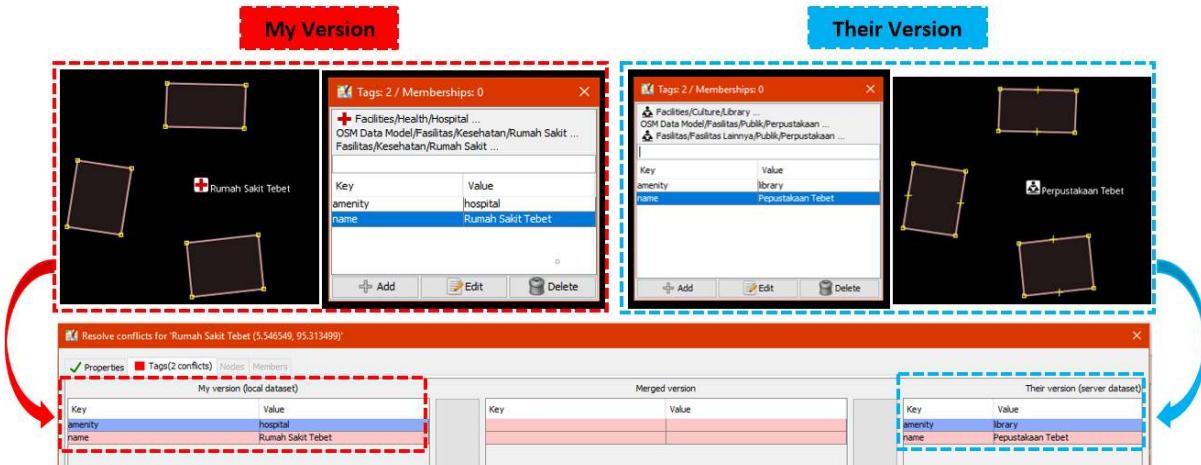


Conflict Property Window

The picture above is an example of conflict of properties in JOSM. As can be seen in the picture, in My Version the object has square shape and in the other version (their version) one of the node is deleted then change its shape become triangle. To fixed this, you need to choose which version that correct based on the location of the different nodes in both version.

2. Conflict of Tag

Conflict of tag happens because there are different information (tag) on on the object that has been edited by two or more contributors. The information could be deleted or changed on the other version.



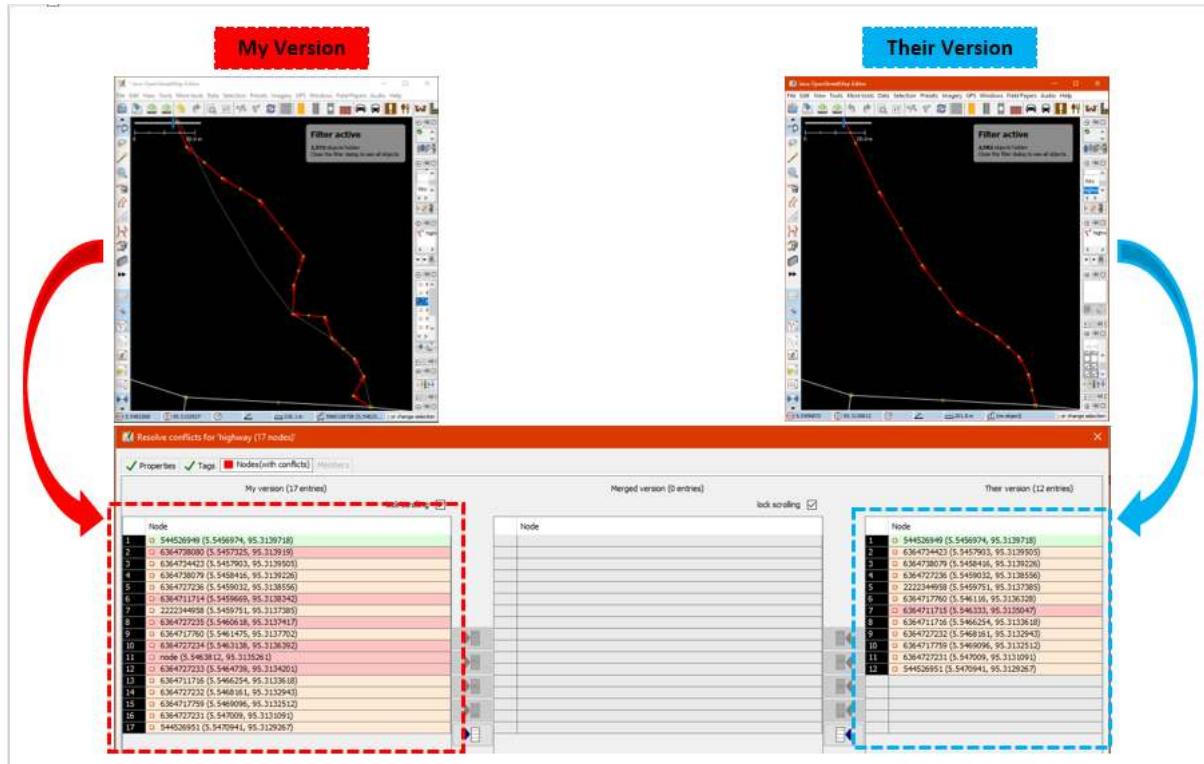
Conflict of Tag in JOSM

The picture above shows differences between two versions on the same object in JOSM. **My version** has Rumah Sakit tag (*amenity = hospital*) with its name value is Rumah Sakit Tebet Raya while the other

version (**Their version**) has tag klinik (*amenity = clinic*) with name RS Tebet Timur. You have to choose one of them that you think has correct information to fix it before upload it to the server.

3. Conflict of Node

This conflict happens when there are differences order of the nodes in a way or closedway object(s) which have been removed or moved on one of the versions and has been uploaded to the OSM server.

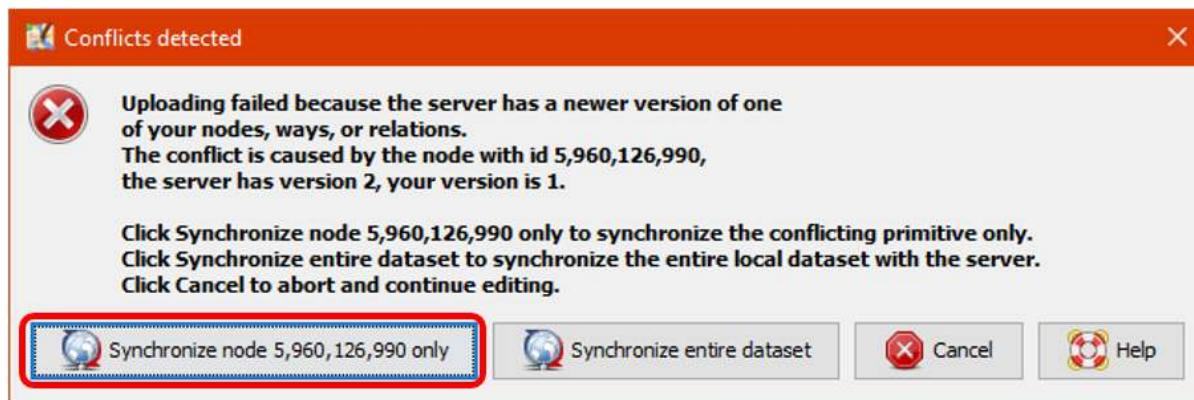


Conflict of Nodes in JOSM

III. Fix Conflict Data in JOSM

Fixing conflict data in JOSM is quite simple, even though most OSM contributors would have some confusion to do it. Generally, every data conflict fixing in JOSM asks you to choose the correct changes between your version and the other version that have uploaded to the server (their version). You have to choose whether to **keep your version** or delete your version and **use their version**. Steps to fix conflict data in JOSM as follows:

- When the conflict window appears, you might be only want to select the **Synchronize node 5,960,126 only** option. However, this option will only fix conflict in one certain nodes. Instead, you should choose **Synchronize entire dataset** option so you can resolve all conflict nodes in one time.



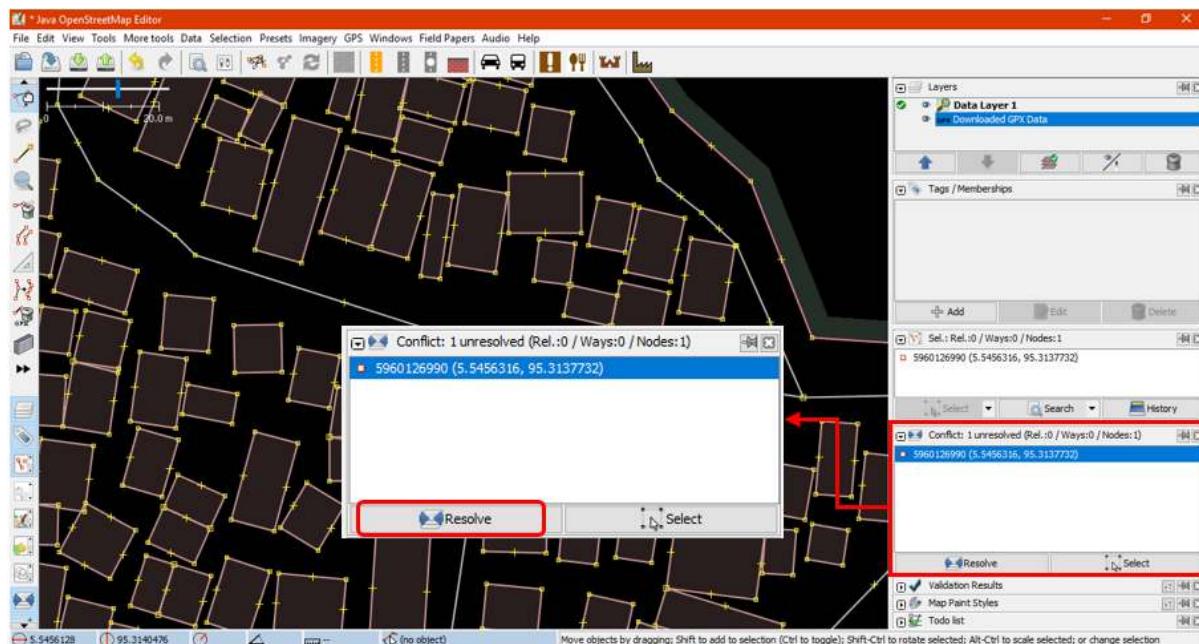
Conflict Detection Window in JOSM

- After that, JOSM will show how many conflicts that has been detected, Click **OK**.



Number of detected conflict

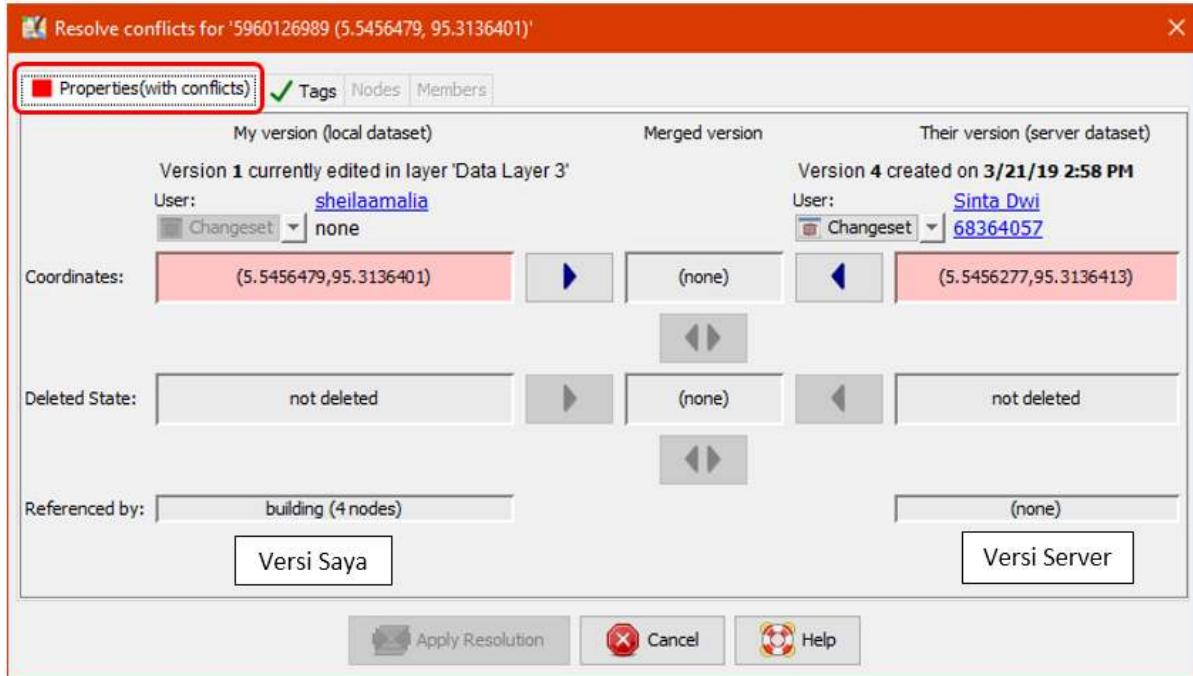
- There is a list of conflicts in **Conflict** panel at bottom right corner in your JOSM. You can choose which conflict you want to fix and click **Resolve**.



Conflict panel to fix detected conflict

- When you have click the **Resolve** button, the window will appears and shows detail about detected conflict. The message about conflict might be looks complicated but it actually has simple instruction. You will know about what type of conflict do you have by looking at symbol. Therefore, the conflict in this example was caused by different coordinate location and position of object. You

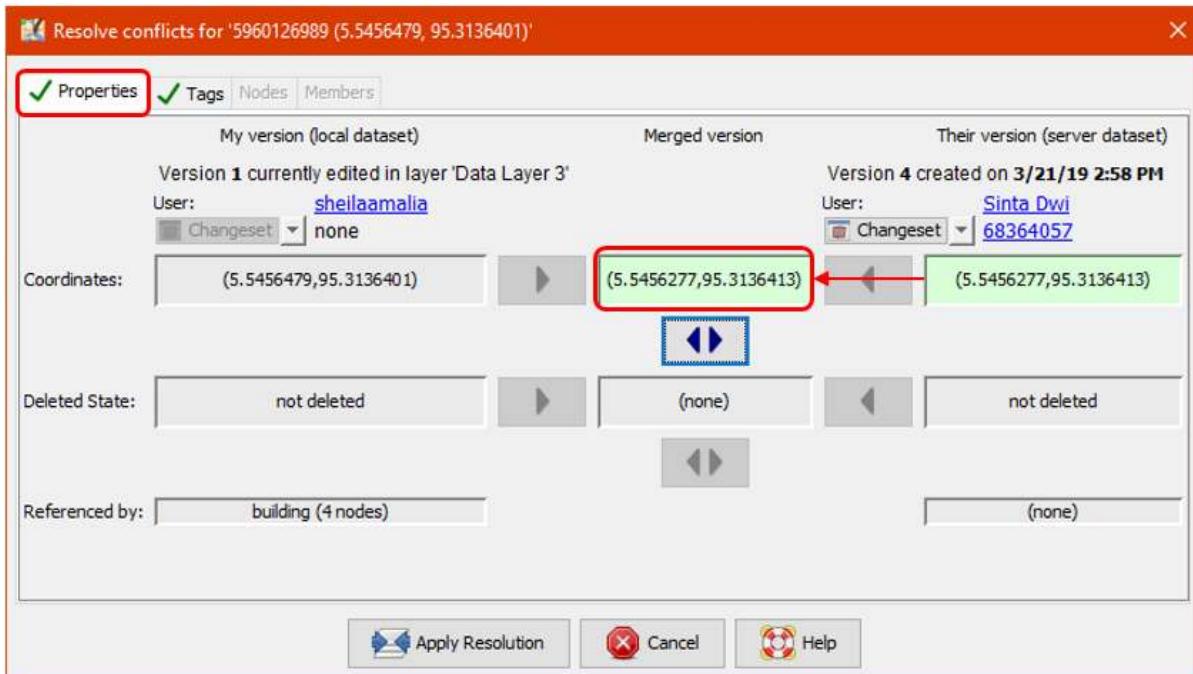
can look at a list of changed or moved coordinate as shown in picture below. Thus, conflict in this example was caused by one changed node.



A Window to Resolve Conflict

- You only can resolve one conflicts at one time. You can choose which correct version between your version or their version in the server. If you sure that your version is the correct one (you edit / add the object based on your field survey mapping or you already know the object personally), then choose **My Version (local dataset)**. However, if you are not sure about your version and think that the other version more convincing then you can choose **Their version (server dataset)**.

Click blue arrow symbol in the version that you choose. If the conflict has been fixed then the symbol will be going turn to green check mark



Choose one of the versions to resolve data conflict

- After you have select the right version, you have to make sure the color of conflict box has been changed from pink to green. This means you have successfully fixed the conflict.



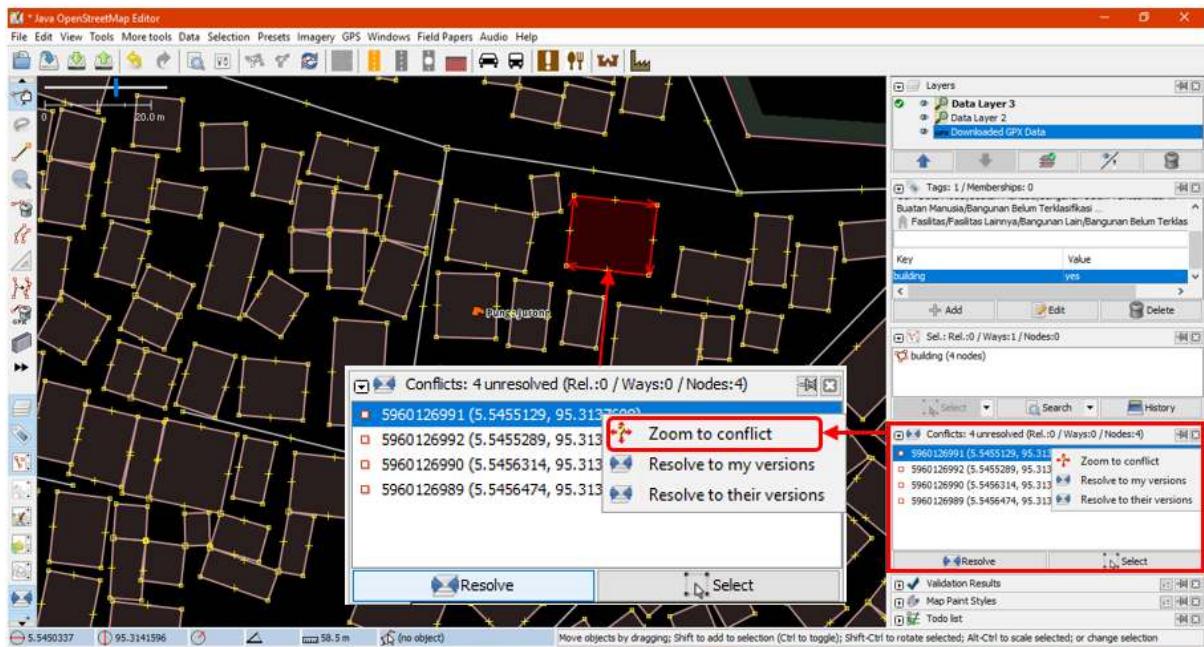
Difference color between original conflict and resolved conflict

- Then click **Apply Resolution** as shown in the picture above. After you have finished all of your conflict, you can start to upload your OSM changes.



Resolved conflict window

- In window menu, you can activate **Conflicts** window. This window shows total number of conflict on all of your data when you click the **Resolve** button. You also can use another way by right click on one of the conflict and choose **Resolve to my versions** or **Resolve to their versions**. To find the object you can right click and click **Zoom to Conflict**. This will be very useful if you have many conflicts and need to check and fix them one by one.



Window of list conflict on JOSM_

Note : You can not upload your changes until you have resolved all of your conflict and list of conflict in the conflict window has empty. Keep in mind, you need to be careful when resolving the conflict and need to check it one by one to make sure everything is correct as it should.

IV. Avoiding Data Conflict in JOSM

You can do some things to avoid conflict when uploading your data into OSM server, as follows:

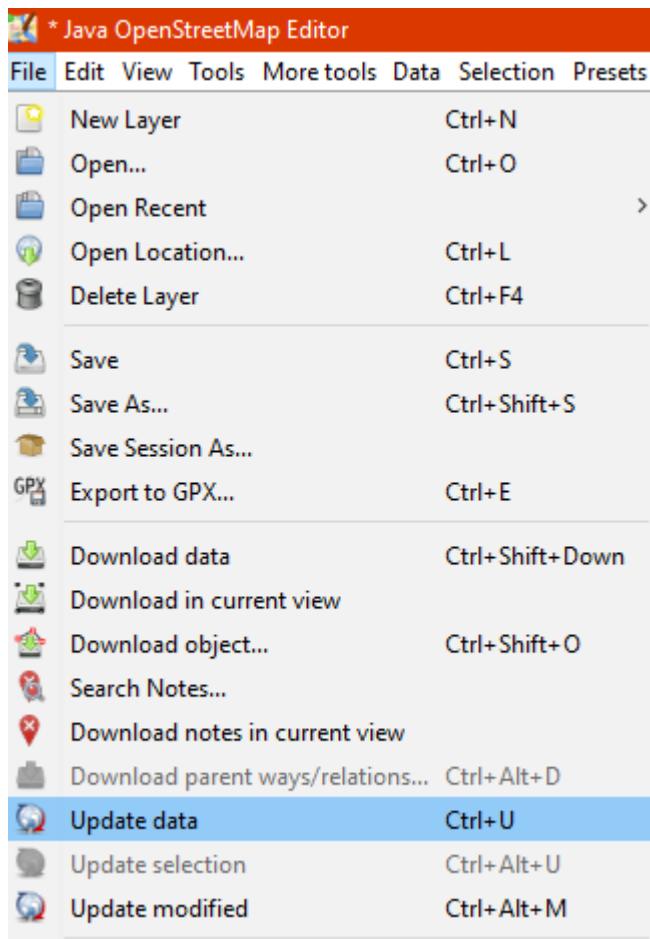
- Upload your changes continuously**

To minimize conflict, you can upload your changes continuously. For instance, if you mapped 100 buildings but does not have a good internet connection, you should upload your changes for every 20 buildings or every 15 minutes. The reason for this is because the conflict would have bigger possibility to occur if you upload when it is finished. The longer you waiting to upload the more possibility the data could possibly have edited and uploaded to the server by other contributors. Therefore, the probability of conflict for your edit will increase.

If you want to save your OSM data and upload it later, you can update your OSM data first before you upload it. This should be done so you can get the latest OSM data from the server before you upload it. You can do that by click **File → Update data** or **Update Modified** then waiting until the updating process is finished. After that, you can upload your changes with **Upload data** options



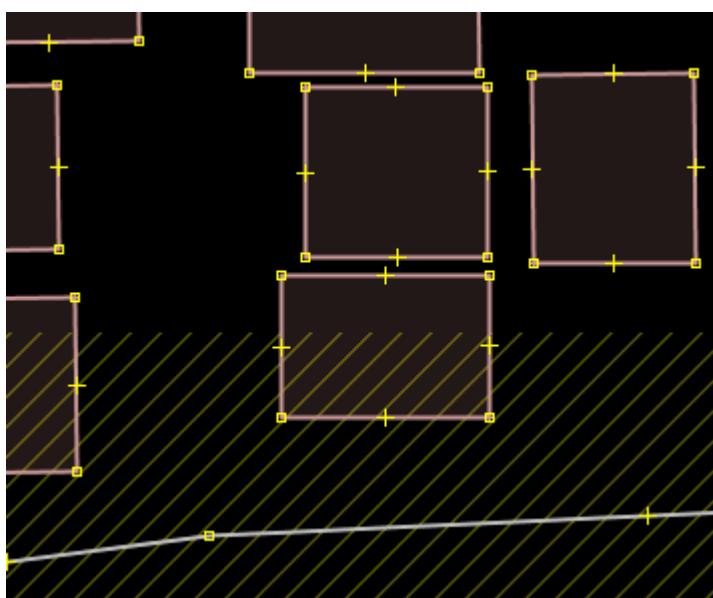
File menu or just click  icon on *menu* bar.



Update data options in file menu

- **Edit Only in Downloaded Area**

You can do mapping in specific area to minimize risk of conflict with avoid editing objects outside your downloaded area in JOSM. This can prevent two or more users editing in same area. Notice that diagonal lines around your downloaded area is an area you need to avoid to edit in JOSM.



Downloaded Area (black) dan Outside Downloaded Area (diagonal lines)

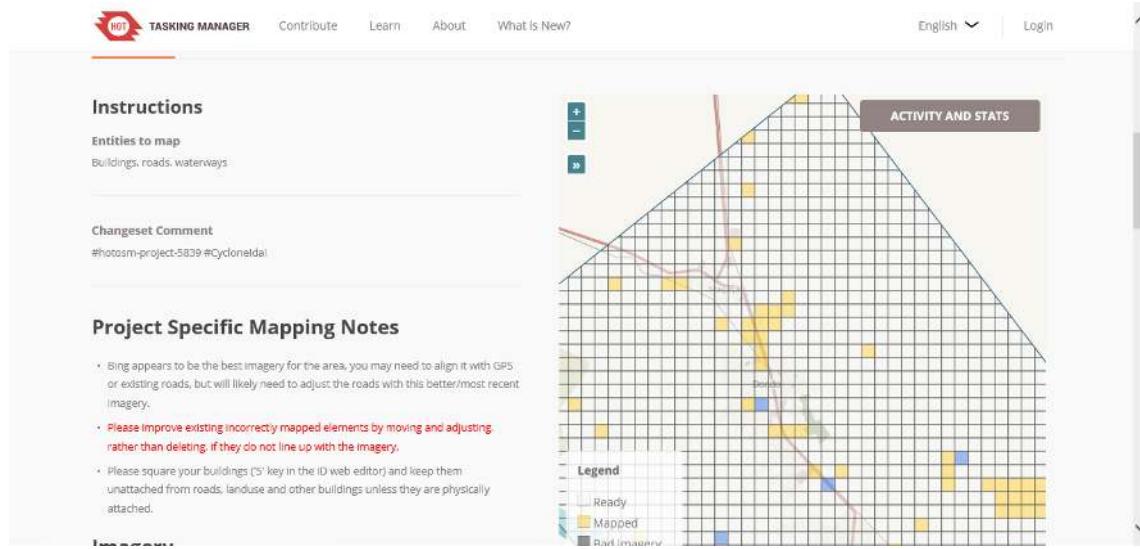
After you download the data, your editing area is only area inside which does not have diagonal

lines. The area outside your editing area most likely currently editing or have been edited by other contributors. Avoid edit in the area will reduce the risk of getting conflict in your data.

- **Using Tasking Manager**

If you want to do collaborative mapping, you can use *Tasking Manager*. It will help you to divide your mapping area into task grids. Thus, you can choose your mapping area grid easily without worry getting same area with other OSM contributors because once you select certain grid, it will be locked and cannot choose by other contributors.

Any mapping volunteer in the area can choose one grid that they want and after finish they can mark the grid as completed mapped. This will allow a lot of people to map certain area in same time without getting worried to get conflict.



Tasking Manager Interface (tasks.openstreetmap.id)

Summary

If you have followed and finished to practice all the steps in this chapter, You have successfully understand about data conflict in JOSM and how to fix it. Moreover, you also have learned about types of conflict and how to avoid them in JOSM. Congratulations!

4.1 Designing The Data Model

Overview

When beginning a mapping project, a data model will need to be created in order to determine what features are mapped and the details collected for each of those features. 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

OSM doesn't work with layers or attribute tables, but tags. **Tags** are used in OSM to categorize features, and to add information that is useful for understanding of the map, planning, routing, and querying. Each tag consists of a key, and a value. Each map feature should have one or more tags such as:

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

In addition, each of these features can have an unlimited number of related attributes added into OSM as tags. For example, a building might have the following tags:

- building=commercial
- building:material=brick
- roof:material=metal
- shop=tailor

Creating a data model should be done in collaboration with all stakeholders in order to ensure that all necessary information is collected - it is a lot more difficult to revisit a location for mapping to collect additional information. At the same time, when designing a data model you should consider how much time it will take for a surveyor to complete data collection - every feature type, attribute, or question will add additional time needed.

Presentations

- Data models and tagging [1]

Resources

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

Data model workflow

Designing a **data model** based on **OSM tagging** is typically defined by the following questions and workflow:

1. What is the focus of the data collection? Consider how the data will be used.
2. What features do you want to collect? Identify the focus of the data collection.
3. Where are you collecting data? Data models can differ based on their location.
4. What has been done before? Draft data model by leveraging similar models.
5. What tags exist for features?
 1. Verify tag status through OSM Wiki
 2. Verify tag usage through TagInfo
6. Use approved tags where possible in data model

- Do all stakeholders agree on the data model? Review data model and incorporate feedback from project partners (adding, removing, or changing data model features can delay field data collection and decrease data quality!)

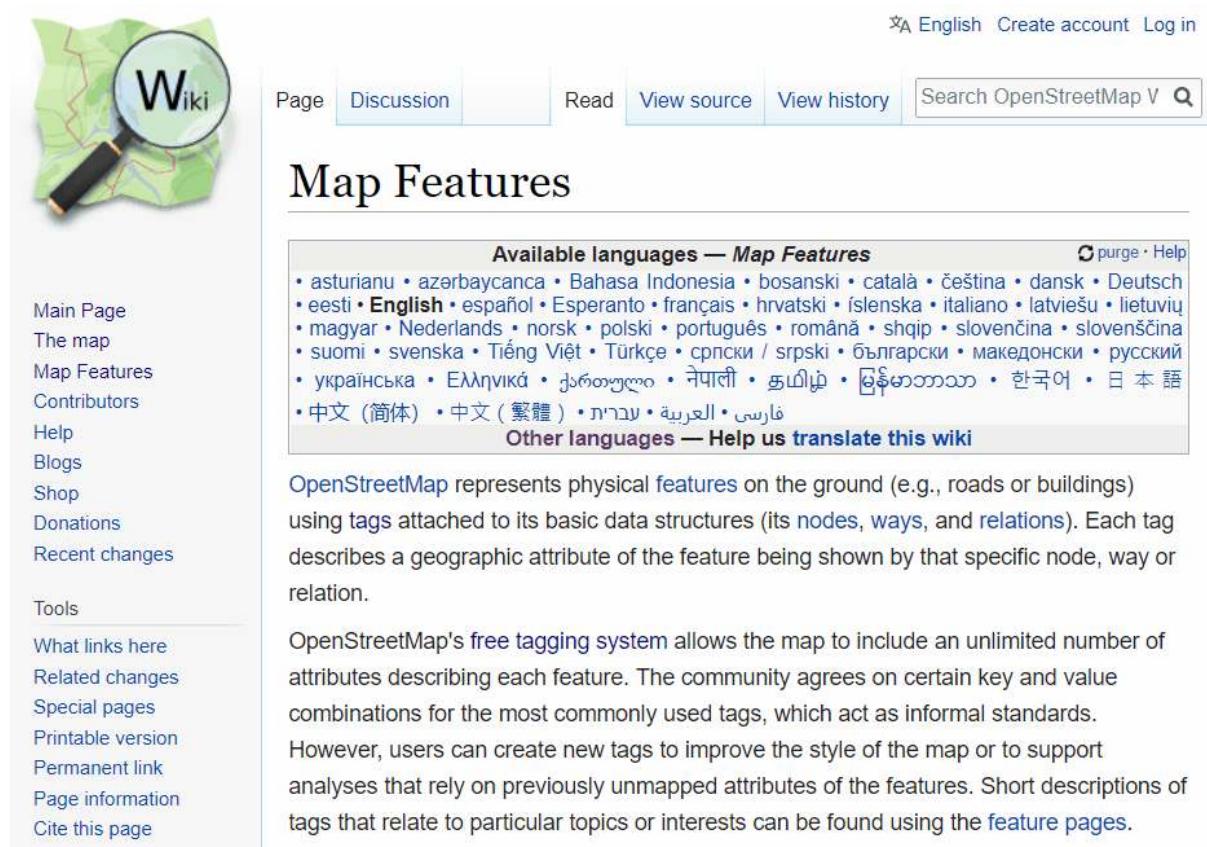
Tools for creating your data model

HOT recommends using TagInfo and the OSM Wiki to search for existing OSM features when developing your data model. The following steps will provide an introduction to how to use these tools.

Skills and Technology Needed

- Computer with
- Internet connection
- OpenStreetMap Account
- Recommended: computer mouse

How to Use the OSM Wiki



The screenshot shows the 'Map Features' page on the OpenStreetMap Wiki. At the top right, there are links for 'English', 'Create account', and 'Log in'. Below the header, there is a navigation bar with tabs: 'Page', 'Discussion', 'Read', 'View source', 'View history', and a search bar labeled 'Search OpenStreetMap V' with a magnifying glass icon. To the left of the main content area, there is a sidebar with a 'Wiki' logo and a magnifying glass over a map. The sidebar contains links to 'Main Page', 'The map', 'Map Features', 'Contributors', 'Help', 'Blogs', 'Shop', 'Donations', 'Recent changes', and 'Tools'. Under 'Tools', there are links to 'What links here', 'Related changes', 'Special pages', 'Printable version', 'Permanent link', 'Page information', and 'Cite this page'. The main content area has a heading 'Map Features' and a section titled 'Available languages — Map Features' which lists many languages. Below this, there is a section titled 'Other languages — Help us translate this wiki'. The text in the main content area explains what OpenStreetMap represents and how it uses tags. It also discusses the free tagging system and how users can create new tags.

Figure 1: osm_wiki_map_features

- Navigate to https://wiki.openstreetmap.org/wiki/Map_Features in a Google Chrome or Mozilla Firefox internet browser.
- This page provides documentation on common, existing OSM features categorized by type. These tables contain keys and values, along with comments and sometimes pictures to help define the tag. Scroll through the tables to explore the tags described.
- Search for a particular tag by using 'Ctrl+F' on your keyboard. As an example, search for the tag that should be used for hospitals. To do so, hit 'Ctrl+F' on your keyboard, type 'hospital' in the search bar, and hit enter. This will bring you to the appropriate tag for hospitals. *Note: there might*

be more than one appropriate tag for a search item. Scroll through the results until you find the appropriate tag.

4. Keys and values within the tables will also link out to individual wiki pages for those features. For example, by clicking on "hospital" under amenities, you will be redirected to <https://wiki.openstreetmap.org/wiki/Tag:amenity%3Dhospital>. This page provides in-depth detail about the tag as well as related tags and tips on how to map a particular feature.
 5. To practice, search for other key words relating to features you would want to map to discover keys and values related to that feature.

How to use TagInfo



taginfo

KEYS · TAGS · RELATIONS · PROJECTS · REPORTS · ABOUT

Data from: 2019-06-27 00:59 UTC

KEYS

building • highway • name •
source • amenity • addr:street •
shop • addr:housenumber •
surface • ...

[See all keys...](#)

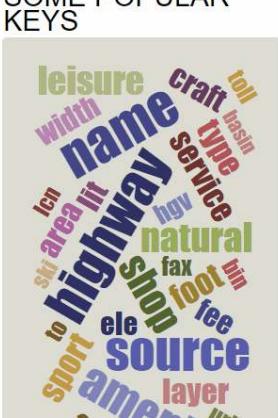
TAGS

building=yes •
highway=residential •
building=house •
highway=service • ...

[See most common tags...](#)

RELATION TYPES

SOME POPULAR KEYS



REPORTS

Reports show the tag data from different angles. They often bring together data from several sources in interesting ways. Some of the reports can help with finding specific errors.

- Characters in keys
- Database statistics
- Frequently used keys without wiki page
- Historic development
- Key lengths
- Language comparison table for keys in the wiki
- Languages
- Similar keys

ABOUT

OpenStreetMap uses **tags** of the form **key=value** to add meaning to geographic objects. Taginfo collects information about these tags from several sources to help you understand what they mean and how they are used.

[More about taginfo...](#)

INTERNATIONAL

Figure 2: taginfo

1. Navigate to <https://taginfo.openstreetmap.org> in a Google Chrome or Mozilla Firefox internet browser.
 2. In the upper left corner, use the search bar to find a tag. For this activity, search for "roof".
 3. The next window will allow you to select from existing keys, values, and relations that contain "roof".
 4. Selecting one of these options will bring you to an information page about that key, value, or relation. For this activity, find and click on "roof:material".
 5. You will now see an information page about the tag "roof:material" including values that have been used with the key "roof:material", combinations of other tags that have been used with the key, a map of the key's global use distribution if there are enough use cases, and links to any existing related OSM Wiki pages.
 6. To practice, search for other key words relating to features you would want to map to discover keys and values related to that feature.

Creating your data model

The following activity will guide you through the process of creating a data model. While this process could be done by hand or in document software (such as Google Docs or Microsoft Word), spreadsheet software is the recommended method of documenting your data model.

Skills and Technology Needed

- Computer with

- Internet connection (recommended for accessing TagInfo and OSM Wiki)
- OpenStreetMap Account
- Recommended: computer mouse
- Spreadsheet software, such as LibreCalc, Google Sheets, or Excel (recommended for structuring your data model)

Create a list of all of the features that you want to collect. For example: buildings, water points, roads.

| Feature |
|--------------|
| Buildings |
| Water Points |
| Roads |

Go to OpenStreetMap wiki to search for the appropriate key for each feature, and value if there is only one value option.

| Feature | Key | Value |
|--------------|----------|-------------|
| Buildings | building | |
| Water Points | amenity | water_point |
| Roads | highway | |

For features with multiple values, such as buildings, use the OSM Wiki page for that key as well as TagInfo to find appropriate values. These values should only be what is reasonable for your data collection. While it would be ideal to collect every building type in a city, your project might only be able to collect all school and hospital buildings. Note: values in your data model should make sense for the context of your geography. For example: hut is an appropriate value for buildings in Liberia, but not likely in Germany. Additionally, you may need to interpret an existing value type to best match the appropriate value for your region.

| Feature | Key | Value |
|--------------|----------|---------------------------------|
| Buildings | building | residential, school, civic |
| Water Points | amenity | water_point |
| Roads | highway | primary, secondary, residential |

Once you have the base tags for your features, you can decide on what attributes you want or can collect for each feature.

| Feature | Key | Value |
|--------------|-------------------|---------------------------------|
| Buildings | building | residential, school, civic |
| | building:material | |
| | building:levels | |
| | roof:material | |
| Water Points | amenity | water_point |
| | status | |
| Roads | highway | primary, secondary, residential |
| | name | |
| | condition | |
| | surface | |
| | width | |

Next, values can also be determined for each attribute key. These options can be determined using the OSM Wiki and TagInfo, or in some cases can be defined by the mapper - such as for numeric answers

or names.

| Feature | Key | Value |
|--------------|-------------------|--|
| Buildings | building | residential, school, civic |
| | building:material | cement_block, brick, wood, mud |
| | building:levels | <i>numeric</i> |
| | roof:material | thatch, metal, concrete, plastic, tile |
| Water Points | amenity | water_point |
| | drinking_water | yes, no |
| Roads | highway | primary, secondary, residential |
| | name | <i>user defined</i> |
| | condition | excellent, good, poor |
| | surface | gravel, paved, dirt |
| | width | <i>numeric</i> |

Once completed with your data model, this data model should be checked by your stakeholders for any gaps. Additionally, your project plan should allow flexibility so that this data model can be adjusted with field testing and consulting your mappers.

Collecting private data Private data should never be uploaded to OSM. However, some projects do require personal information to be collected. When this is the case, the data model can include unique non-OSM tags for private data that needs to be collected. When cleaning data following data collection, this private data can be kept in a full dataset before being removed. Once private data is removed, the dataset can be uploaded to OSM.

Links 1: https://docs.google.com/presentation/d/1CU6cBtu9ZAeCWKlz6xLVN4fBrdsN7R5tFELPXbepill/edit#slide=id.g5c7d19429e_0_225

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

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

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_\(Android\)](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

Overview

Several mobile applications exist to assist with field navigation using OpenStreetMap as a baselayer and functioning offline for low-connection environments. Options include OSMAnd [1] and Maps.me [2].

While navigation tools are not *required* for data collection, they can be extremely useful for data collection teams in navigating to field locations, as well as for supervisors and project managers to understand where their teams have been.

Additional benefits of navigation applications include:

- **Collecting GPX tracks:** GPX tracks can be used to record field movement as well as recording highway and road routes for later digitization and upload to OSM.
- **Adding KML files:** Adding point layers to a navigation map can help field mappers navigate to specific locations or survey blocks that are not in OSM.

Which navigation application should I use?

| I want to... | Maps.me | OSMAnd |
|---------------------------------------|---------|--------|
| Use OSM data to find my location | ☒ | ☒ |
| Find my location offline | ☒ | ☒ |
| Add kml files for navigation guidance | ☒ | ☒ |
| Record GPX tracks* | ✗ | ☒ |
| Add data to OSM within app | ☒ | ✗ |

Presentation Introduction to Navigation Applications Introduction to Navigation Applications [3]

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

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

Considerations for downloading and use by large numbers of individuals

- Download the apk files prior to installation. These are offline files that can be shared between users and allow for offline installation.
- For Maps.Me, share basemaps with an offline file rather than requiring each user to download an entire basemap (i.e. Liberia, northern Botswana) on data or wifi. To get an offline map file, you will need to download the map to one device. Plug the device into a computer and navigate to the file folder. The basemap file in this folder can be copied and pasted to the appropriate file in other devices.

Linked Resources

1. <https://osmand.net/>
2. <https://maps.me/>
3. https://docs.google.com/presentation/d/1pio6SeVv93IVWI2_UM6tg2CR-AJE1SfqEKUJZM90o0g/edit?usp=sharing

4.4 Creating forms for ODK & OMK

Survey Form Design

When using ODK and OMK survey applications, you will need to create the files that will serve as the survey forms.

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.

Training Materials: <https://docs.google.com/document/d/1IIR75Cmy92giXLa9hCVIur0wJ3HU4nTZOq6zQWyrEU/edit#>

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

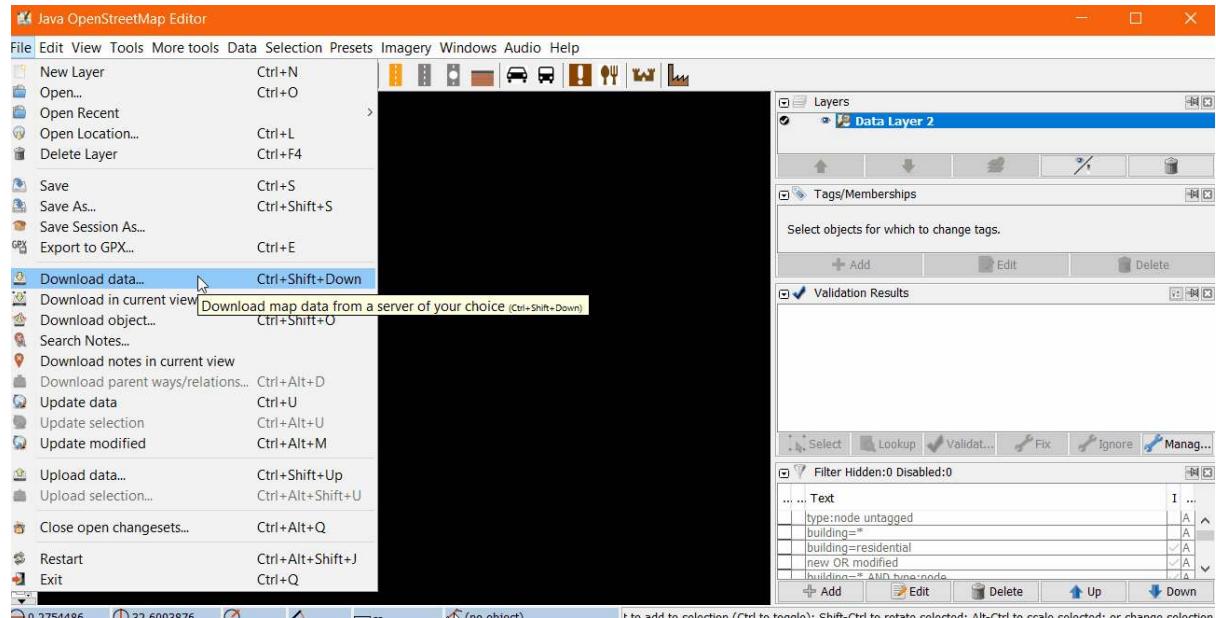
To conduct data collection using OpenMapKit (OMK), you will need to create an .osm layer. This .osm layer provides the buildings for selection in the OMK application.

Skills and Technology Needed

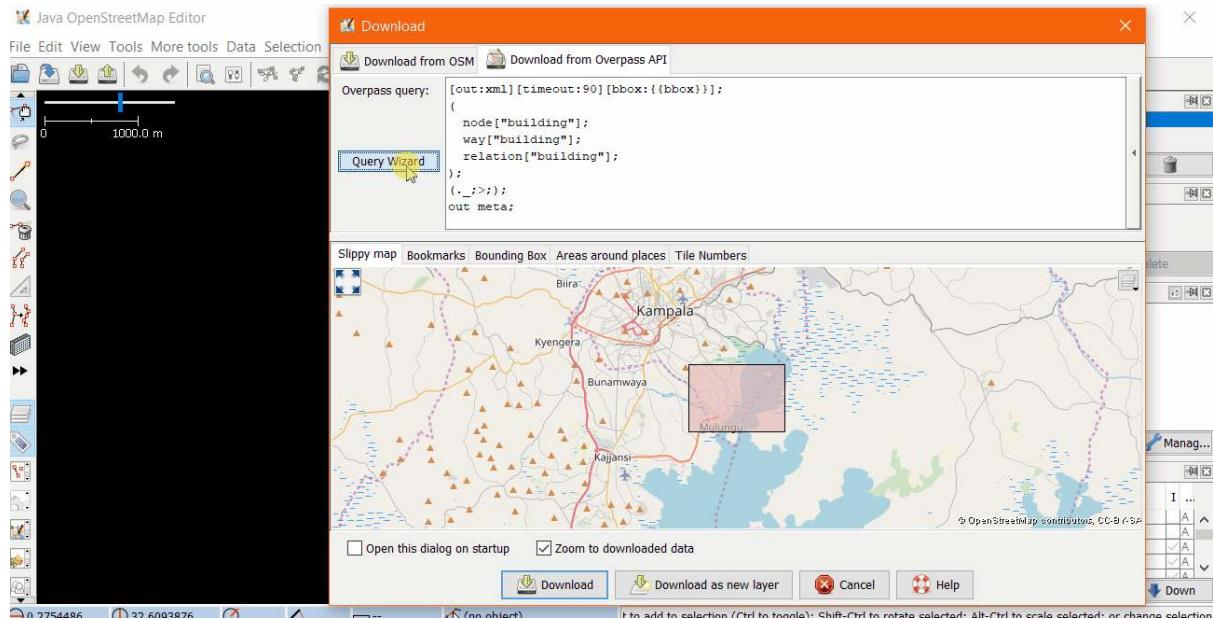
- Computer
- Internet Connection
- JOSM Installed
- Basic JOSM skills

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.



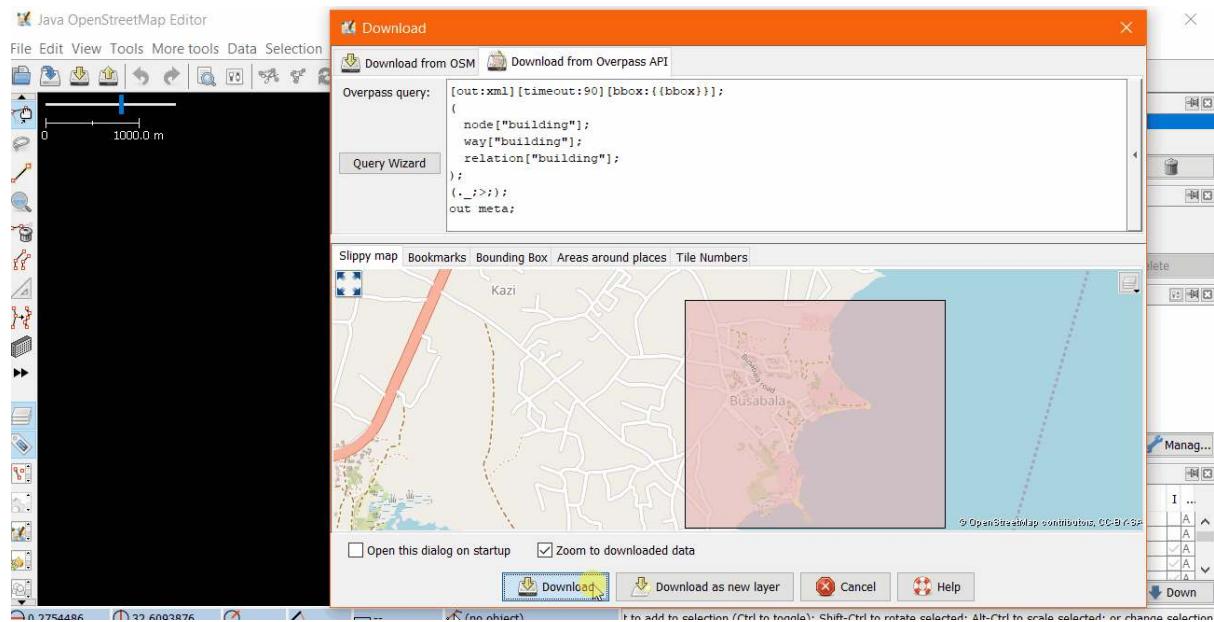
In the 'Download' window, click the tab 'Download from Overpass API'. This will allow you to download data with specific key=value tags in an area of interest. The top of this tab provides space for a query to be entered. Click 'Query Wizard.'



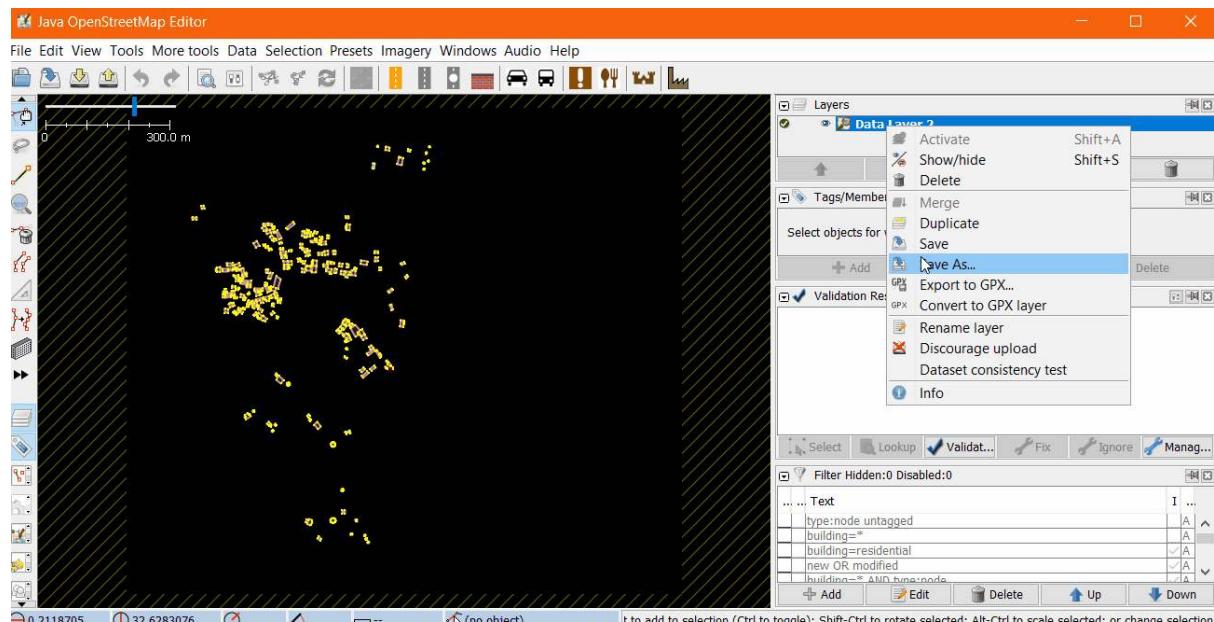
For an OMK .osm layer, we want a layer with only building polygons. In the search bar, type "building=*". This will return an OSM feature with a building tag. Click 'Build query'.

| | |
|---|--|
| ● <code>type:node</code> | Download objects of a certain type. |
| ● <code>key=value in <u>location</u></code> | Download object by specifying a specific location. For example, ● <code>tourism=hotel in Berlin</code> - all objects having 'tourism=hotel' as attribute are downloaded. ● <code>tourism=hotel around Berlin</code> - all object with the corresponding key/value pair located around Berlin. Note, the default value for radius is set to 1000m, but it can be changed in the generated query. ● <code>tourism=hotel in bbox</code> - all objects within the current selection that have 'tourism=hotel' as attribute. Instead of <code>location</code> any valid place name can be used like address, city, etc. |
| ● <code>key=value</code> ● <code>key=*</code> ● <code>key~regex</code> ● <code>key!=value</code> ● <code>key!~regex</code> ● <code>key="combined value"</code> | Download objects that have some concrete key/value pair, only the key with any contents for the value, the value matching some regular expression. "Not equal" operators are supported as well. |
| ● <code>expression1 or expression2</code> ● <code>expression1 and expression2</code> | Basic logical operators can be used to create more sophisticated queries. Instead of "or" - " ", " " can be used, and instead of "and" - "&", "&&". |
| ● <code>ref~ "[0-9]+"</code> ● <code>name ~ /postnord/i in</code> | Regular expressions can be provided either as plain strings or with the regex notation. The modifier "i" makes the match case-insensitive |

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 KOKO 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

— title: 4.8 Adding Survey Data into OSM Using JOSM bookShowToC: True —

Objectives:

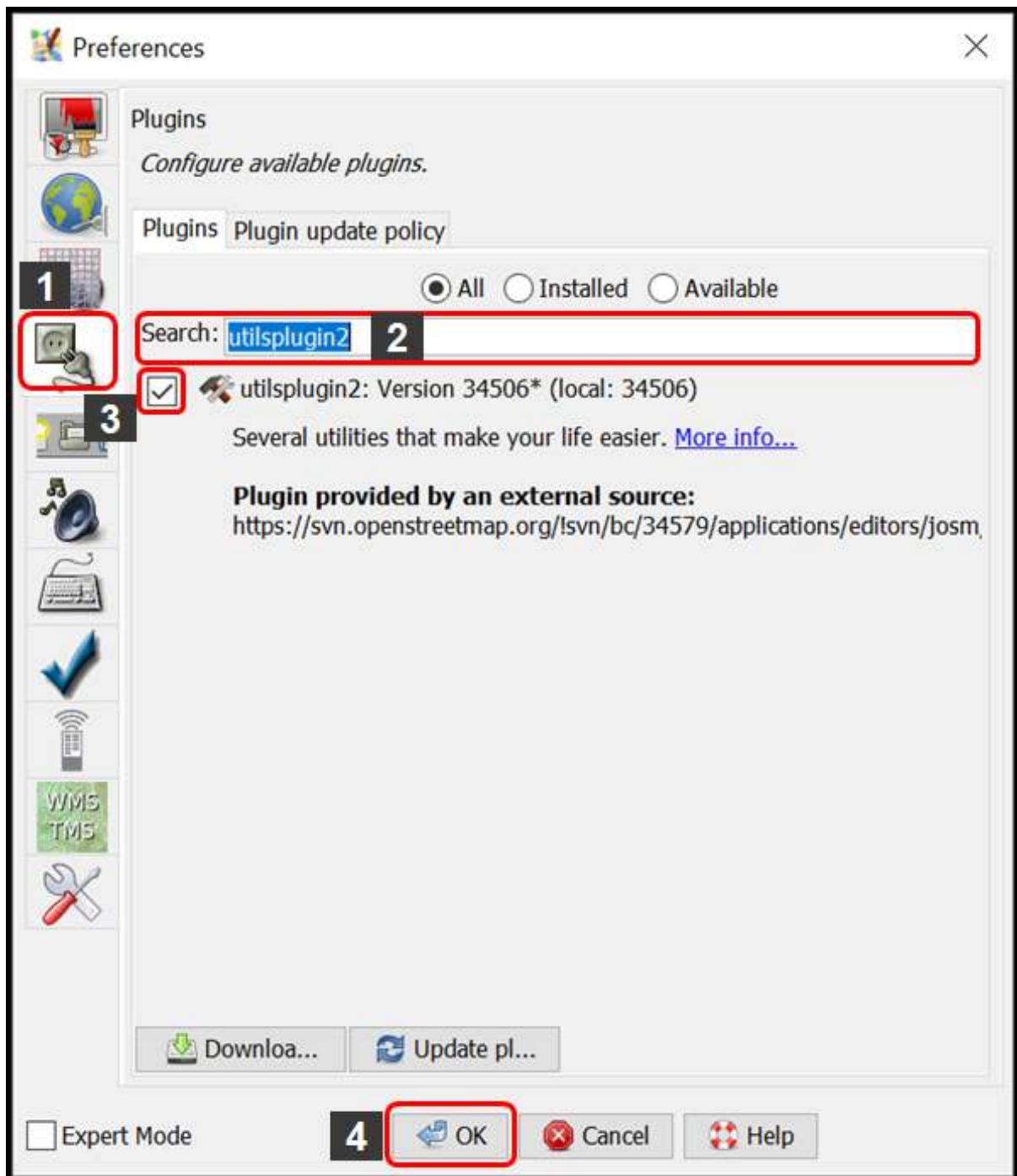
- To be able to install plugin Utilsplugin2
- To be able to merge all survey data
- To be able to save .osm file using JOSM
- To be able to download OSM data
- To be able to add satellite imagery layer on JOSM
- To be able to add and edit OSM data using JOSM
- To be able to upload changes into OSM
- To be able to view changes of OSM data in OSM website

Adding or mapping new objects in OSM is one way to enrich OSM data. Mapped object's information will be very limited when you add OSM data based on satellite imagery only. Field survey can be conducted to solve this problem. Field survey can help you add more information to the mapped object. You can learn more about survey toolkit in the **Field Data Collection Methodology** module. You need an OSM data editor to do the OSM mapping. There are a lot of OSM data editor available, but in this module the OSM data editor used is JOSM. JOSM has a lot of useful tools and plugins, making OSM mapping a lot easier.

I. Installing plugin Utilsplugin2

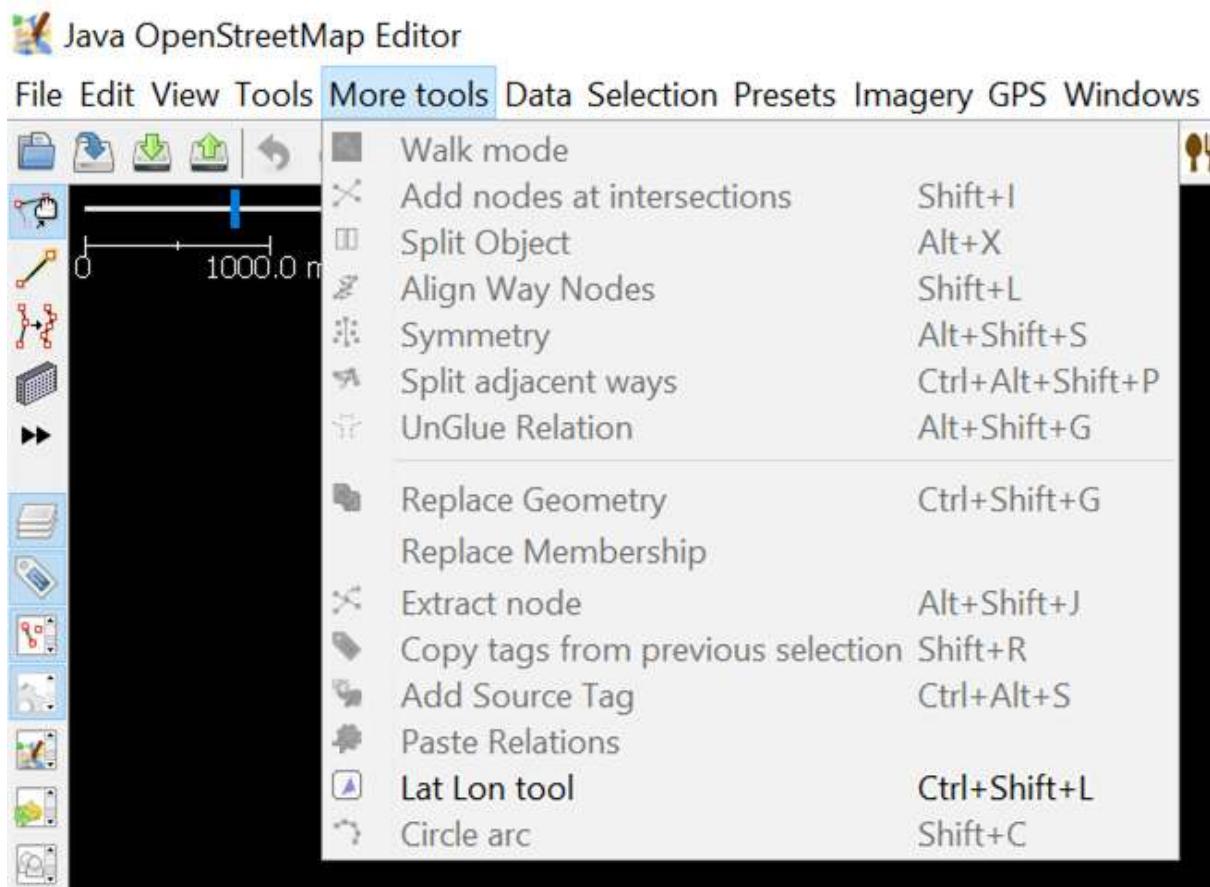
Before adding or editing OSM data using JOSM, install plugin you'll be using first. JOSM has a plugin called utilsplugin2 whose one of the functions is makes copying preset/tag easier. To use this plugin, you have to install the plugin first since it is not installed by default. These are the steps to install plugin utilsplugin2:

- Open JOSM
- Click menu **Edit → Preferences**
- Select menu **Plugins** to install new plugin. If you haven't downloaded available plugins, click **Download List** first to download it. Make sure that you are connected to the internet.
- After downloading plugins, search the **utilsplugin2** by typing it in the search box. After you found it, give a check on the checkbox next to utilsplugin2.



Installing plugin utilsplugin2

- Click OK and wait until the installation process is finished. If the plugin has successfully installed, there will be **More tools** menu on your JOSM.



More tools menu on JOSM

Note: Sometimes JOSM ask you to Restart JOSM after installing new plugin to apply newly installed plugins. However, not all newly installed plugin needs JOSM restarting to be used after installation process finished.

II. Merging All Survey Data

If you have finished conducting survey using field data collection toolkit such as ODK Collect and OpenMapKit, you can use the survey data as the reference to add object's information when mapping it in OSM. Survey data file format from ODK Collect and OpenMapKit is .osm. The amount of .osm file from ODK Collect and OpenMapKit will be the same amount as the surveyed objects since information of one object will be saved in one .osm file. Merge all .osm file to make it easier to use the survey data as mapping reference by following these steps:

- Go to File Explorer to where you save .osm file from ODK Collect and OMK.

WORK > Survey > Data Survey Jakut

Search Data Survey Jakut

| Name | Date modified | Type |
|---|-------------------|-------------|
| Jakarta Utara Data Collection Survey_2018-12-0... | 4/11/2019 2:40 PM | File folder |
| Jakarta Utara Data Collection Survey_2018-12-0... | 4/11/2019 2:40 PM | File folder |
| Jakarta Utara Data Collection Survey_2018-12-0... | 4/11/2019 2:41 PM | File folder |
| Jakarta Utara Data Collection Survey_2018-12-0... | 4/11/2019 2:41 PM | File folder |
| Jakarta Utara Data Collection Survey_2018-12-0... | 4/11/2019 2:42 PM | File folder |
| Jakarta Utara Data Collection Survey_2018-12-0... | 4/11/2019 2:42 PM | File folder |
| Jakarta Utara Data Collection Survey_2018-12-0... | 4/11/2019 2:43 PM | File folder |
| Jakarta Utara Data Collection Survey_2018-12-0... | 4/11/2019 2:43 PM | File folder |

File directory for .osm file from ODK Collect

- Search all .osm file by typing “osm” in the **Search** box. Select all .osm file from the search results.

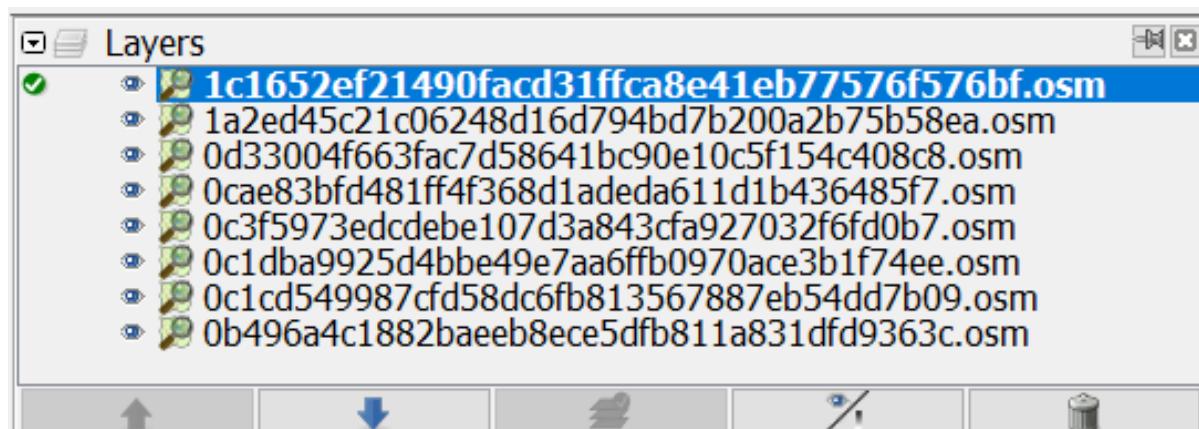
Search Results in Data Survey Jakut

osm

| | | |
|---|---|----------------------------------|
|  | 1a2ed45c21c06248d16d794bd7b200a2b75b5... | Date modified: 12/3/2018 8:37 PM |
|  | 0d33004f663fac7d58641bc90e10c5f154c408c... | Date modified: 12/3/2018 8:37 PM |
|  | 1c1652ef21490facd31ffca8e41eb77576f576bf... | Date modified: 12/3/2018 8:37 PM |
|  | 0c1dba9925d4bbe49e7aa6ffb0970ace3b1f74e... | Date modified: 12/3/2018 8:37 PM |
|  | 0c1cd549987cf85dc6fb813567887eb54dd7b... | Date modified: 12/3/2018 8:36 PM |
|  | 0b496a4c1882baeeb8ece5dfb811a831dfd9363... | Date modified: 12/3/2018 8:36 PM |

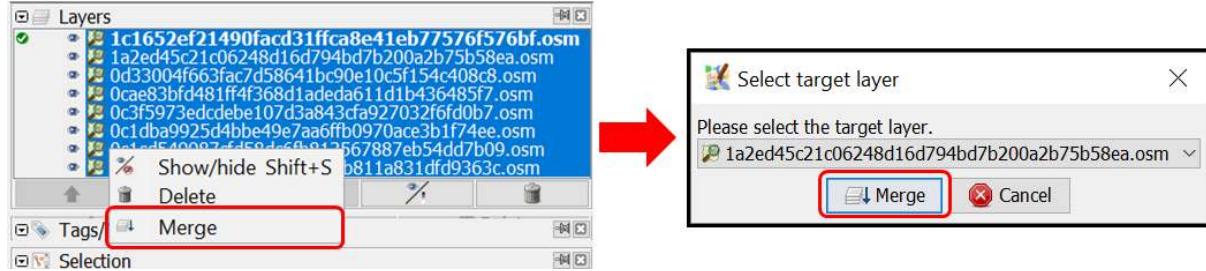
Search results for keyword “osm”

- Drag all selected .osm file to **JOSM**.



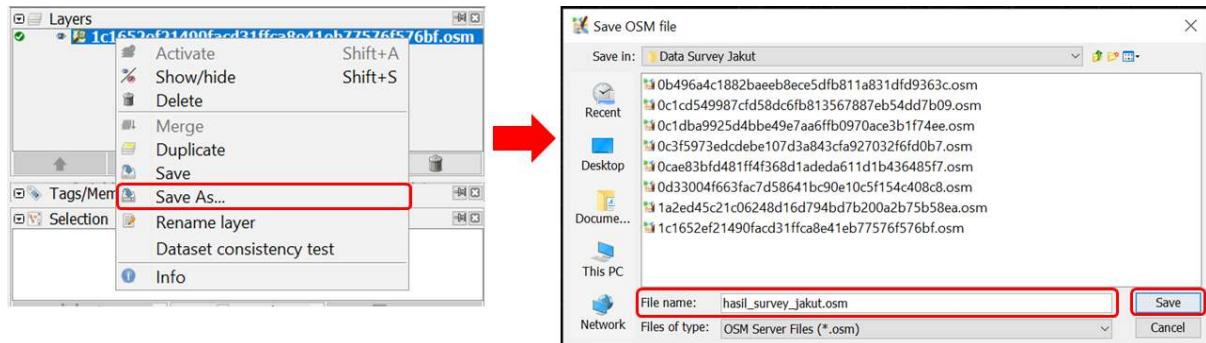
Layers Windows after .osm file from ODK and OMK dragged into JOSM

- Select all those .osm layer by selecting the uppermost .osm layer, then pressing Shift and then selecting the lowermost .osm layer
- Right click on one of the .osm layer, then click Merge. Select target layer Windows will appear, you do not have to change the target layer, click Merge.



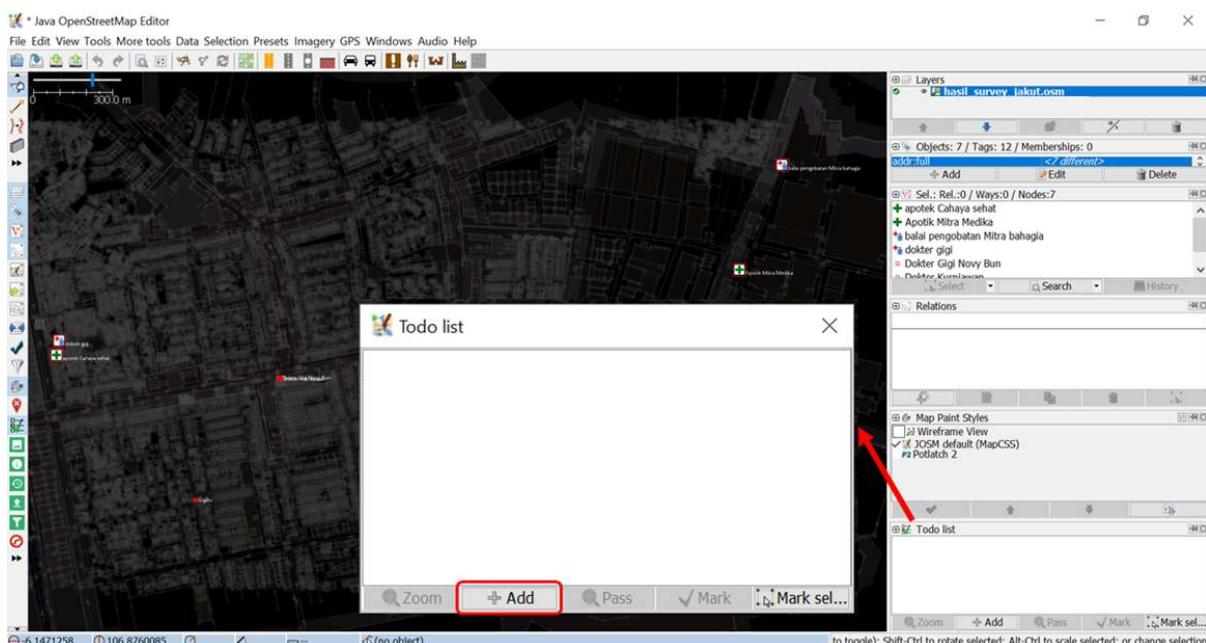
Merging all survey data layer

- Save the merged layer and change the name by right-clicking on the merged layer, select Save As, change the layer name and then click Save.



Saving the merged survey data layer

- JOSM provides a plugin named to-do to help you mark the mapped or unmapped object from the merged survey data layer. You can refer to Using to-do list on JOSM module to learn how to install and how to use to-do plugin in details. If you have already installed to-do plugin and activated Todo list Windows, select all objects nodes in the merged layer using Select object icon, then click Add on the Todo list Windows.

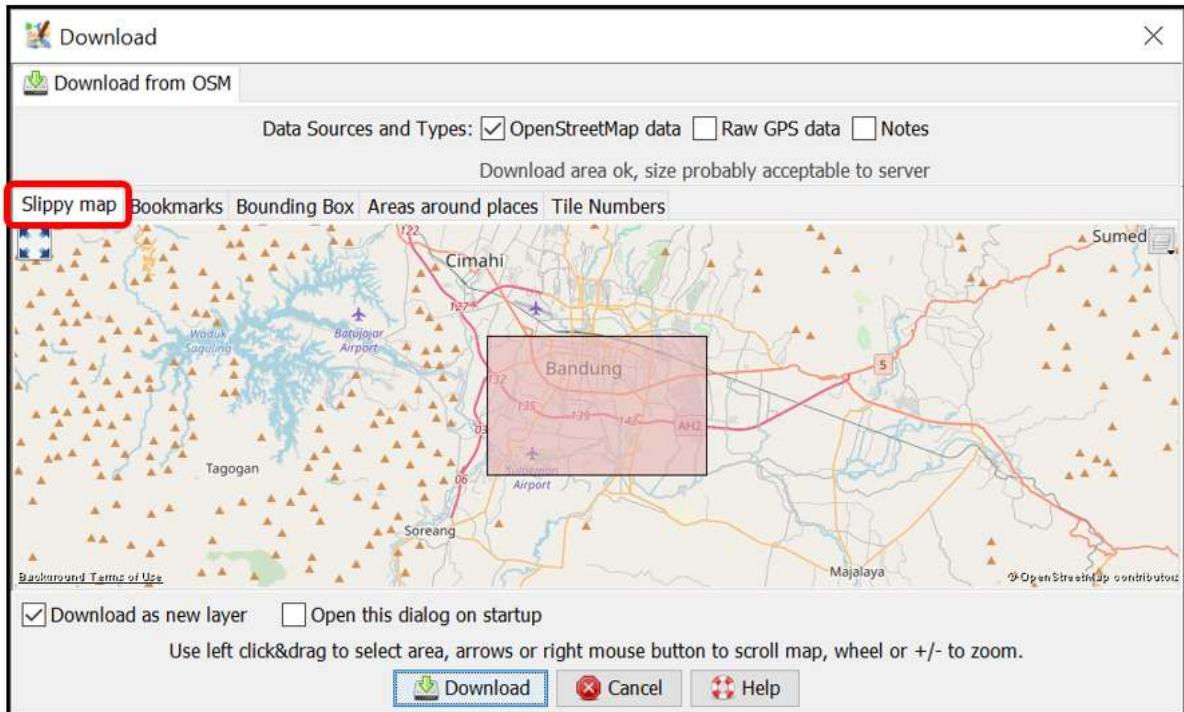


Adding objects into Todo list

III. Downloading OSM Data

After successfully merging all survey data, you need to download existing OSM data. Downloading OSM data aims to discover which objects already mapped and which objects have not already mapped on OSM. These are the steps to download OSM data using JOSM:

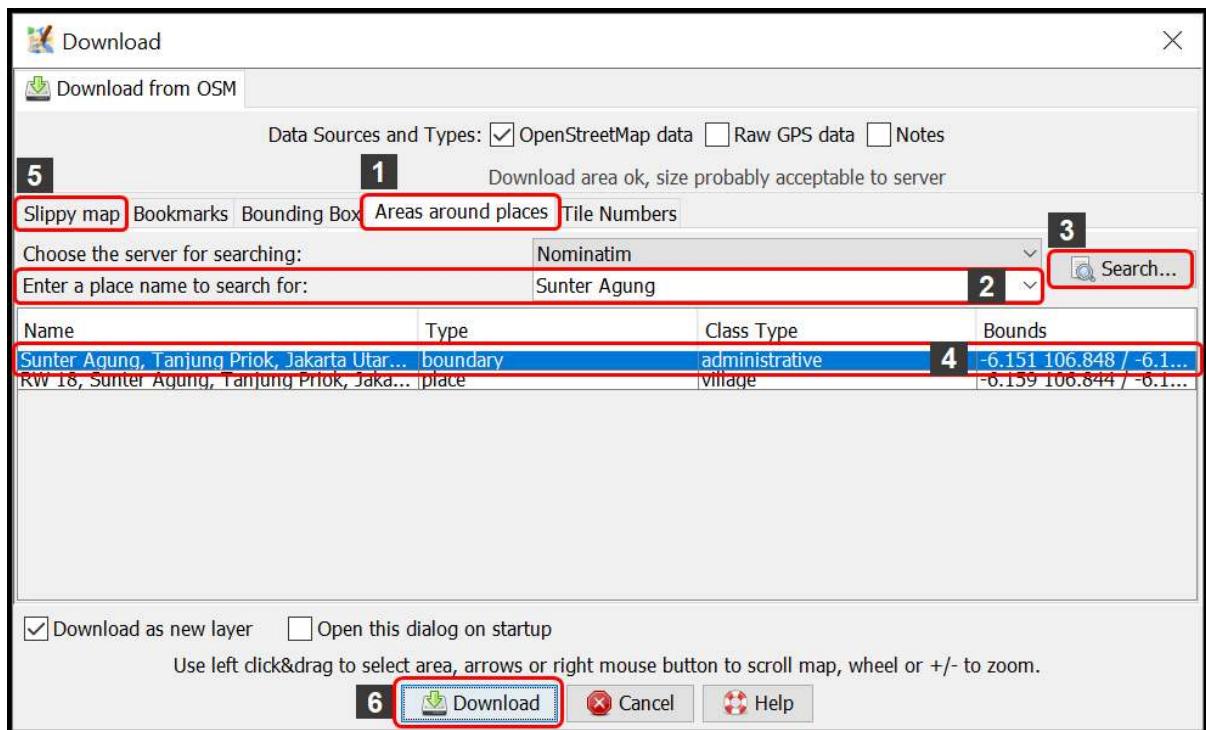
- Click menu **File → Download Data**
- Download Windows will appear. It will show you tab **Slippy Map** by default.



Download Windows on JOSM

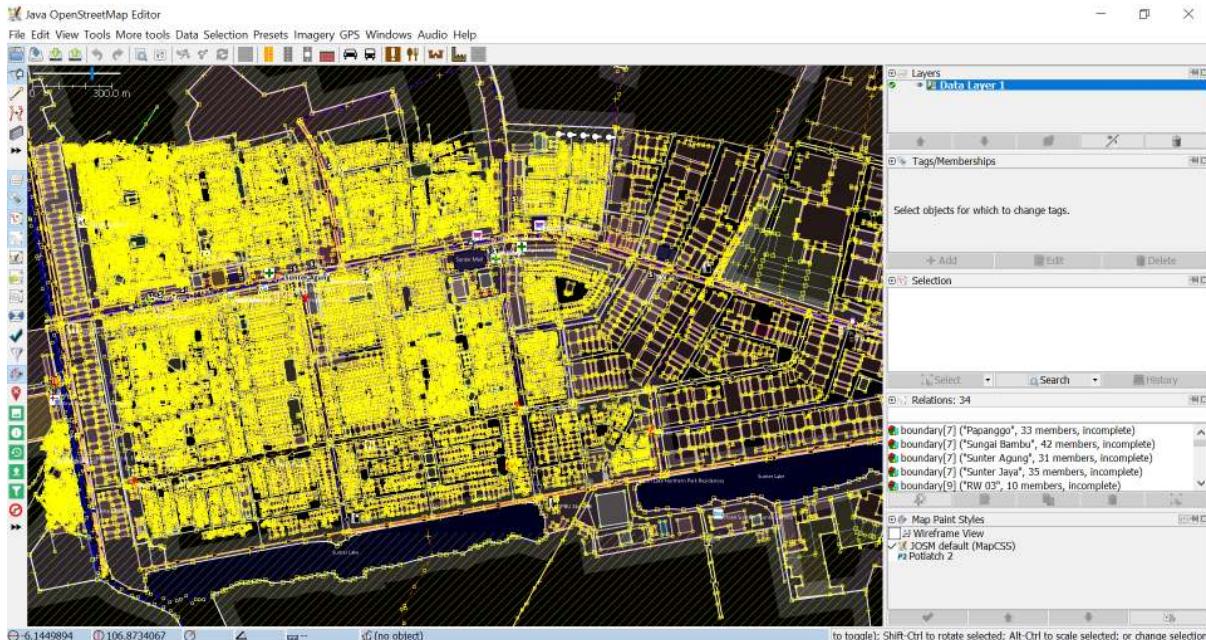
- If the map is not displaying your mapping area, slide the map by **right clicking and hold** your mouse and then **drag the map** to your mapping area. Draw a box at your mapping area by **left clicking and hold** your mouse and then **move** your mouse until a pink box cover the entire mapping area. Then click **Download**.
- If it is quite hard to find your mapping area by sliding the map, you can click tab **Areas around places** and type the name of your mapping area in the **Enter a place name to search for** box then click **Search**. The search result will show you names of your mapping area. **Click on one of the names** then go back to tab **Slippy Map**. The map on the tab **Slippy Map** will be directed to your mapping area. **Draw a box** covering your entire area of mapping, then click **Download**.

Note: Do mind the amount of existing OSM data in your mapping area. If there is already a lot of existing data, you should download it part by part since JOSM can not download an enormous amount of data at once.



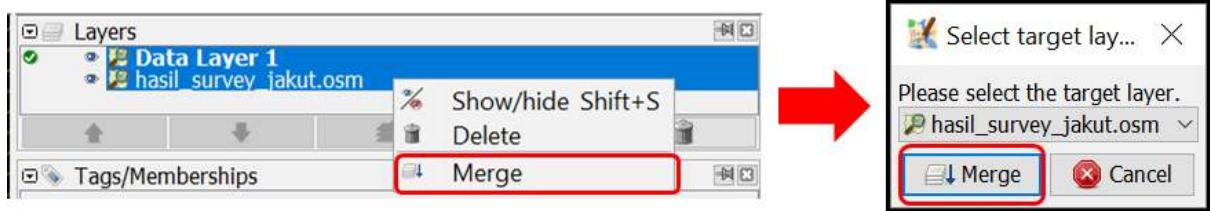
Tab "Areas around places" at Download Windows

- After finished downloading OSM data in your mapping area, there will be a new layer in the Layer Windows that will also be your editing layer to add or edit OSM data. Make sure that you **only add or edit data in the clear area, not in the shaded area**. The shaded area is not your downloaded area. And make sure your entire survey area is already downloaded. After downloading OSM data, your JOSM will look like this:



Tab "Downloading OSM data on JOSM" at Download Windows

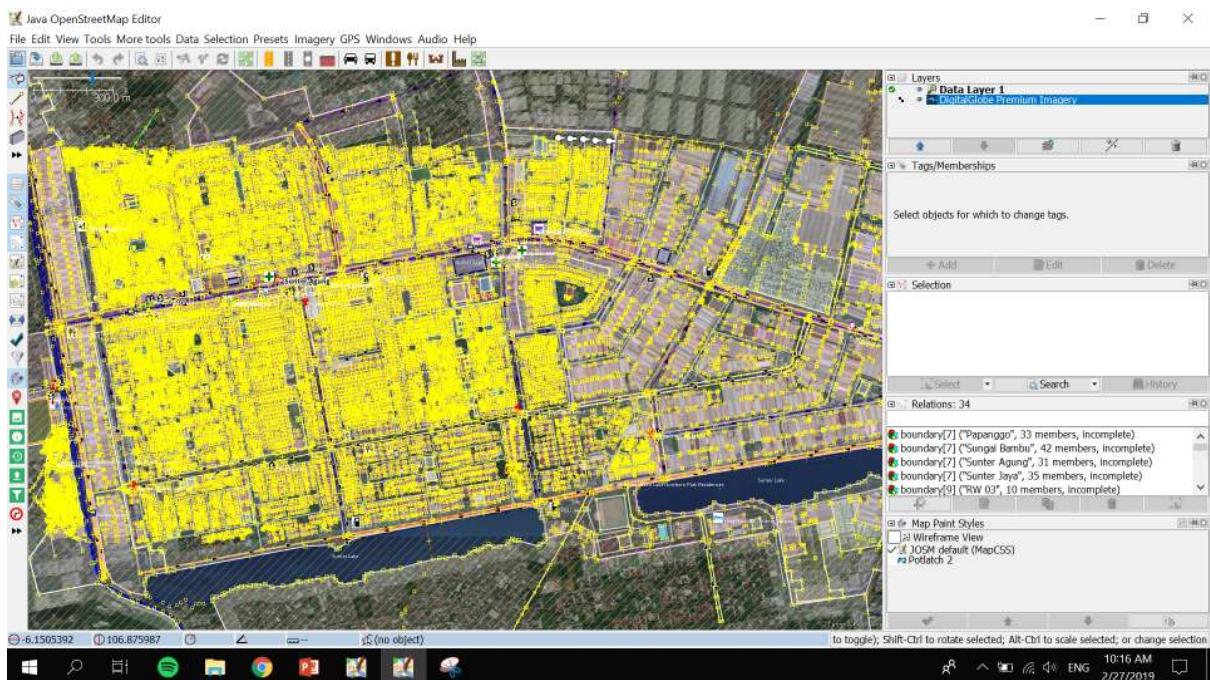
- If you already downloaded OSM data in all your area, merge your downloaded OSM data layer with your survey data layer. Select those **two layers** then **right click**, select **Merge**. Save on your survey data layer. Then click **Merge**.



Merging downloaded OSM data with survey data layer

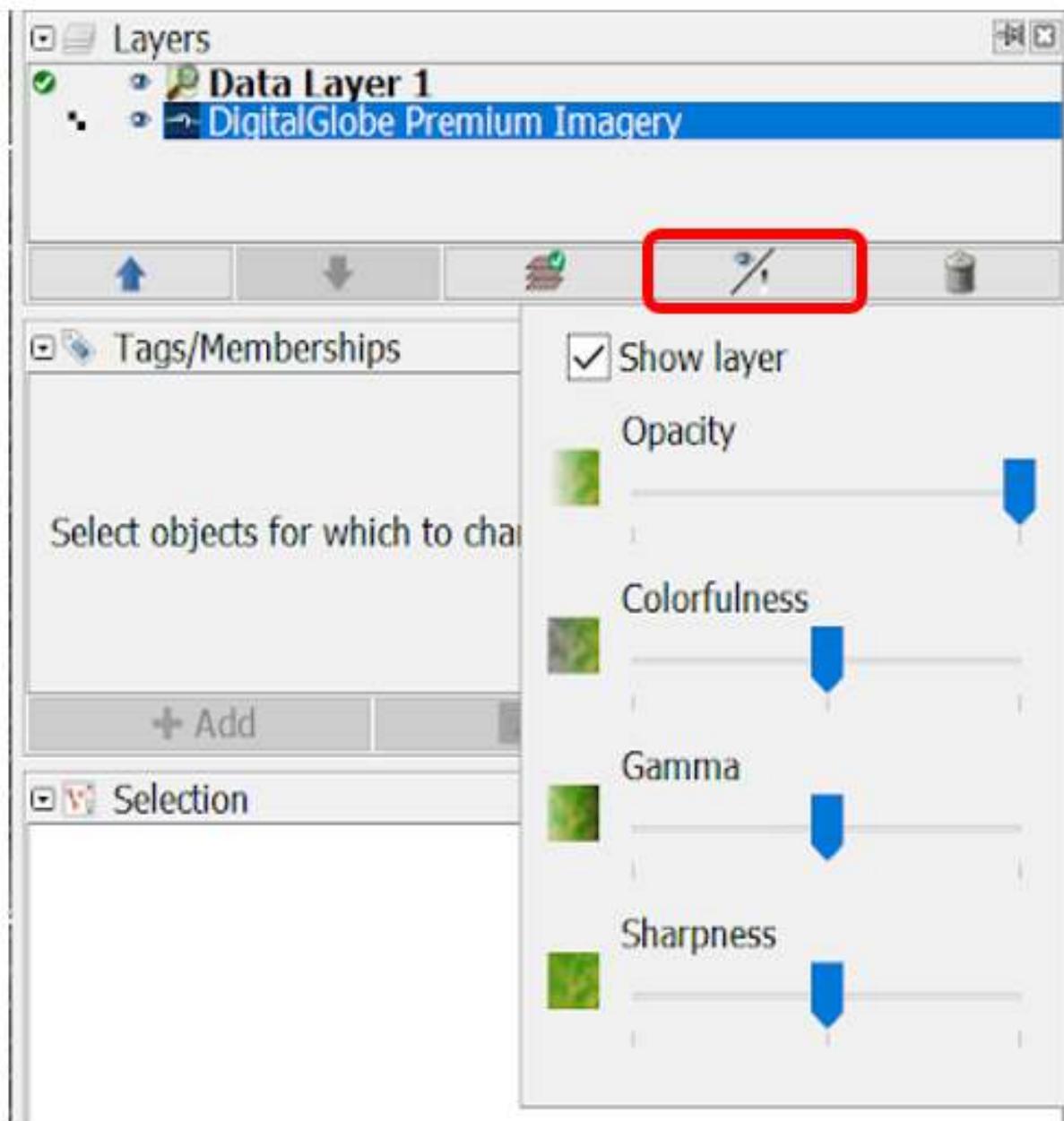
IV. Adding Satellite Imagery

- Add satellite imagery as another reference for mapping by clicking menu **Imagery** → choose one of the available imagery you want to use, such as **DigitalGlobe Premium Imagery**. After successfully adding satellite imagery, it is time to add OSM data. Your JOSM will look like this:



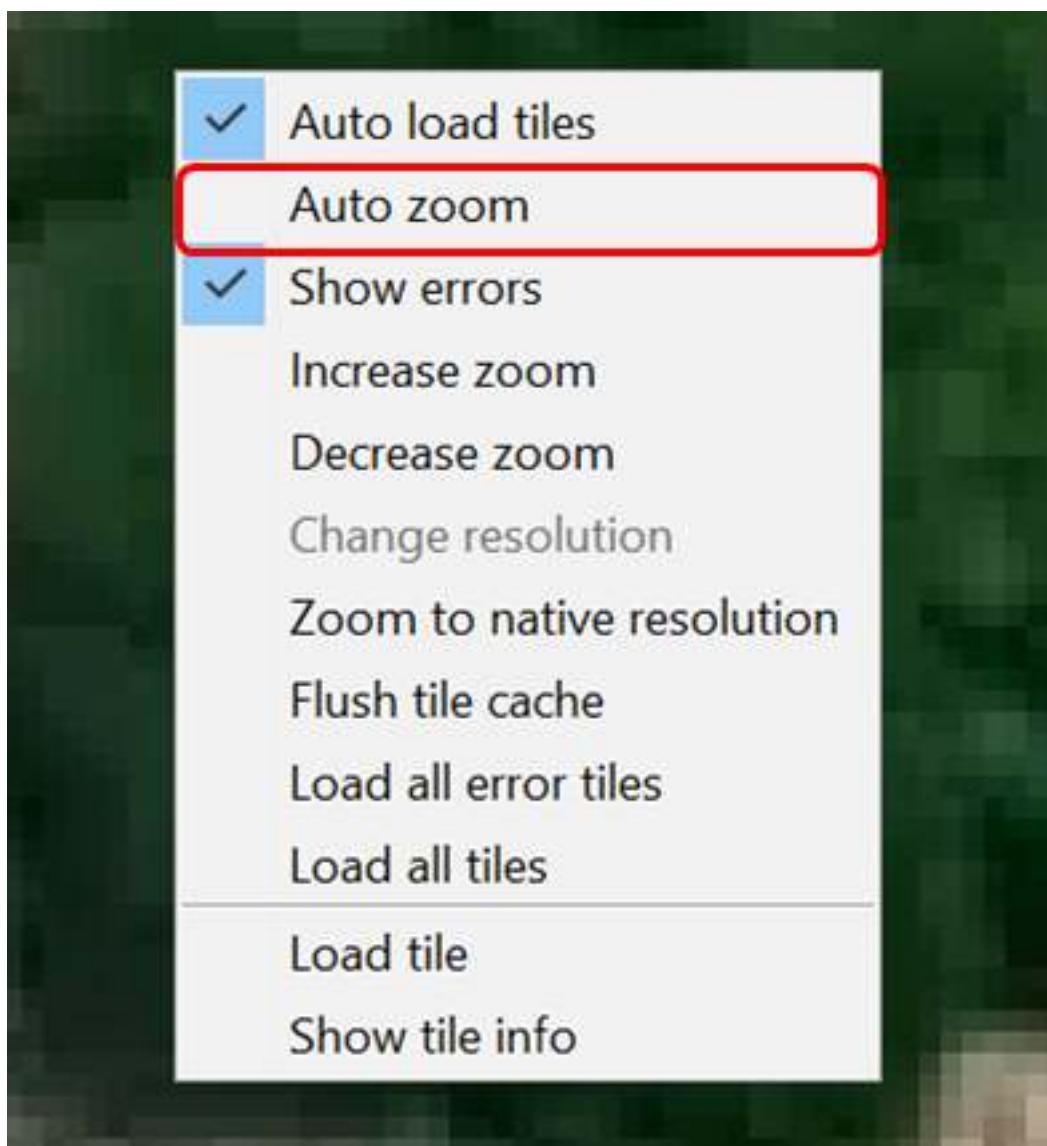
Adding satellite imagery on JOSM

- You can adjust the display of the satellite imagery. Select the satellite imagery layer, then click icon **Change visibility of selected layer** and adjust its display by sliding the blue button left or right.



Changing the display of satellite imagery

- If you use **DigitalGlobe Premium Imagery** as your reference, sometimes it has two versions of display when you zoom in or zoom it out. Usually there is only one version of display aligned with the existing OSM data. Inactivate **Auto Zoom** feature so that the satellite imagery display won't change when you zoom in or zoom it out. To inactivate Auto Zoom feature, **right click on the Satellite Imagery display → click Auto zoom** so that the checkmark next to Auto zoom disappear.

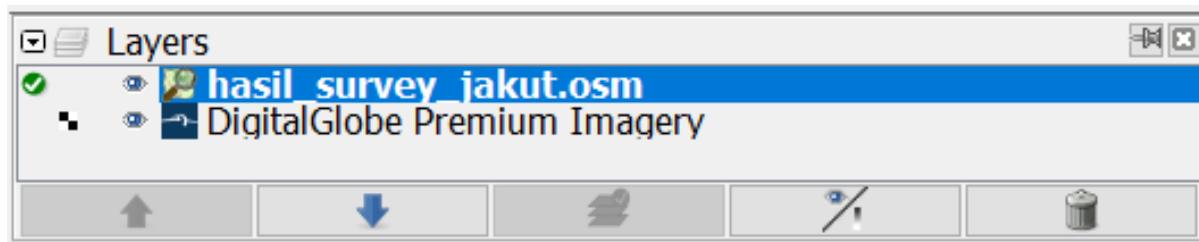


Inactivating Auto zoom for satellite imagery

V. Editing OSM Data Using JOSM

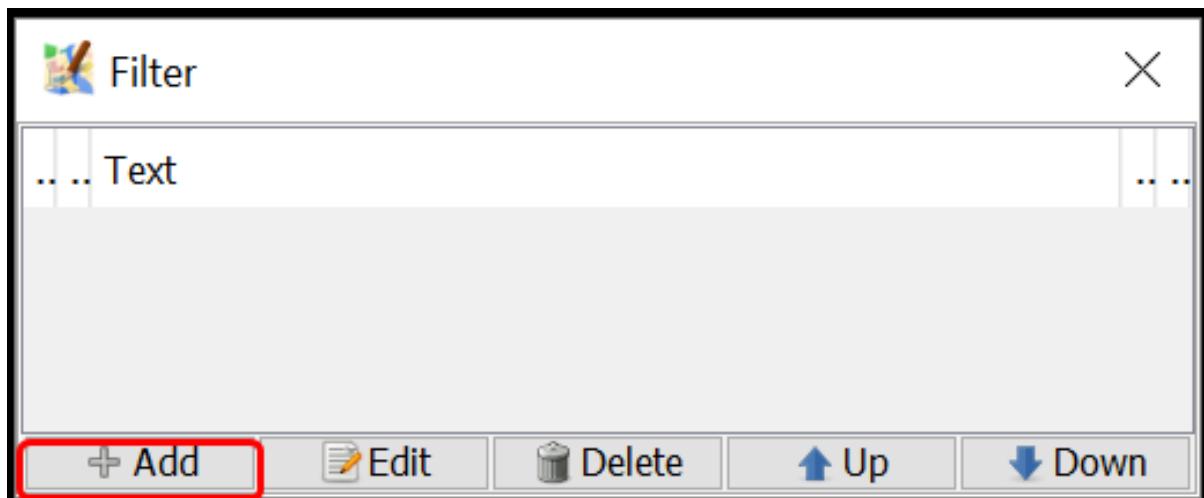
Now you are ready to add or to edit OSM data using JOSM. You can draw new objects or you can edit the existing objects using the tools mentioned in **Using JOSM** module. Here are the steps on how to add or edit OSM data using survey data, downloaded OSM data and satellite imagery that you already added before on JOSM:

- After successfully following the steps mentioned in the previous sections, there will be two layers on your JOSM: **satellite imagery layer** (in the picture below, the layer meant is DigitalGlobe Premium Imagery layer) and **merged survey data with downloaded OSM data layer** (in the picture below, the layer meant is *hasil_survey_jakut.osm* layer). It will look like this:

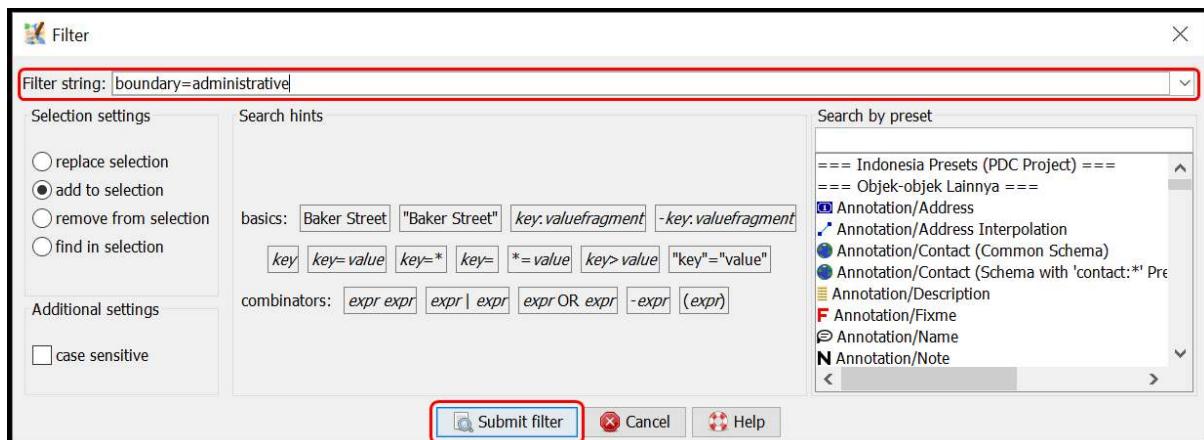


Satellite imagery layer and merged survey data with downloaded data layer

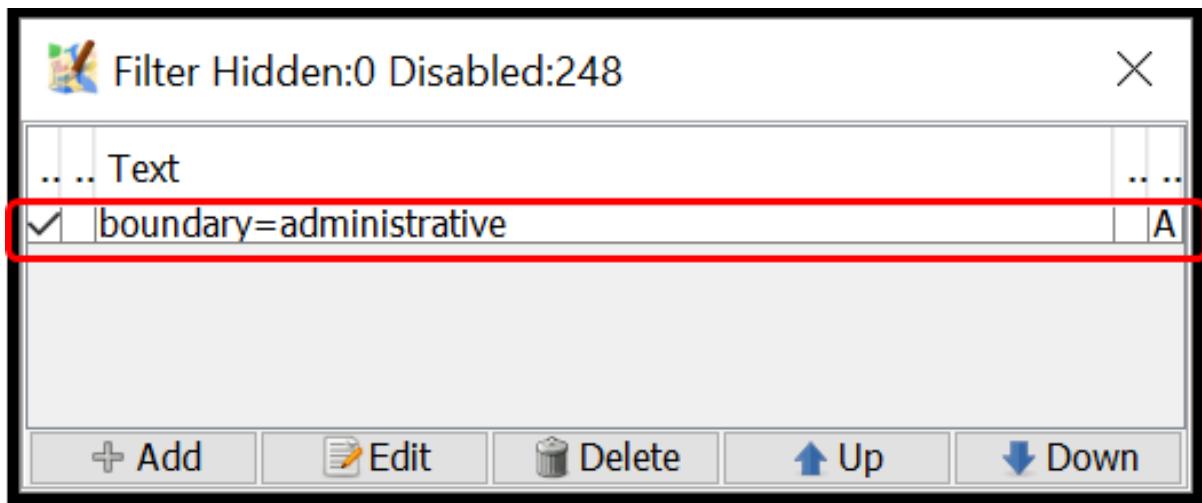
- You can use **Filter** feature on JOSM so that you don't accidentally make changes on other objects such as administrative boundaries. Administrative boundaries in OSM is a delicate objects, so if there are already administrative boundaries mapped on your mapping area then it is better to utilize the **Filter** feature. To use this **Filter** feature, activate the Filter Windows by clicking menu **Windows** → **Filter**. There will be Filter Windows in the right panel. Click **Add** in the Filter Windows, type **boundary=administrative** in the **Filter string** box and click **Submit Filter**. New filter will appear for the administrative boundaries. To turn off the filter, simply uncheck the checkmark on the left of the filter. You can find out more about **Filter** feature on JOSM in the **Using Filter on JOSM** module.



Filter Windows on JOSM

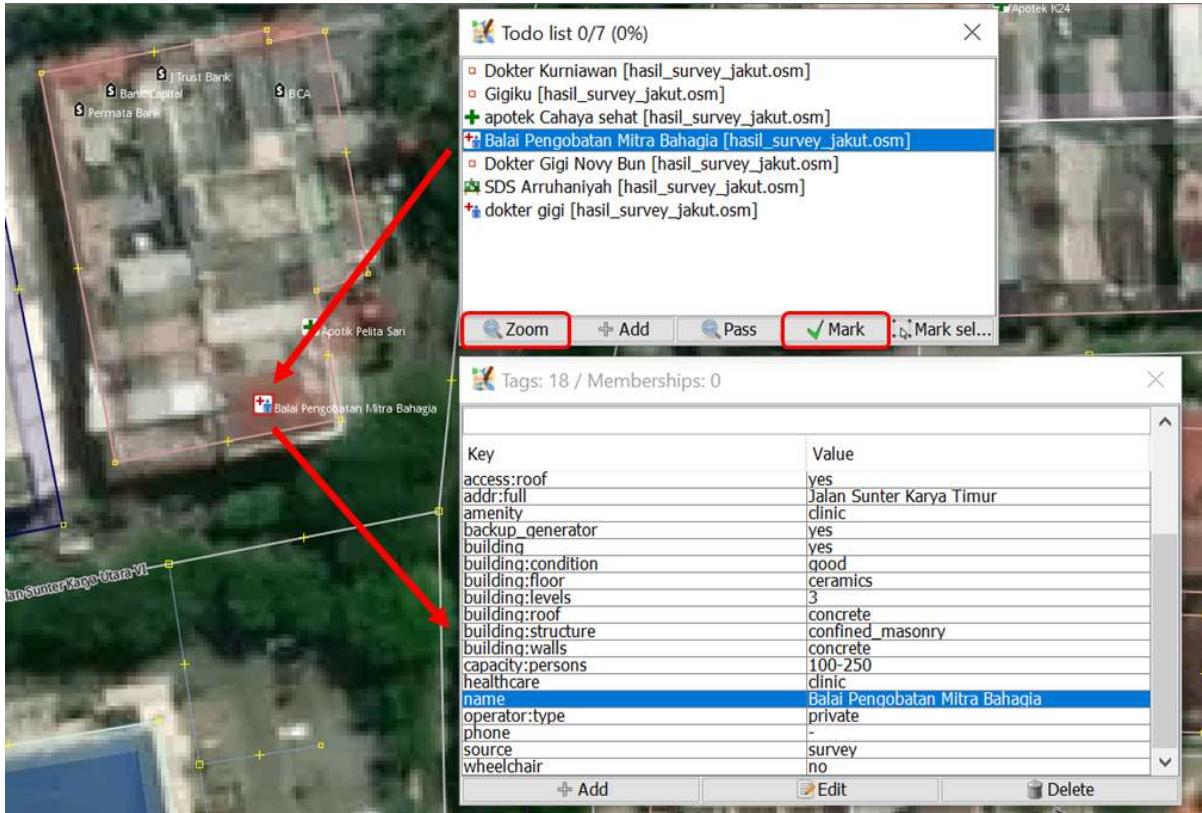


Adding filter string in the Filter Windows

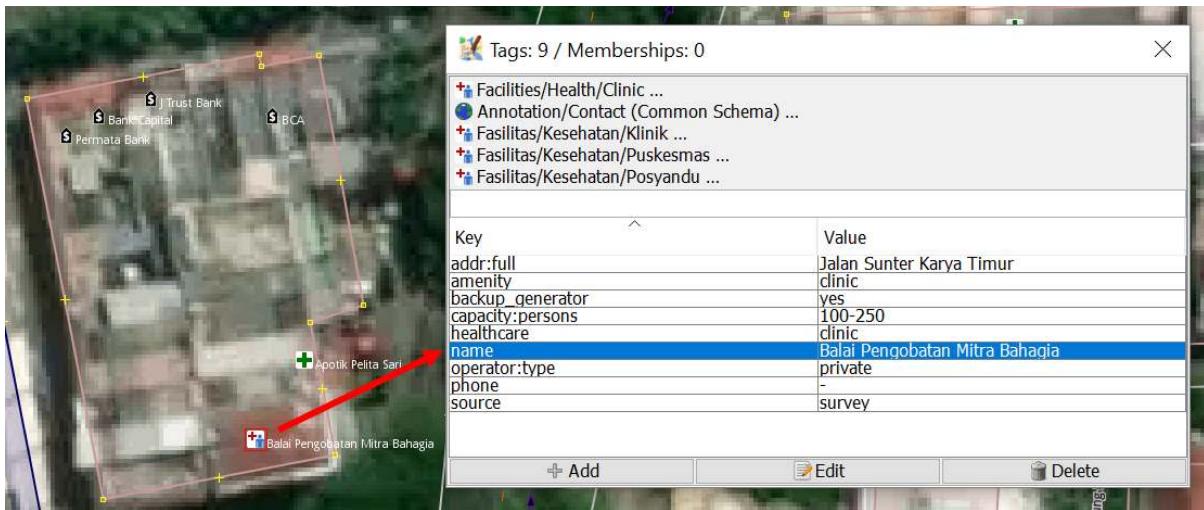


Newly added filter in the Filter Windows

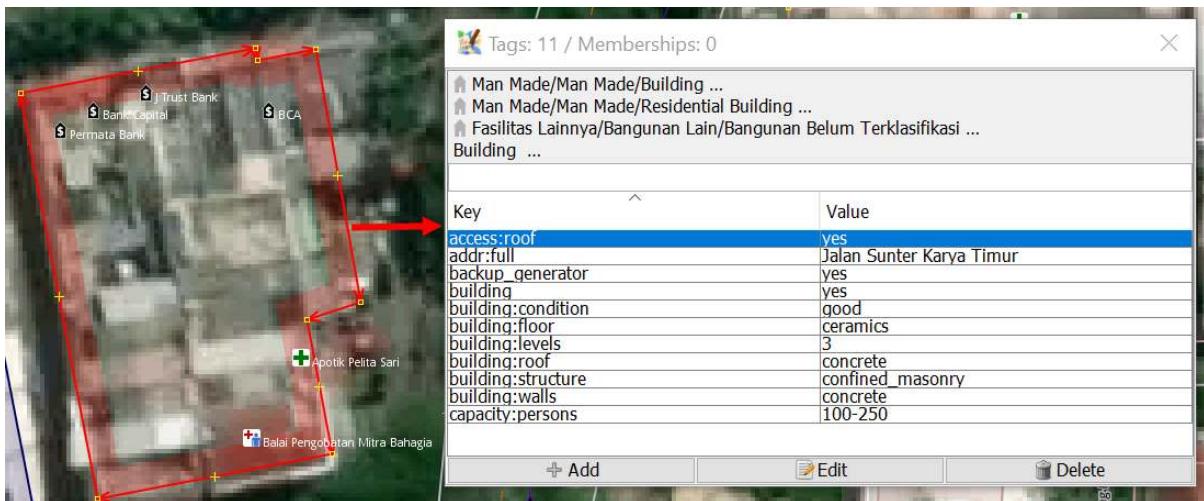
- Start mapping by zooming in to an object, select one object in the Todo list Windows and then click **Zoom**. After selecting and zooming in one object, you can copy the tag from the selected object to the downloaded OSM objects. Select the downloaded OSM object that aligns with the selected survey object, then click menu **More tools → Copy tags from previous selection** or press **Shift + R** on your keyboard. Make sure you selected the aligned survey object right before copying its tags to downloaded OSM object. Also make sure that the copied tags are consistent with OSM mapping guidelines and suitable for the object type. For example, in the picture below, a clinic located in a shophouse complex, mapped as a point and only have tags suitable for point object. While the building related tags added to the shophouse building where the clinic is located. When you finish copying tags for one object, click **Mark** to identify that it is just already mapped on OSM. Repeat until all of the objects mapped on OSM.



Using Zoom dan Mark feature on the Todo list Windows

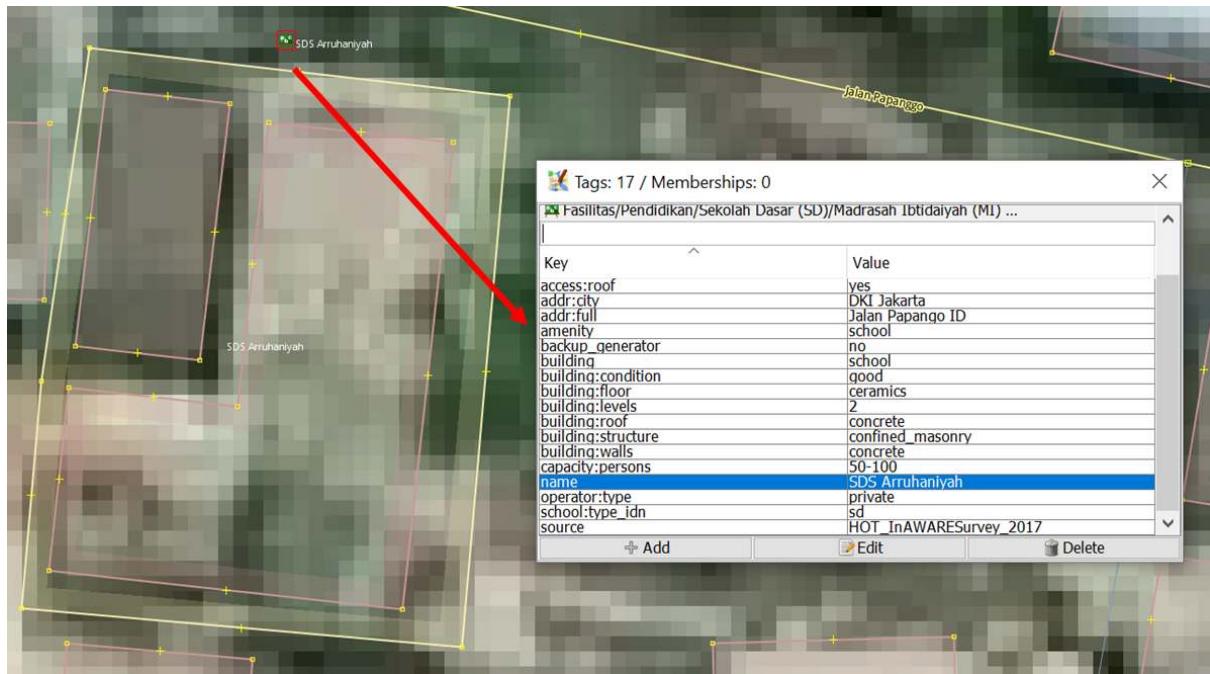


Tags suitable for point object

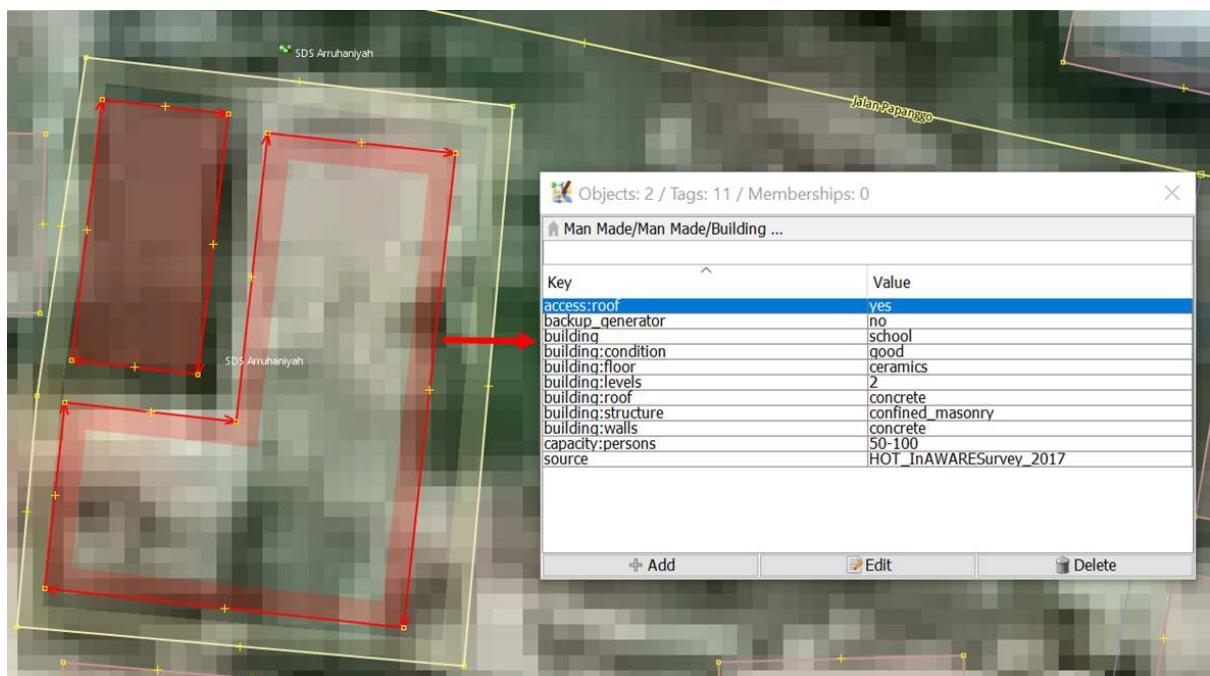


Copying building related tags using Shift + R

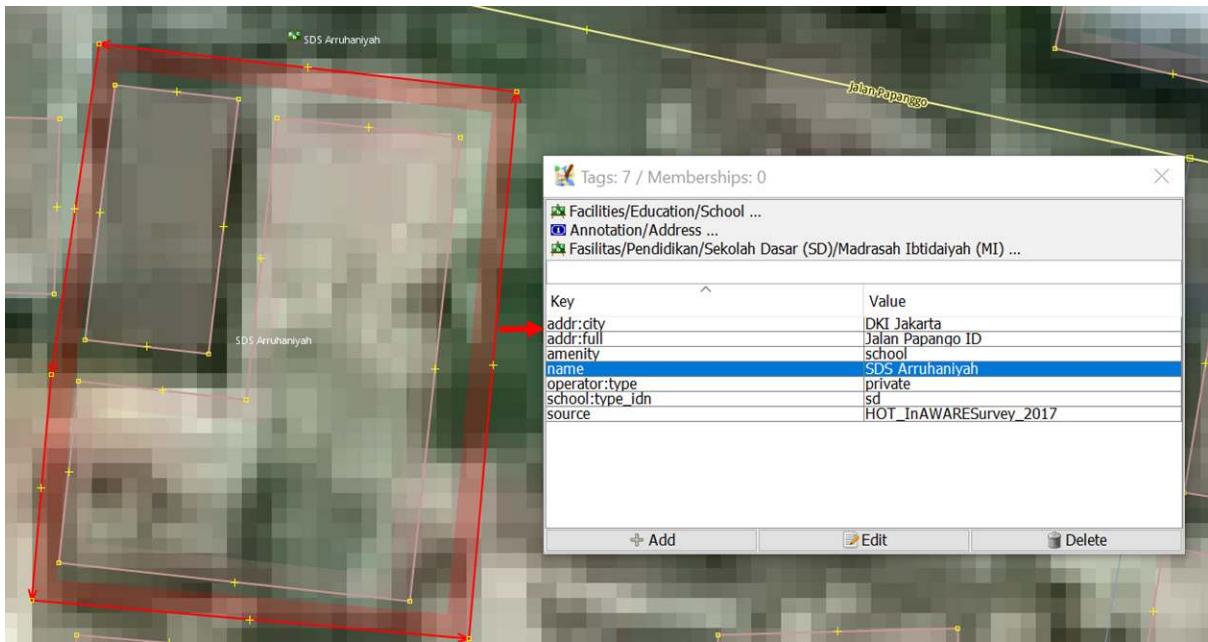
- Example given above is for point object. When you find an object that is supposed to map as a polygon, such as school complex which has more than one building inside, how to map it on OSM? Select the school object in the Todo list Windows and then click **Zoom**. Select the point object on the map. Copy the tag to the building polygon aligned with the point object by selecting the building polygon and then clicking menu **More tools → Copy tags from previous selection** or pressing **Shift + R** on keyboard. After copying the tags, delete tags that are not related to building and left only building related tags. Draw a polygon covering all school area using **Draw nodes**, then copy tags that are suitable for school area (tags that you deleted before in the building polygon) like **amenity**, **name** and **addr:full**. After that, delete the school point from the survey data since it has just been mapped as a school area polygon.



School point from survey data



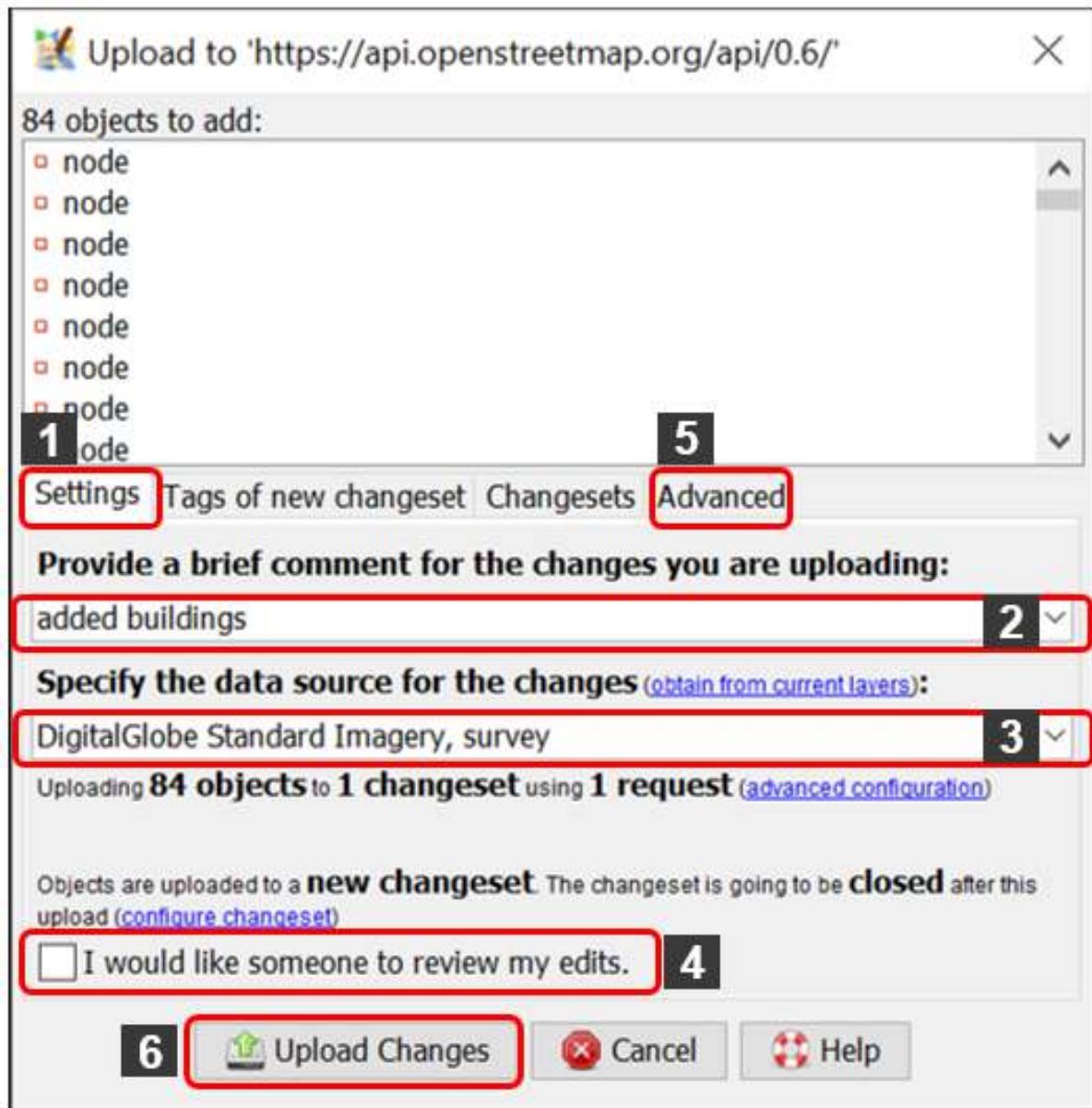
Tags suitable for school building



Tags suitable for school area

VI. Saving Changes

- If you have already done mapping using JOSM, save changes to OSM server because the newly added objects are saved only in your computer. To save the changes you've made, click menu **File → Upload Data**.
- If you encounter warning/error after clicking Upload Data, it is better to fix warning/error first. You can find out more about fixing warning/error and common warning/errors found in **Survey Data Validation Using JOSM** module. However, if you don't have the time to learn how to fix warning/error, you can just go ahead and click **Continue Upload**. Upload Windows will appear.
- If there is no warning/error, Upload Windows will appear. On the Upload Windows, type a brief comment for the changes you've done in the comment box and specify the source(s) in the source box. Type the name of the satellite imagery and survey in the source box. If you want other contributors to review your edits, give a checkmark next to **I would like someone to review my edits**. Then click **Upload Changes**.

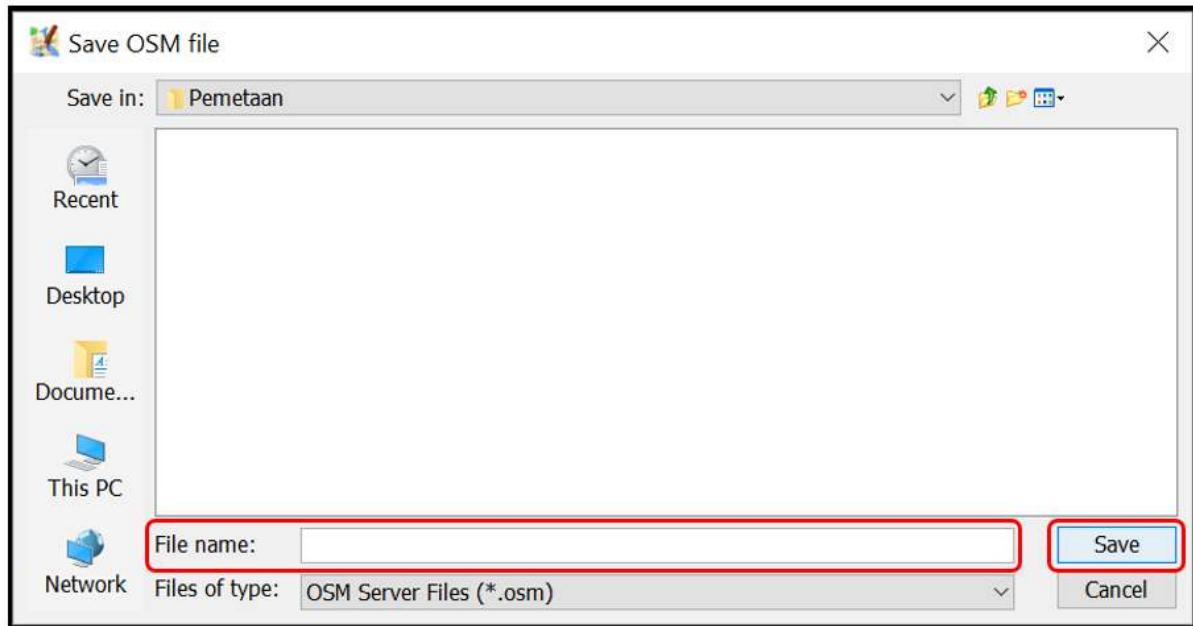


Upload Windows on JOSM

Note: You need to periodically upload your edits when mapping so that there won't be a hefty amount of edits to upload. The more edits you want to upload, the more time it takes to upload. If you already mapped a lot of edits and haven't done any upload, you can upload it by chunk. You can do it by clicking tab **Advanced** and select **Upload data in chunks of objects** in the Upload Windows. Type the **Chunk size** with how many changes you want to upload per chunk, such as 500. This can be done to avoid incomplete upload, especially when your internet connection is unstable that resulted in object duplication.

VII. Saving .osm File

- You can also save your editing layer by right clicking on your editing layer and click **Save**. **Save OSM file** Windows shown below will appear. Type the name of your file, then click **Save**. Your file will be saved in .osm format.



Save OSM File Windows on JOSM

Note: If you haven't finished mapping your area and you want to continue mapping it later, you can save your work as .osm file then you can continue mapping it later. You can open your saved .osm file by clicking menu File → Open, choose the file you want to open and click Open. After opening it, update the OSM data first by clicking menu File → Update Data and you can go ahead to continue mapping.

VIII. Viewing Changes in the Map

- You can view your changes by checking it on OSM website and directing it to your mapping area. Keep in mind, new changes can be viewed a while after uploading it to OSM server.



OSM map before and after mapping process

SUMMARY

If you can apply and follow through to all of the steps mentioned in this module, then you are able to go through OSM mapping process using JOSM successfully. You are able to do OSM mapping process, such as downloading OSM data, adding satellite image, editing OSM data, uploading changes, saving OSM data as .osm file and viewing changes. You can upload your changes periodically, such as by region or by village. If you already have finished conducting survey in one region or in one village, you can upload it directly to OSM. This shall be done so that your survey data is not piled up and others can perform data validation for your edits.

5.1 Using ODK Collect

Overview

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.

This guide provides **surveyors, mappers and field supervisors** with the skills to:

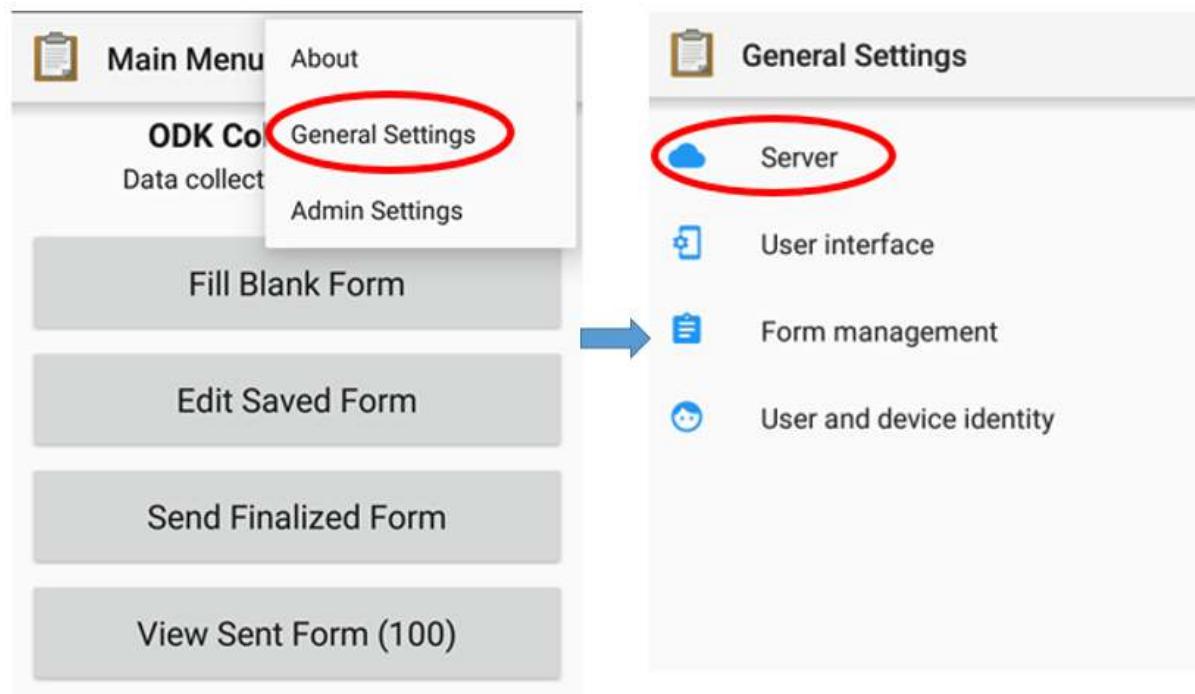
- Complete the initial setup for ODK Collect
- Use ODK Collect for data collection surveys

Initial Setup for ODK Collect

1. Set the URL Server

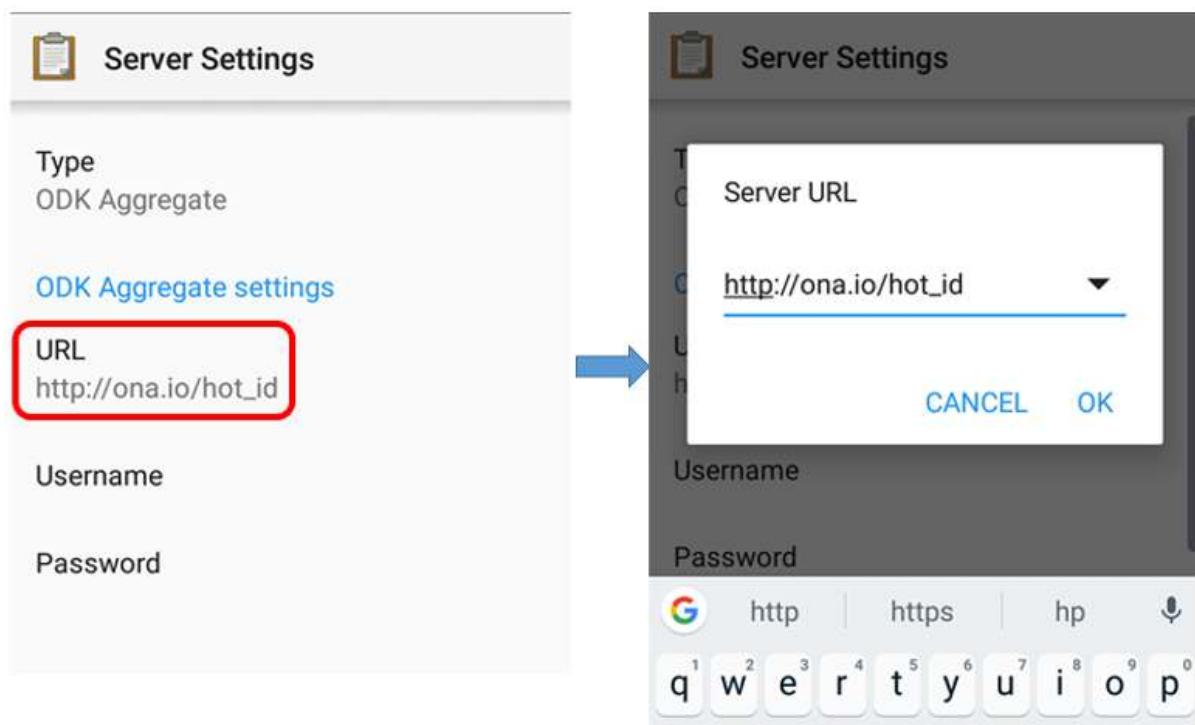
To take the form survey from the server for the first time, the user needs to set the URL server. There are the steps:

- 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**

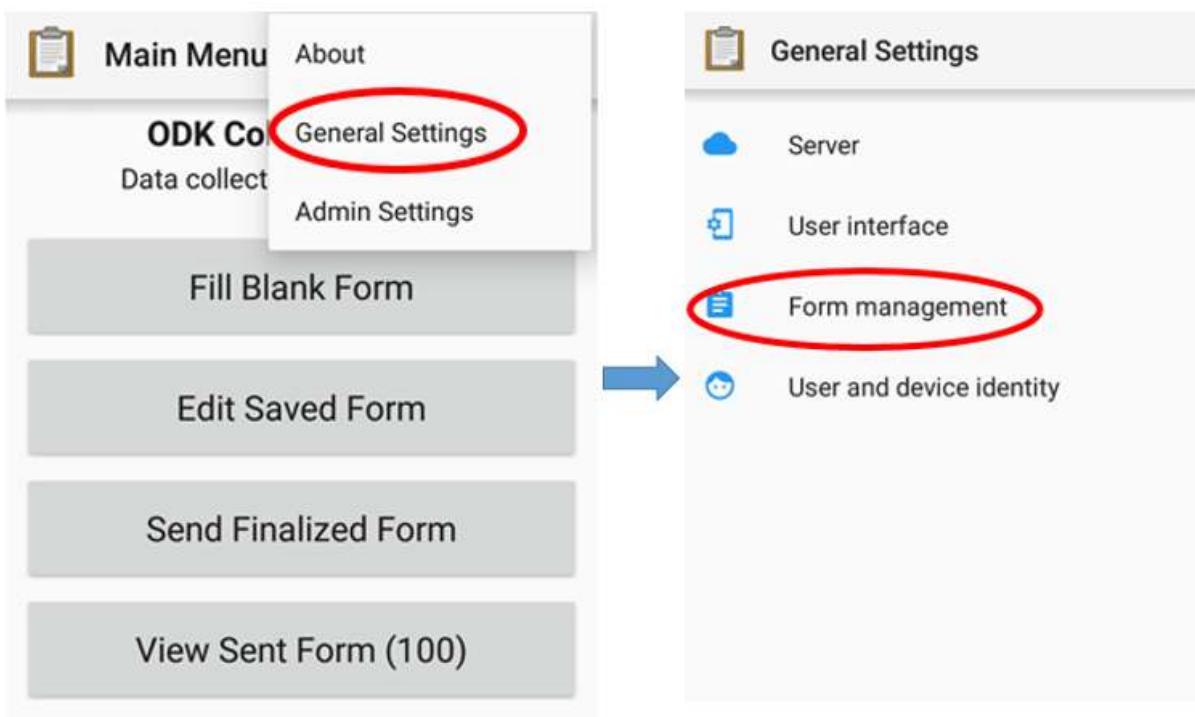


Step to fill the URL address in ODK Collect

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.

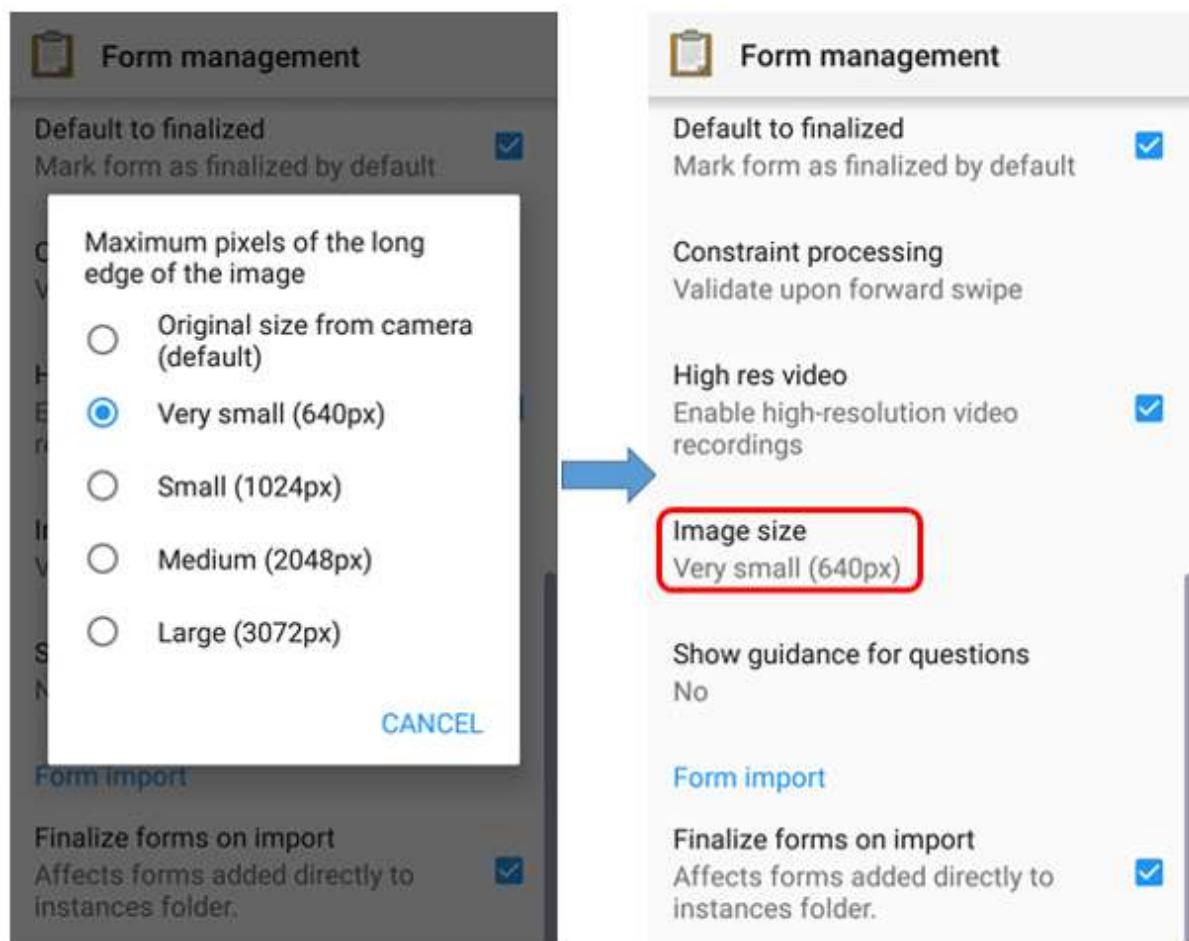


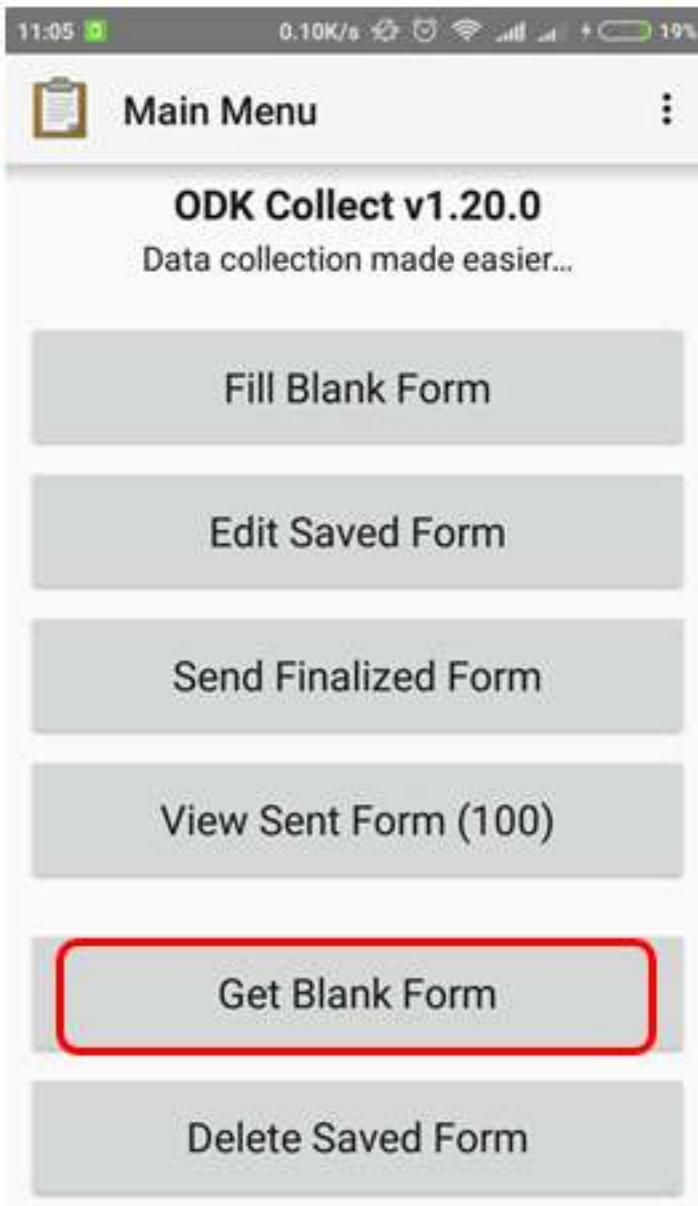
Image Size menu to set the image resolution

ODK Collect basic operations

1. How To Get a Blank Form Survey From Server

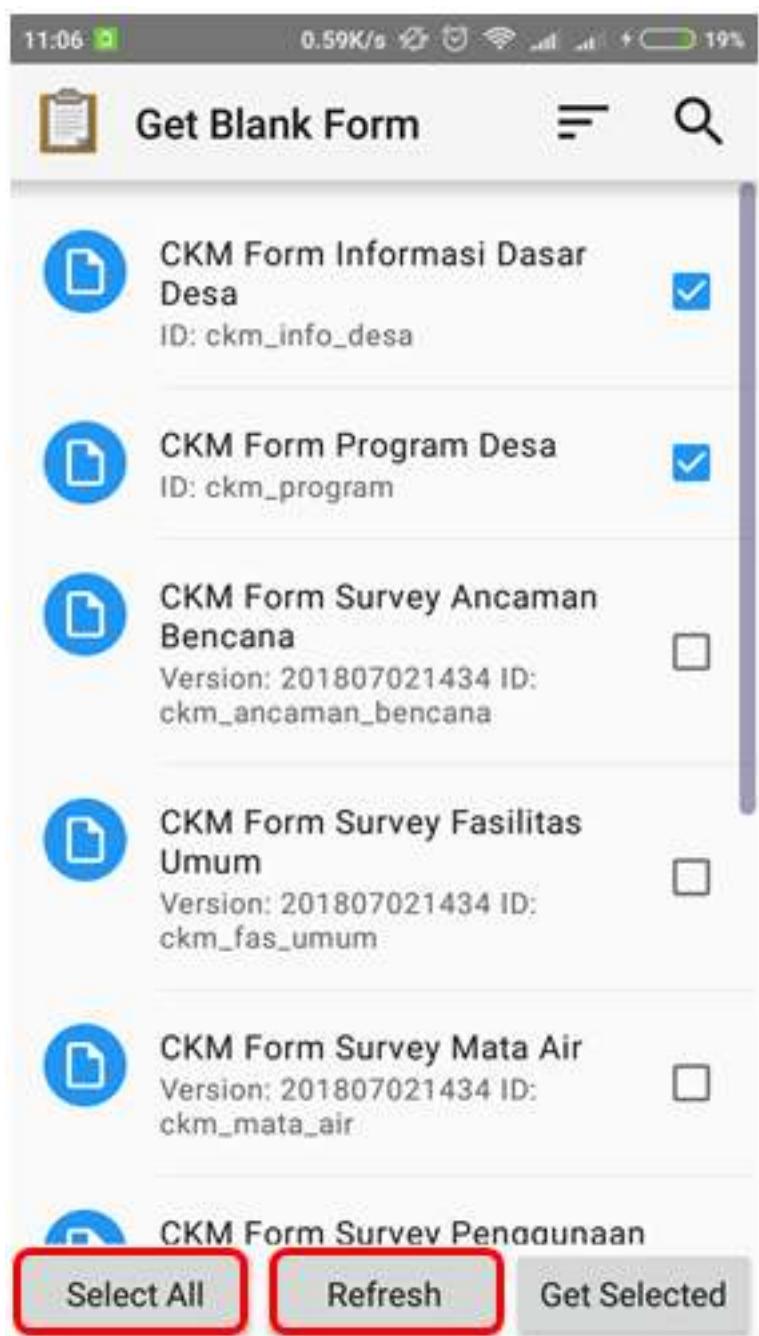
Before you fill-out the form survey that you made before, you need to download the blank survey form from specified server. For further explanation about create a survey form in ODK, you can learn in **Making Survey Form for ODK & OMK applications** module. You can follow this step to take a blank survey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

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



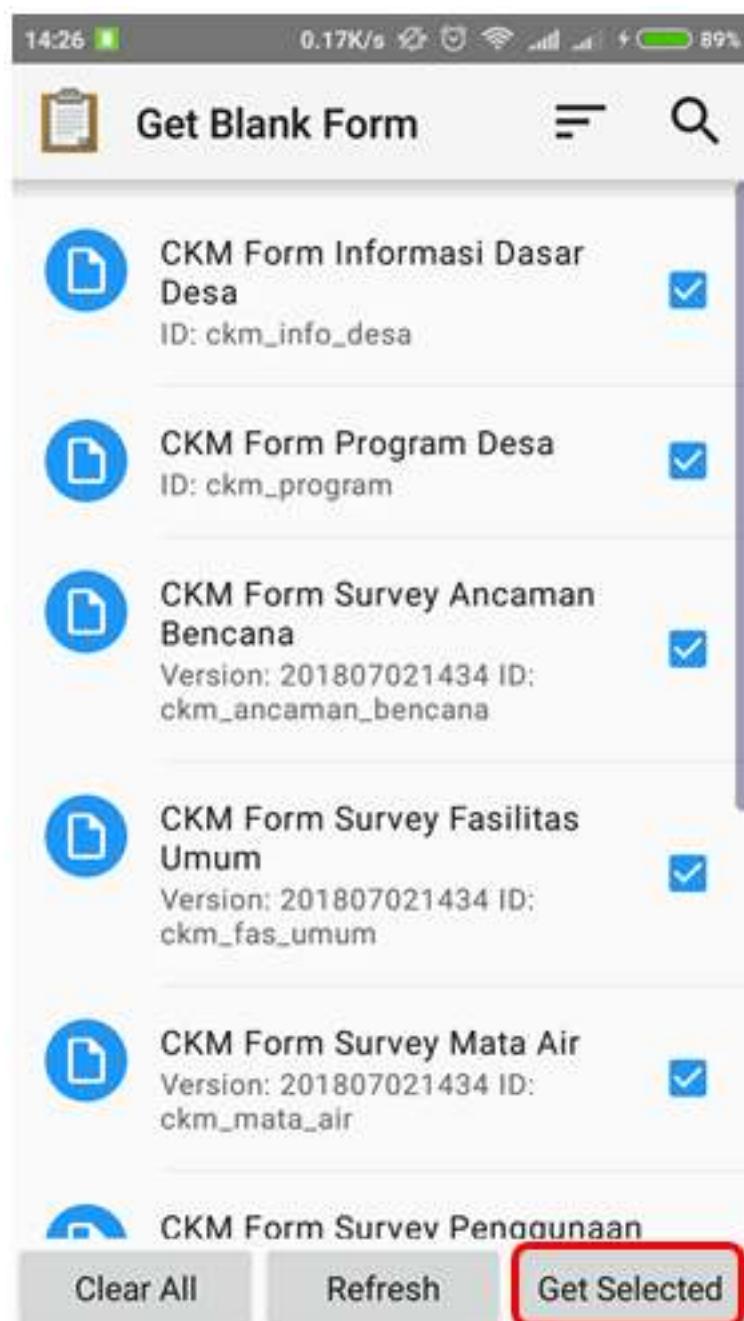
Get blank form options to take form on a server

- 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.



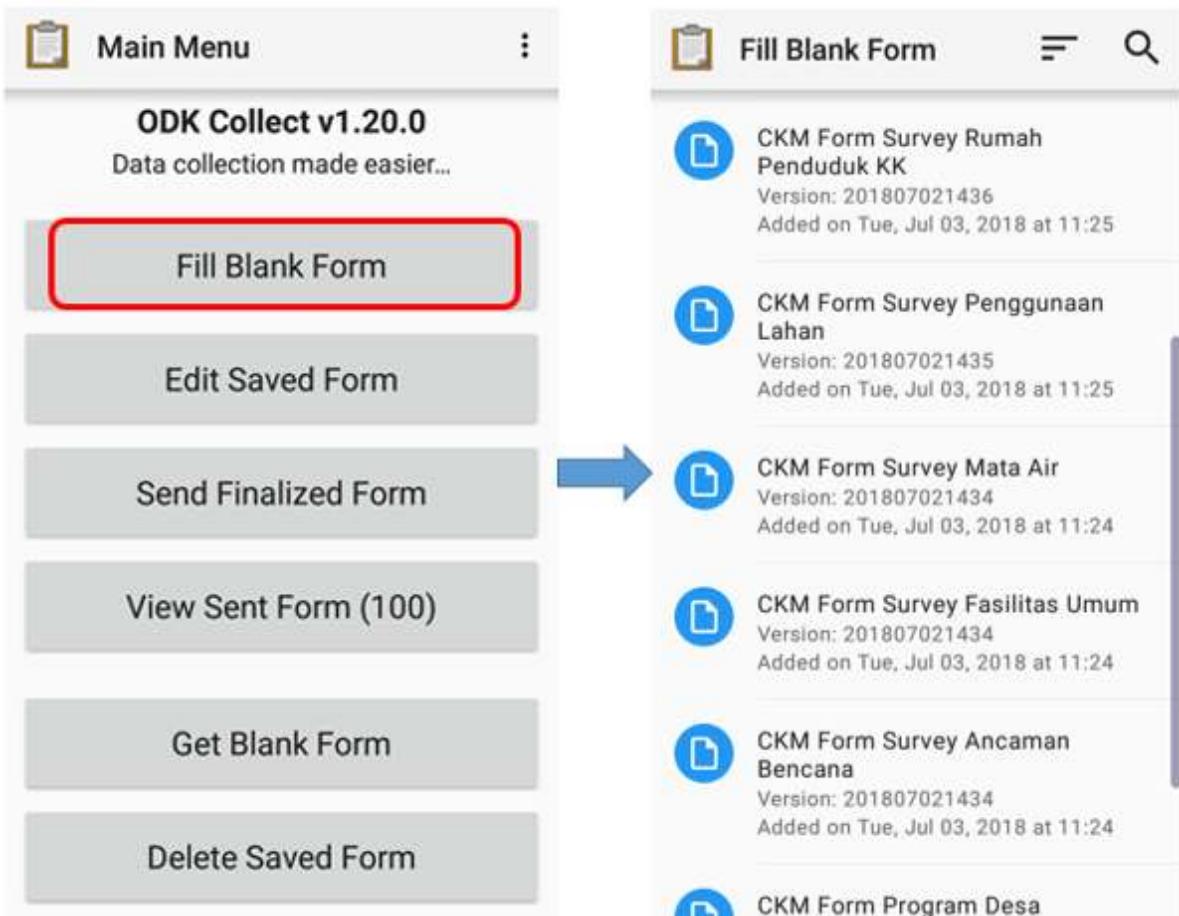
Page display on Get Blank Form menu

- 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.



* 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 OpenMap-Kit** on the form. You can learn about using OMK application in the module **Using the OpenMapKit**.



GRAB Jakarta...



* Pilih tag osm untuk objek ini

Anda akan beralih ke aplikasi OpenMapKit untuk memilih tag bangunan

Launch 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.



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 Saved Form



CKM Form Survey Fasilitas Umum

Finalized on Tue, Mar 05, 2019 at 14:47



CKM Form Survey Fasilitas Umum

Finalized on Tue, Mar 05, 2019 at 11:54



CKM Form Survey Fasilitas Umum

Finalized on Tue, Mar 05, 2019 at 11:55

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

- Then, press floppy disk icon

The image shows two screenshots of a mobile application interface for survey data entry.

Left Screenshot: A list of survey fields and their values. Fields include:

- * Nomor PERANGKAT/ALAT GPS
GPS-5
- * Nama surveyor
Budi
- Nama Desa
MASEBEWA
- Nama Dusun
Dusun Masebewa
- RT
1
- Nomor Peta
2
- Nomor Titik pada GPS
001
- * Nama Objek

At the bottom are two buttons: "Go To Start" and "Go To End".

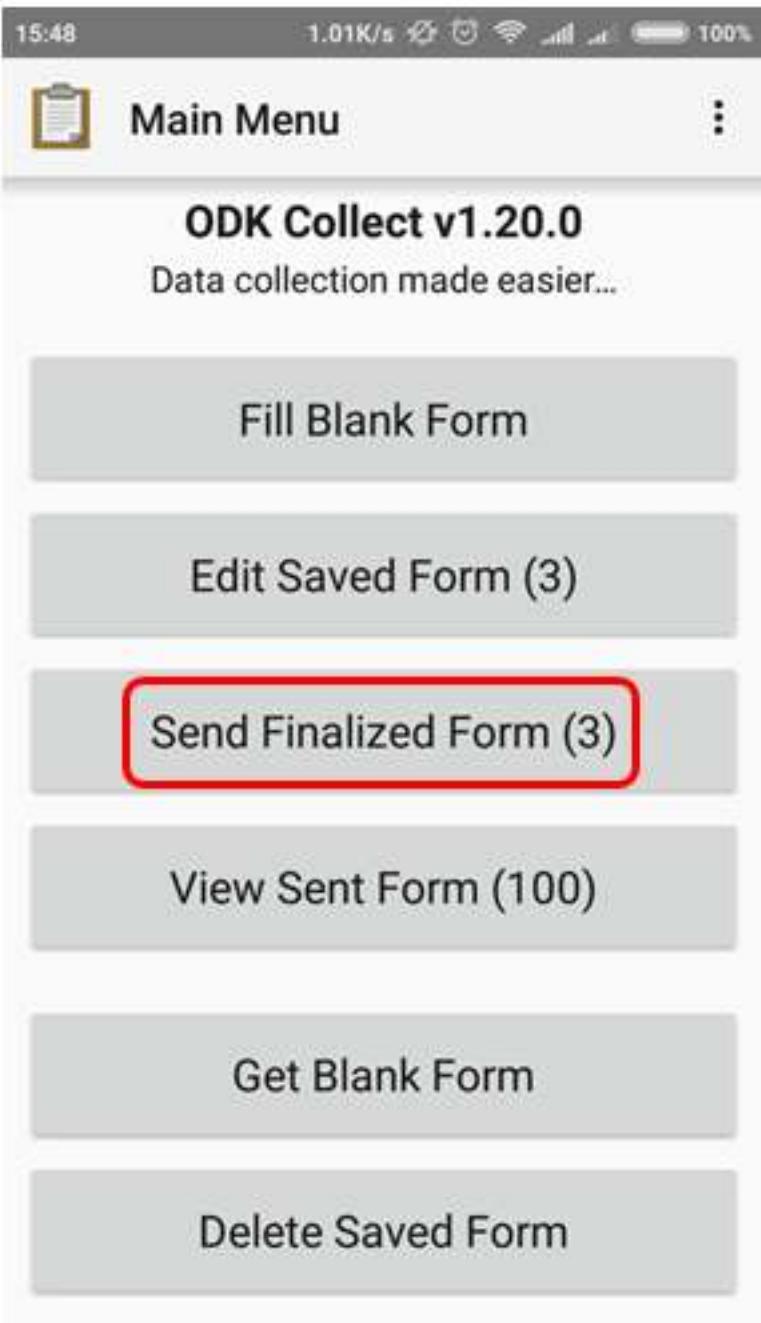
Right Screenshot: A modal window titled "CKM Form Sur..." with a red box around the "Send" icon. The modal lists "Tipe Dinding" options:

- Bata
- Kayu
- Bambu
- Seng

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

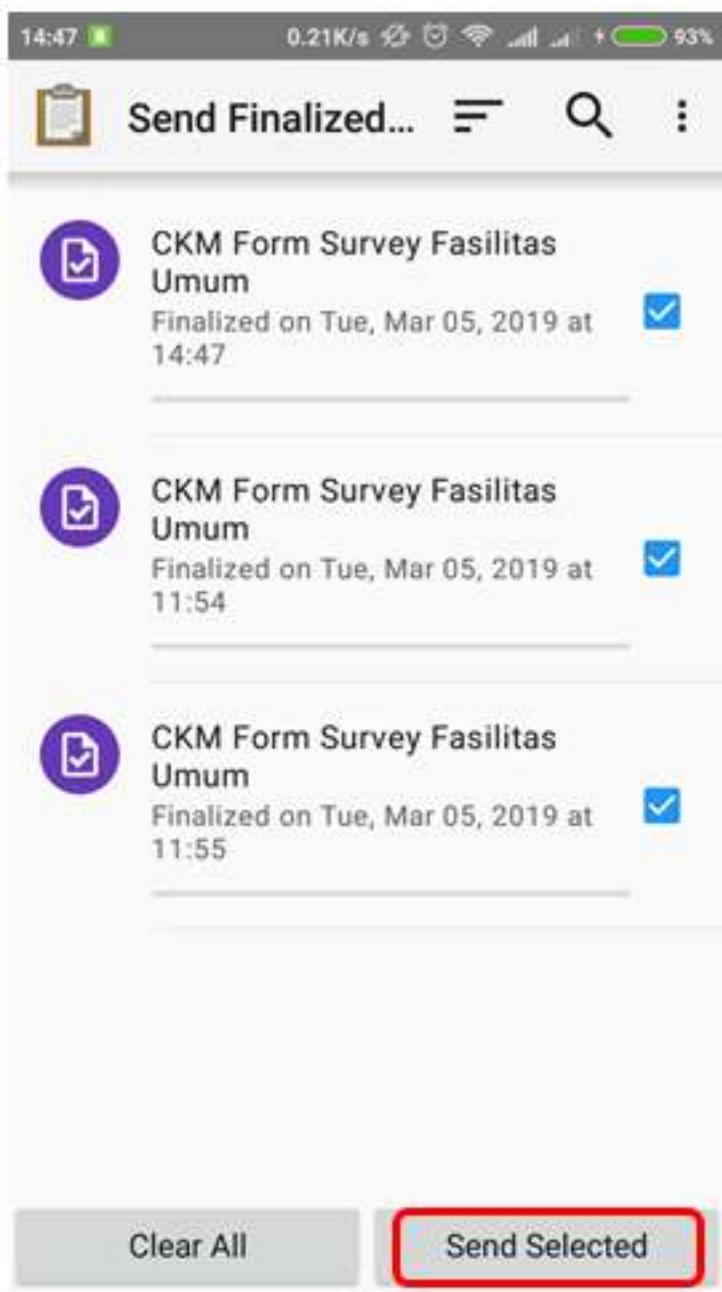
4. Upload Survey Forms to Server After you fill and save the form, the next step is upload form survey to server. You can follow this step to upload form to server:

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



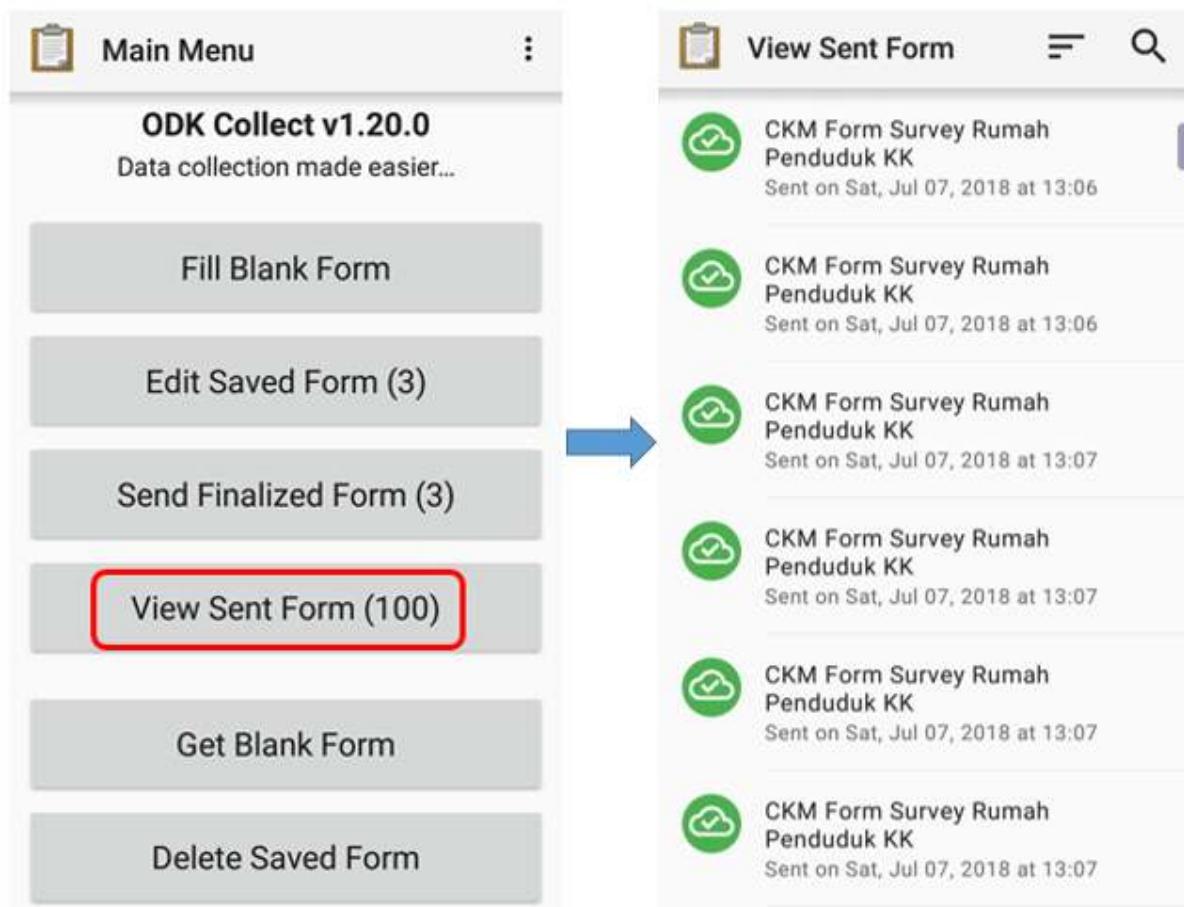
Send Finalized Form to upload a survey form to the server

- 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.



Main Menu

:

ODK Collect v1.20.0

Data collection made easier...

Fill Blank Form

Edit Saved Form (3)

Send Finalized Form (3)

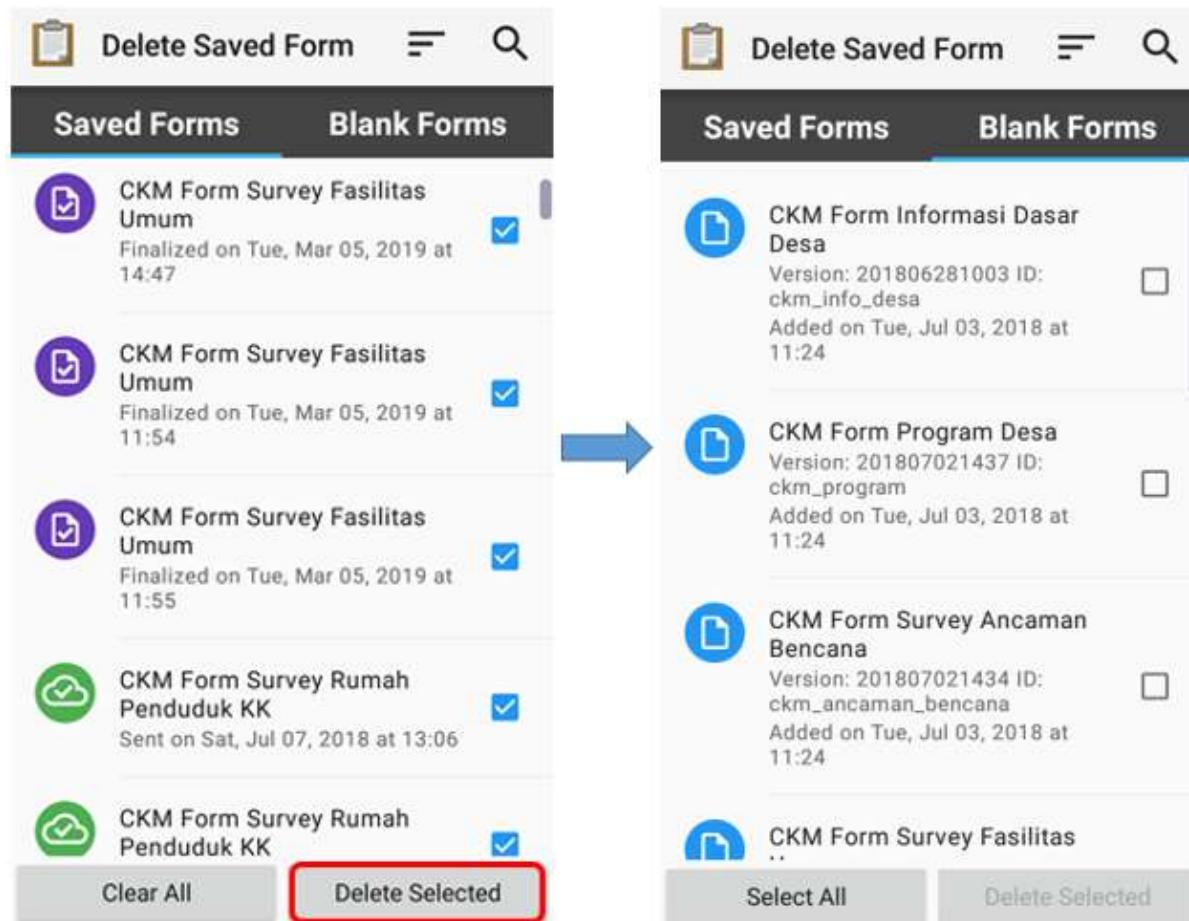
View Sent Form (100)

Get Blank Form

Delete Saved Form

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](#)

Umum

Finalized on Tue, Mar 05, 2019 at
11:55



CKM Form Survey Rumah
Penduduk KK



Sent on Sat, Jul 07, 2018 at 13:06



CKM Form Survey Rumah

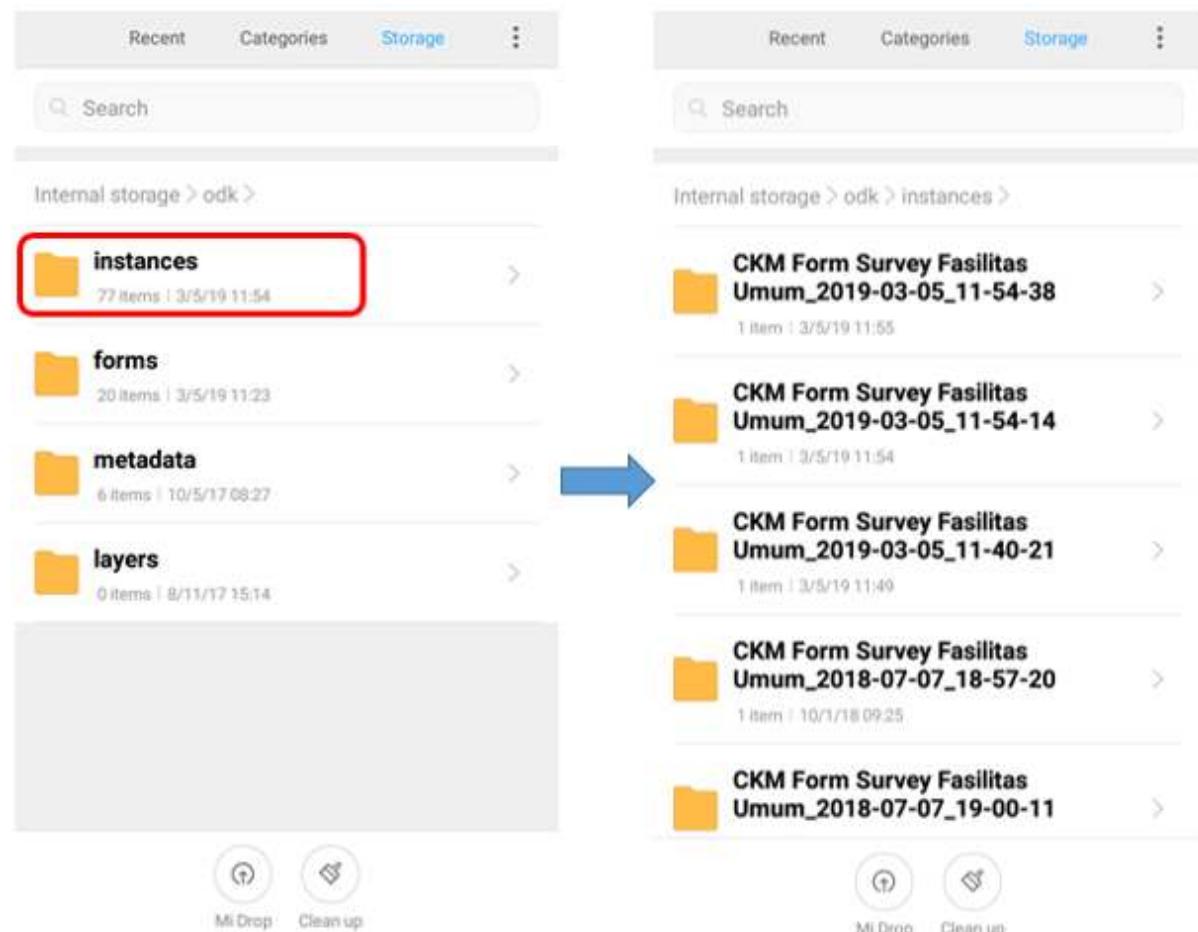
[Clear All](#)

[Delete Selected](#)

Delete confirmation dialog box

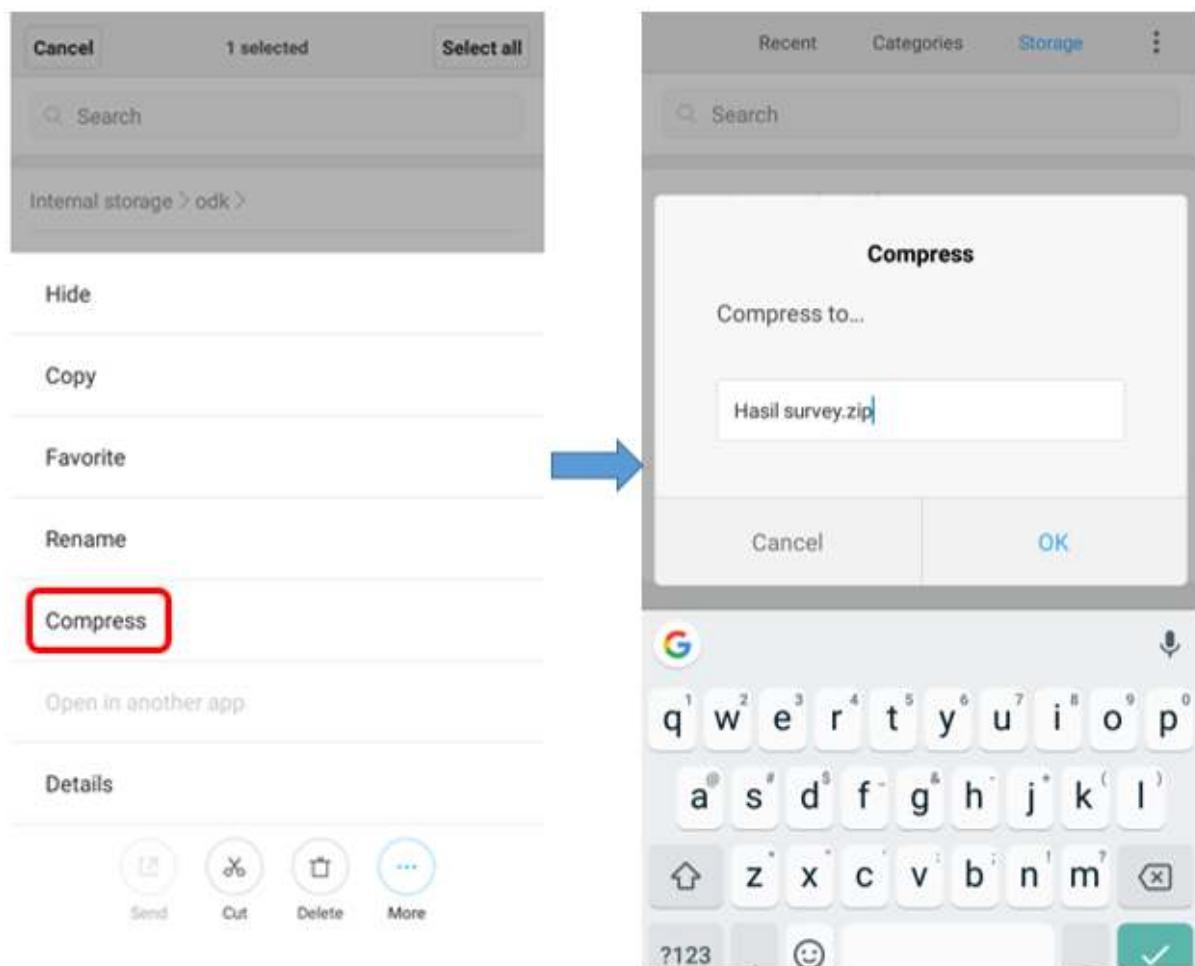
5. Upload Survey Form to Google Drive After you upload all the survey form to server, you need to save and upload the survey result file in .zip format in Google Drive folder that was created by your mapping supervisor. This is the step:

- 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.



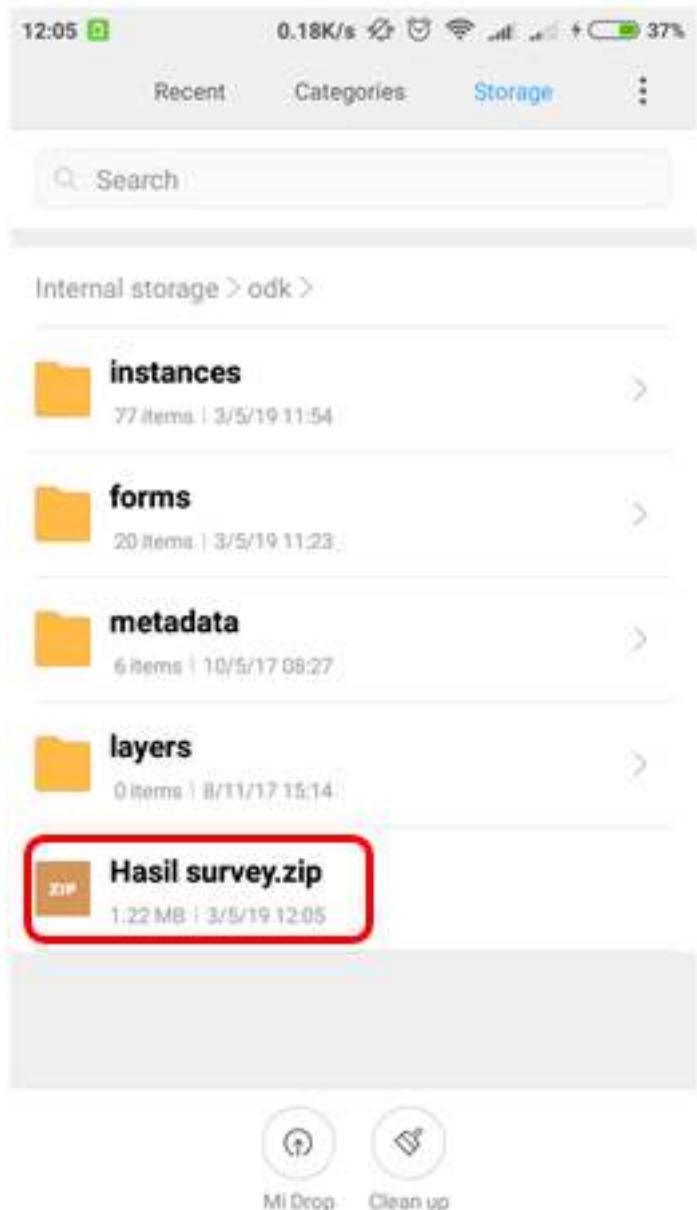
Instances folder in ODK folder and the survey result in instances folder

- 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.



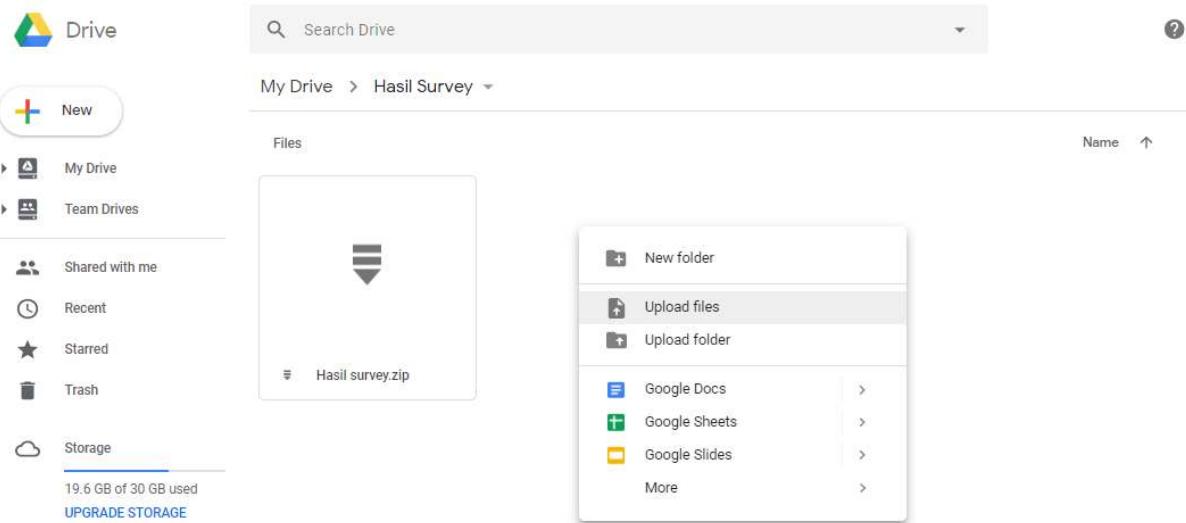
The step for convert to .zip format

- 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

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_[yourOSMusername].osm
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]/_private for example akweteyman/2019-01-31/03_final_lusdavo folder. * File name: akweteyman_2019-01-31_final_lusdavo_private.osm
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.

5.2 Using the OpenMapKit Application

Overview

OpenMapKit (OMK) 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*.

This guide provides **surveyors, mappers and field supervisors** with the skills to:

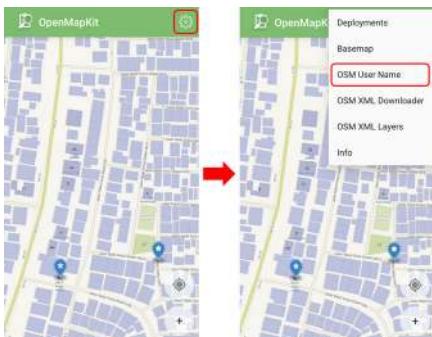
- Operate the initial setup for *OpenMapKit*
- Operate how to enter offline basemap for *OpenMapKit*
- Operate *OpenMapKit*

Prior to learning how to use **OpenMapKit**, users should know how to use *ODK (OpenDataKit) Collect*, an android-based application to replace paper form for surveys as *OpenMapKit* is an extension of *ODK Collect*. This extension is used to add information on the position or location of the object surveyed.

Initial Setup for 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*



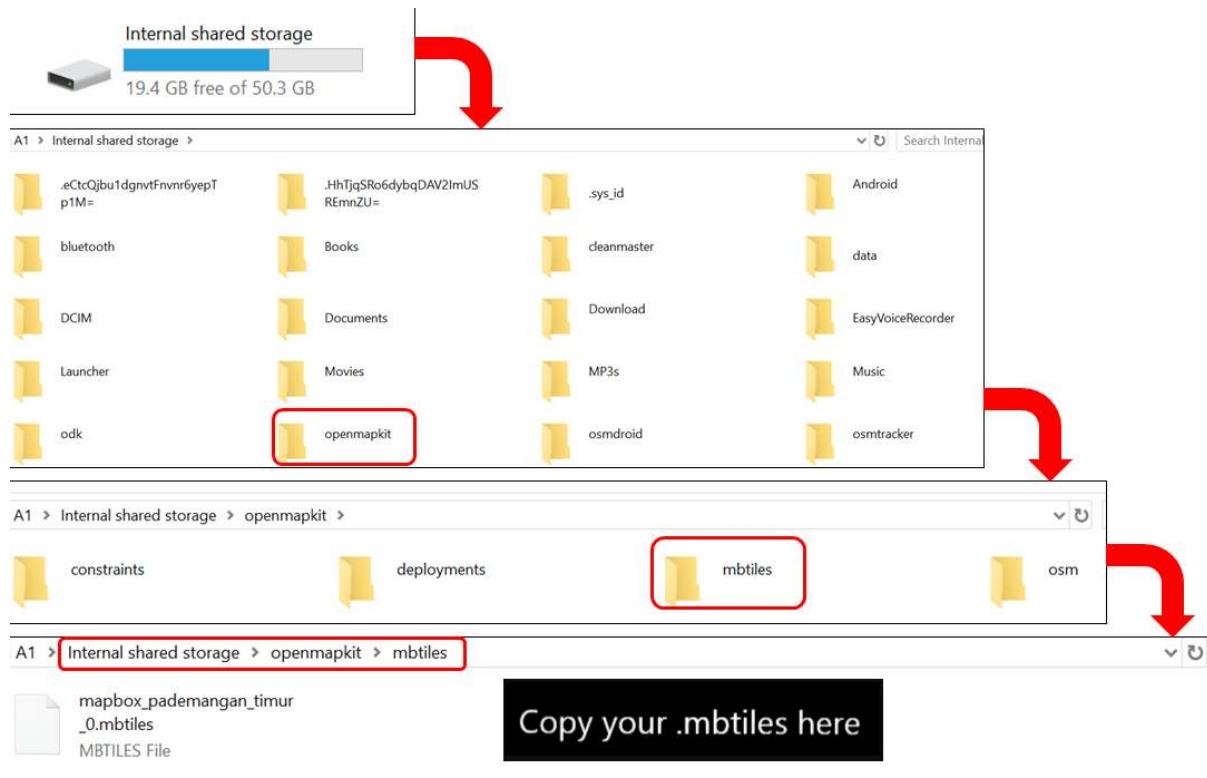
Display settings menu OpenMapKit

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

Import the offline basemap for OpenMapKit

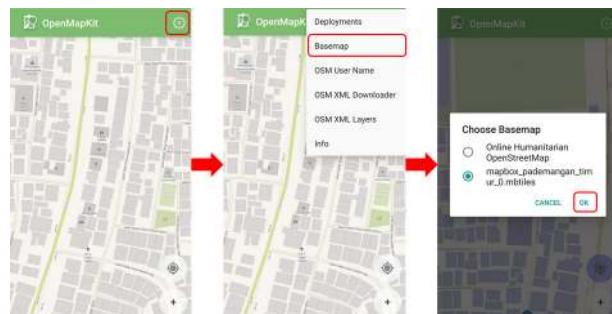
OpenMapKit provides an OSM map as a basemap that must be accessed using an internet connection. But don't worry, you can also enter offline basemap into *OpenMapKit* which is a map that can be opened without an internet connection. An offline basemap can make it easier for you to add information right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

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)</i></p>

- 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_omk.png)
<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 building:

- 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 the page question on 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:

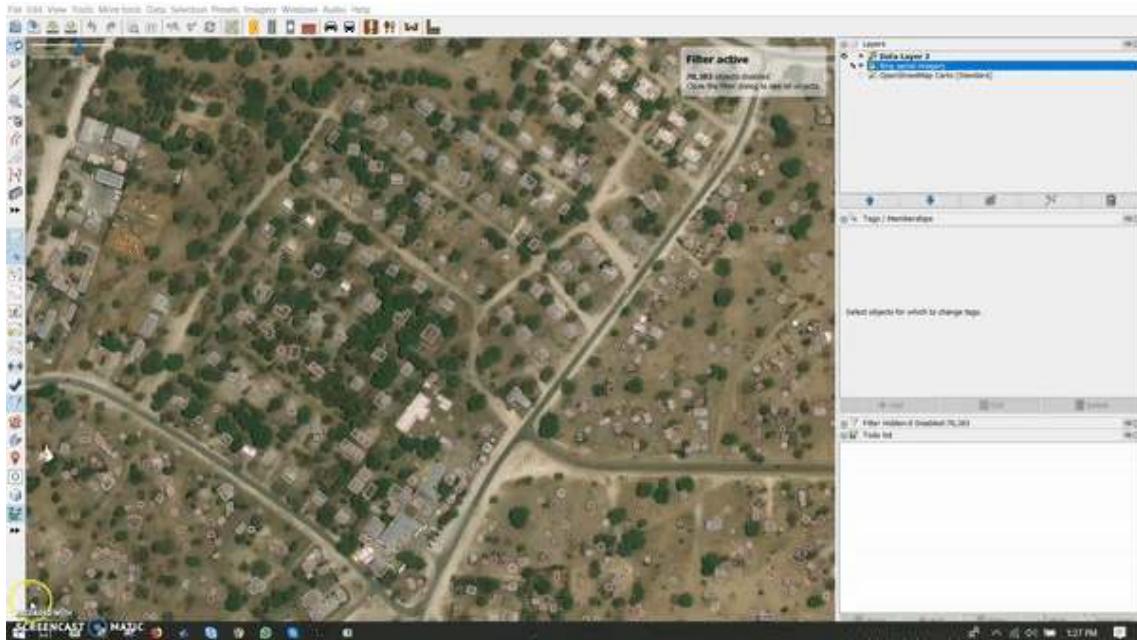
! [the point of objects already loaded with informations](images/using-omk/0314_finished_tag.png)
< p align="center"><i>Point of objects already loaded with informations</i></p>

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

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.

5.3 Using OSMTracker

Overview

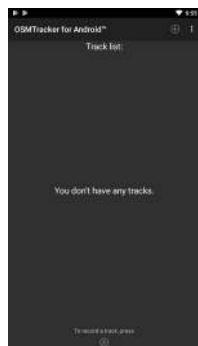
OSMTracker is an android application that allows us to record our survey data. Similar to GPS, OSM-Tracker is able to record waypoint and also track. If you want to learn more about GPS for field survey, you can see the **GPS Module**. What makes OSMTracker different with common GPS device is its capability 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

This guide provides **surveyors, mappers and field supervisors** with the skills to:

- Set up the OSMTracker for the first time
- Use OSMTracker for recording tracks and photos

Initial Setup for OSMTracker

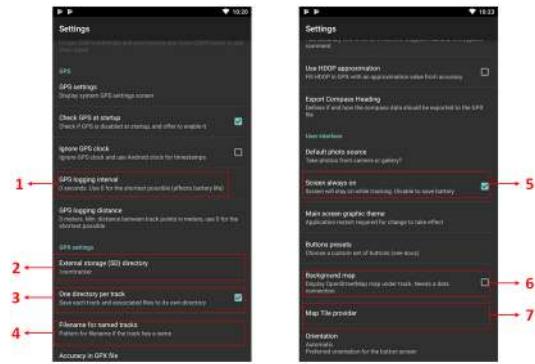
Before you can use the OSMTracker, there are few setting you have to do. Go to

☰ 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.

OSMTracker Basic Operations

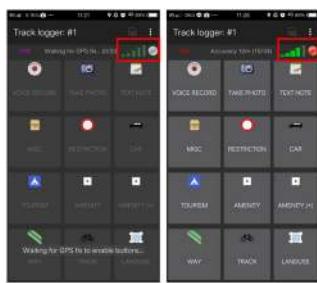
1. Recording Survey Track

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_penggunaan_text_note.md)
<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 can

! [You can choose to take the photos straight from your camera or select from your smartphone's gallery.]

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_jalur.jpg)

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.jpg)

1. Then choose **Resume Tracking**

Note :

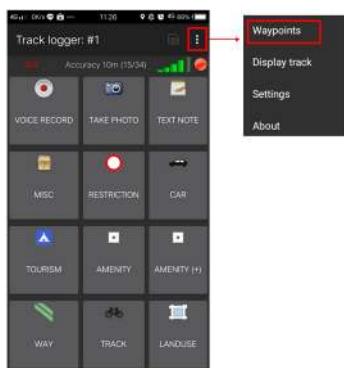


Figure 3: Ikon

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

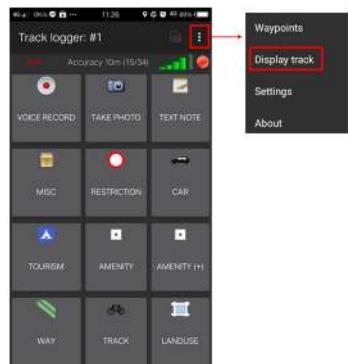
You will see the list of objects and the photos you have collected on the Waypoint list.



Waypoint list to see list of objects you have collected

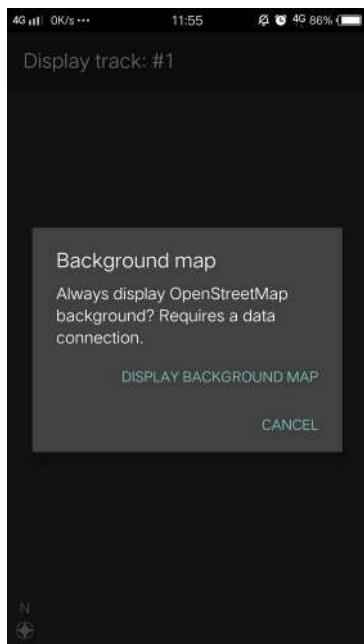
5. Showing Tracks and Waypoints Collected

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**.



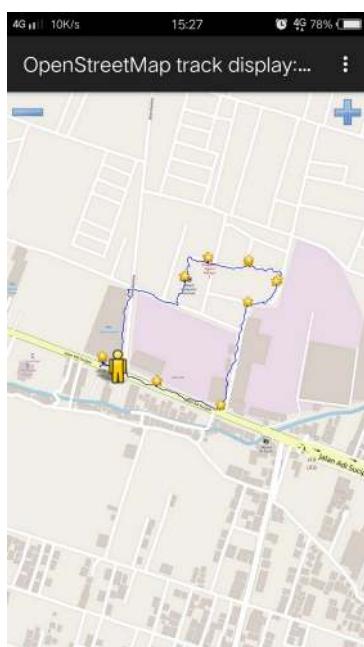
Display track button to see your track and objects you have collected

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.



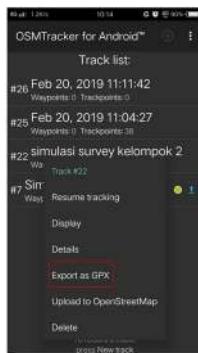
Track and object's collected on field survey

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

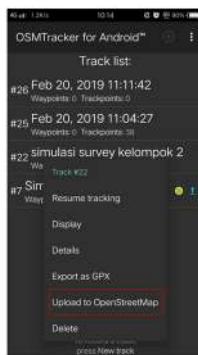
You can save your track and waypoint into .gpx data. You can open .gpx data with mapping software like **QGIS** and **JOSM**. On your survey file, select and press the file for a while, then select **Export as GPX**. If the process is successful, you can see the green dot on the right side of the file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

2. Public

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

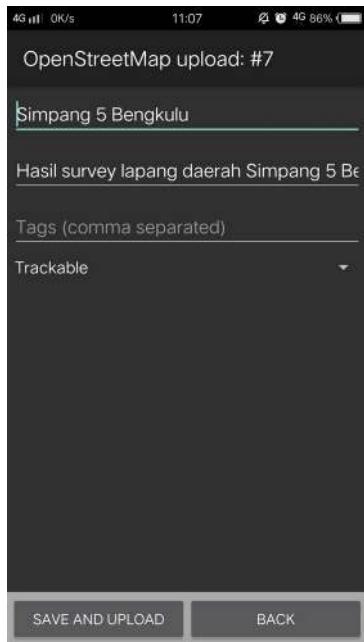
3. Trackable

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

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/0424_Contoh_data_gpx_di_<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

5.4 Quality Assurance and Quality Control

Overview

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 individual user, use OSMCha.
- Check for tagging issues, use Osmose AND JOSM Validation.
- Check for geometry issues, use Osmose AND JOSM Validation.

HOT Training Presentation:

Quality Assurance Tools

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.

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

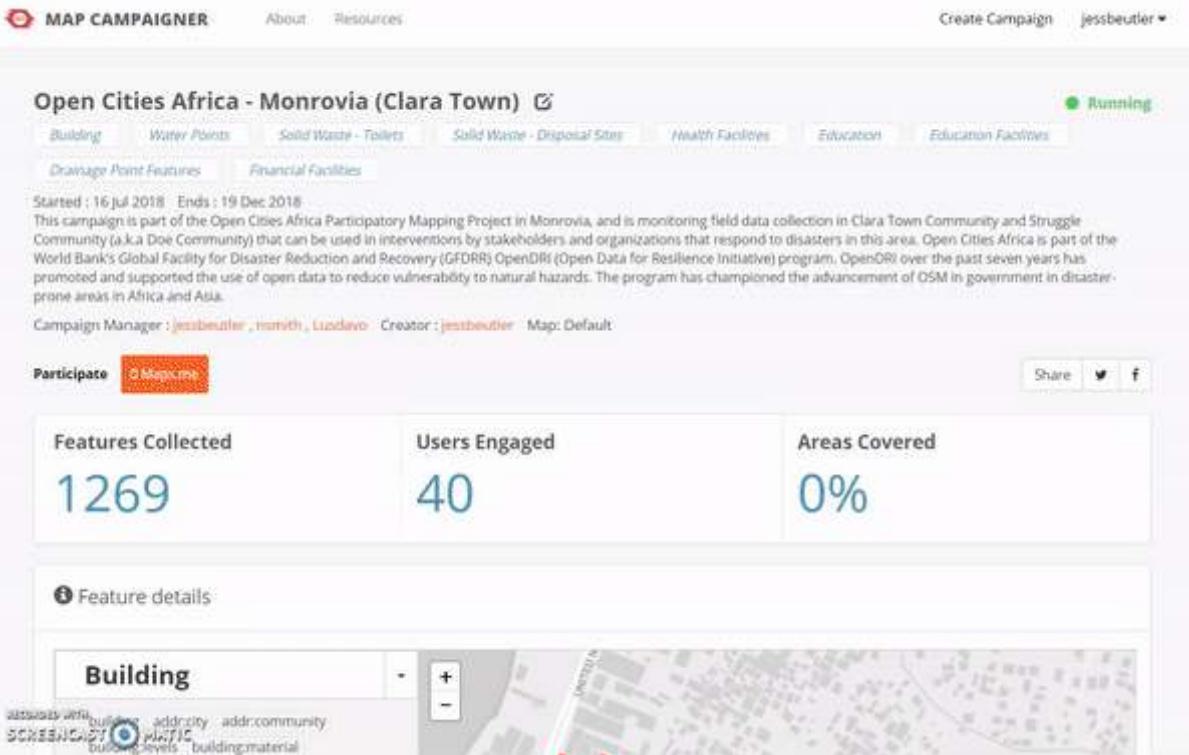


Figure 4: mc_monrovia

How to use MapCampaigner

OSMCha

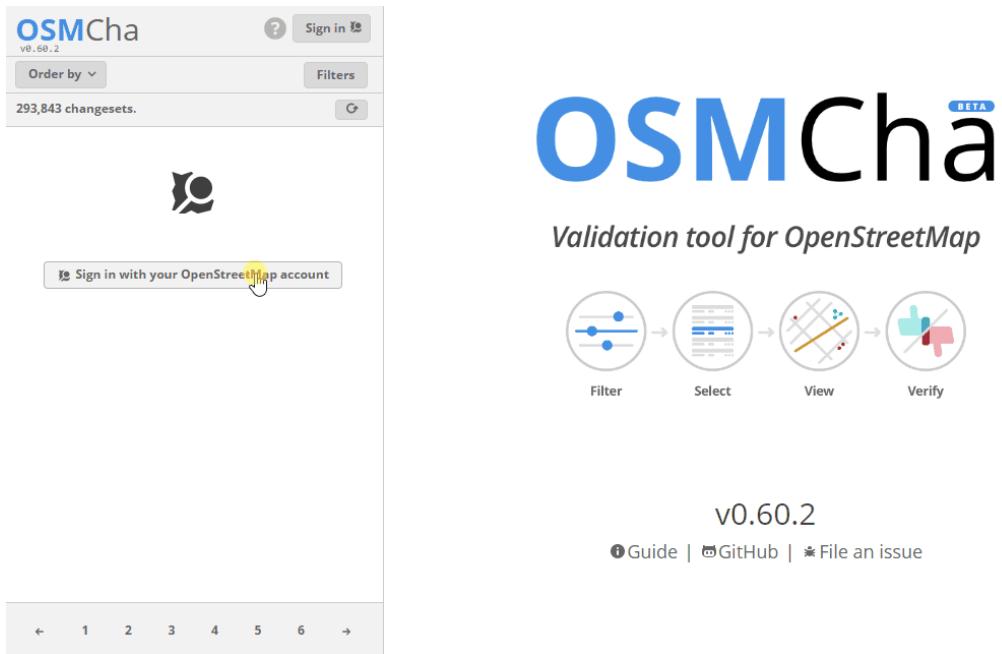
OSMCha, or the OpenStreetMap Changeset Analyzer, is a tool designed to review uploads and changes to OSM data, largely to prevent vandalism and bad edits made to map data. This tool allows users to filter by username, location, dates of upload, and other metadata features. OSMCha is useful for monitoring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

Skills and Technology Needed

- Computer with
- Internet connection
- OpenStreetMap Account
- Recommended: computer mouse

How to use OSMCha

1. Navigate to <https://osmcha.mapbox.com> in the Google Chrome or Mozilla Firefox internet browser.
2. To use OSMCha, you will need to sign in with your OpenStreetMap account and grant permission.



3. Once logged in, a left-hand panel will appear with changesets. Each changeset shows:

- OSM username
- Time of upload
- Changeset comment
- Changeset ID
- Flags (if any) - such as “Possible Import”
- Number of ways added (highlighted in green), ways modified (highlighted in yellow), and ways deleted (highlighted in red)

This screenshot shows a detailed view of a changeset on the OSMCha website. The top right corner shows 'Changeset: 74321392' and 'Open with'. The main area displays a list of contributions from users 'Huascaran1', 'Snowdonian', 'archaictryee', and 'Chusovaya'. Each contribution has a timestamp, a brief description, and a small icon indicating the type of change (e.g., 'possible import'). Below the list is a navigation bar with pages 1 through 6. To the right, a map shows a highlighted area around the 'Suwaga Correctional and Rehabilitation Center'. A legend at the top right of the map indicates '2 15 1' changes. The bottom right corner of the map includes copyright information: '© Mapbox © OpenStreetMap Improve th'.

- With OSMCha, you can create highly focused filters to monitor you and your team’s contribution to OSM. Clicking on ‘Filters’ on the left-hand panel will open the Filters menu.
- In this menu, unique filters can be applied such as OSM username, date range, locations.

The screenshot shows the OSMCha web application. On the left, there's a list of recent changesets from various users like 'DeccanPlateau' and 'Thingvellir'. Each changeset entry includes a timestamp, a brief description, and a small icon indicating its status (e.g., 'possible import'). On the right, there's a 'Filters' panel titled 'Basic' with sections for Date, Comment, and Location. The Date section has a date range set from '2019-09-03' to 'To'. The Location section includes a map of the world and a search bar. At the top right of the filters panel are 'Save', 'Reset', and 'Apply' buttons.

Practice creating a filter

1. Click 'Filters' on the left-hand panel.
2. Set filters for:
 - Start Date: 01/01/19
 - Your username
 - A location
 - One additional filter
3. Click apply.
4. Click on any of the changesets that appear on the left-hand panel. Do any changesets have flags or warnings?
5. Click on 'Filters' again to modify and/or add more filters.
6. To Save a Filter for later use, click on 'Filters' on the left-hand panel. In the upper-right, click 'Save' to choose a name for this Filter.
7. The exact filter can now be accessed using the URL or in the 'My Saved Filters' option after clicking on your username.

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.

How to use Osmose

1. Navigate to <http://osmose.openstreetmap.fr> in the Google Chrome internet browser.
2. Use the zoom, pan, and search features on the map to navigate to your area of interest.
3. Use the left panel to toggle common issues on and off.
4. 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).

To fix issues identified in Osmose

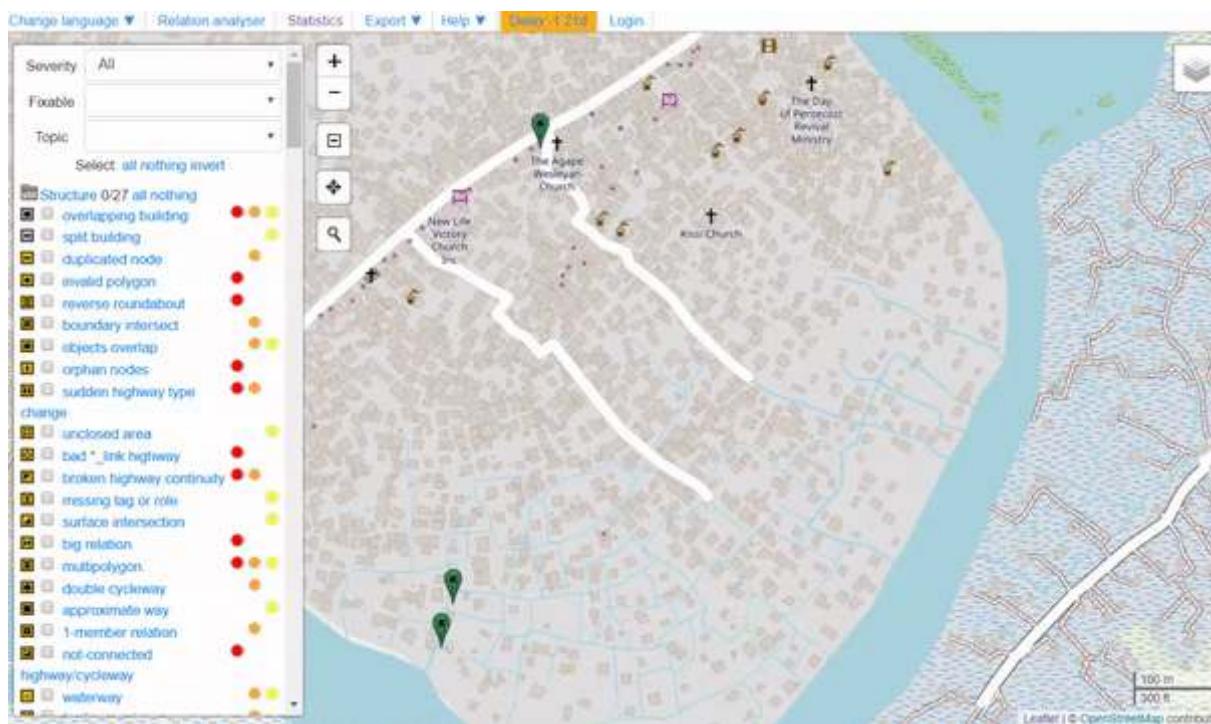


Figure 5: osmose_monrovia

1. Open JOSM on your computer.
2. In Osmose, locate the 'Export' button at the top of the page. Click 'Export', then 'JOSM'.
3. Fix the issues identified then re-upload to OSM.

5.4 Managing Teams in the Field using OSMTracker and QGIS

Overview

Central to effective and successful field data collection is a well thought out field data collection plan. This will ensure that field teams face the least number of challenges while out in the field, thus reducing the number of calls for field support coming to the supervisor.

When planning to deploy a team, it is important for the Supervisor to have a good picture of how many work days they have versus the man power available to do the work. Once this is done, they will then go ahead and create small sections of the mapping area, that can be covered in a day by a team of two mappers or a single mapper depending on the team arrangement.

Similar to the grid in Tasking Manager, creating sections for mapping allows supervisors to divide tasks, monitor progress, and be able to assess gaps or quality issues.

Skills and Technology Needed

- Computer
- QGIS Installed
- Basic QGIS skills

The following activity covers the process of generating mapping sections in QGIS for printing or importing files into OSMAnd. This activity uses the example of leading a team of 8 mapping volunteers to map Grootfontein Town, in Northern Namibia, during a Malaria Elimination Project. Example files are provided for this activity but can be followed with files provided by the user.

Creating Mapping Sections in QGIS for Printed Maps

Step 1: To begin, open QGIS on your computer and start a new project.

Step 2: Create an empty shapefile naming it: *grootfontein_sections.shp*

Step 3: Create sections of the town, giving them numbers. These sections should follow natural features or prominent landmarks such as swamps or roads. This is to ensure that ease of location of these sections by mappers.

Step 4: Make maps showing these sections. These maps can be printed out for sharing with the mapping volunteers. Teams can now head to their allocated sections to conduct field mapping.

Creating and Importing Mapping Sections into OSMAnd

OSMAnd provides a great alternative to printing out these sections maps. With OSMAnd, the Supervisor can instead use the following steps to give sections to team members for use in the field directly on their mobile devices.

Step 1: Export sections centroids from the *grootfontein_sections.shp* giving you *grootfontein_sections_centroids.shp*

Step 2: In QGIS, save the sections shapefiles (*grootfontein_sections.shp*) and the centroids shapefile (*grootfontein_sections_centroids.shp*) as a .gpx giving you a *grootfontein_sections.gpx* and *grootfontein_sections_centroids.gpx*.

Step 3: Transfer these two .gpx files from your computer to the *_Phone/Android/data/net.osmand/files/tracks* folder

Step 4: Open OSMAnd application and load these two files via *Menu button -> My Places -> Tracks -> Browse to where the files are located*

The sections gpx file will show you boundaries of the sections and the centroids gpx file will show you section numbers once a centroid point is selected. With these two, volunteers can move in the field using the OSMAnd app, locating their positions each time as well as the sections in which they are standing.

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/1RyHYVPZU5d4xJ1cpWga4QRdfohpEst9yIJ_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.

The screenshot shows the main landing page of the HOT Export Tool. At the top, there is a navigation bar with links for About, Learn, Exports, Configs, a language dropdown set to English, and a red "Log In" button. Below the navigation bar is a large, light-gray background image of a satellite map showing a dense urban area with many buildings and streets. In the center of the page, the text "Download OpenStreetMap Data" is displayed in a bold, black font. Below this text, a smaller paragraph explains the service: "The Export Tool is an open service that creates customized extracts of up-to-date OSM data in various file formats. Download and use the data simply by crediting the OpenStreetMap contributors." At the bottom of the main content area is a blue rectangular button with the white text "Start Exporting". Further down the page, there is another section titled "Get Started" with a brief description: "Sign up for an OSM account to start creating exports. Our Quick Start guide will get you using the tool straight away, or read about the Export Tool in more detail through the Learn page."

Select 'Create' in the top menu.



Get Started

Sign up for an OSM account to start creating exports. Our Quick Start guide will get you using the tool straight away, or read about the Export Tool in more detail through the Learn page.

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”

The screenshot shows the HOT Export Tool interface. At the top, there's a navigation bar with links for About, Learn, Create, Exports, Configs, English (dropdown), and Log Out. Below the navigation is a progress bar with four steps: 1 Describe, 2 Formats, 3 Data, and 4 Summary. The '1 Describe' step is active. On the left, there are input fields for 'Name' (Name this export), 'Description' (a large text area), and 'Project' (Which project activation this export relates to). A 'Next' button is located below these fields. To the right is a map interface with a blue polygon labeled 'Area Of Interest (AOI)'. There are buttons for 'Custom Polygon' and 'Draw'. A search bar at the top of the map area says 'Search for a location or enter a bounding box as 'minX, minY, maxX, m...'. On the far right, there's a vertical 'Tools' sidebar with icons for 'BOX', 'DRAW', 'POLY', 'POINTER', and 'IMPORT'.

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

This screenshot shows the 'Formats' tab of the HOT Export Tool. The interface is similar to the 'Describe' tab, with a navigation bar at the top and a progress bar for steps 1 through 4. The '2 Formats' tab is active. On the left, there's a list of 'File Formats' with descriptions: Shapefile (.shp), GeoPackage (.gpkg), Garmin (.img), Google Earth (.kmz), OSM (.pbf), MAPS.ME (.mm), OsmAnd (.ubf), and MBTiles (.mbtiles). A 'Next' button is located below this list. To the right is the same map interface as the previous screenshot, showing the 'Area Of Interest (AOI)' with a blue polygon. A 'ZOOM TO SELECTION' button is visible. The 'Tools' sidebar on the right is also present.

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

1 Describe 2 Formats 3 Data 4 Summary

Tag Tree Configs YAML

Search for a feature type... Clear

- > Buildings
- > Commercial
- > Communication
- > Education
- > Emergency
- > Financial
- > Government
- > Healthcare
- > Humanitarian
- > Land Use
- > Localities
- > Natural

Commercial
Geometry types: point, polygon
Keys:

- name
- opening_hours
- shop
- amenity
- tourism
- rooms
- beds

Where: shop IS NOT NULL OR tourism IS NOT NULL OR amenity IN ('marketplace','restaurant','fast_food','caf') OR office IS NOT NULL

Area Of Interest (AOI)
 Custom Polygon Draw

ZOOM TO SELECTION

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.

1 Describe 2 Formats 3 Data 4 Summary

Name: Nata Health Facilities Export
Description: Health Facilities in Nata Village area
Project: Botswana Malaria Mapping
Export Formats:

- Shapefile (.shp)

Buffer AOI - expand an uploaded boundary by 0.02 degrees
 Publish this Export
 Bundle for POSM

Create Export

OpenStreetMap database last updated 5 minutes ago

Area Of Interest (AOI)
 Custom Polygon Draw

ZOOM TO SELECTION

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.

The screenshot shows the homepage of the Humanitarian Data Exchange (HDX) website. At the top, there is a dark header bar with the OCHA Services logo, a search bar labeled "Search Datasets", and links for "FAQ", "Log in", and "Sign up". Below the header, the HDX logo is prominently displayed next to a search icon. The main title "The Humanitarian Data Exchange" is centered above a sub-headline: "Find, share and use humanitarian data all in one place". A "LEARN MORE" button is located below this sub-headline. To the right, there are two main sections: "FIND DATA" and "ADD DATA". The "FIND DATA" section features a search bar and displays statistics: 8,567 DATASETS, 248 LOCATIONS, and 1,121 SOURCES. The "ADD DATA" section includes icons for uploading files and adding metadata, along with text describing HDX Connect: "let others request your data".

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

The screenshot shows the HDX website interface. At the top, there's a navigation bar with links for OCHA Services, FAQ, Log in, and Sign up. The main header says "HDX" and "Tanzania". Below the header, there are tabs for "HOME / DATASETS", "Data [111]", and a search bar containing "Tanzania". To the right of the search bar are buttons for "Show filter", "Show 25 | 50 | 100", and "ORDER BY: Relevance". A red "ADD DATA" button is located in the top right corner.

On the left, there are two filter panels: "FEATURED:" and "LOCATIONS:". The "FEATURED:" panel includes categories like CODs [2], Sub-national [68], Geodata [24], Datasets on request [0], Datasets with Quick Charts [23], Datasets with Showcase [35], and Datasets with HXL tags [23]. The "LOCATIONS:" panel includes Afghanistan [6], Albania [1], Algeria [19], American Samoa [1], and Andorra [1].

The main content area displays three dataset cards:

- Tanzania-healthsites** (Global Healthsites Mapping Project): 700+ Downloads. Updated January 14, 2019. Dataset date: Jan 9, 2019. This dataset updates: Live. Options: CSV, JSON, ZIPPED SHAPESHFILE.
- Learning levels in Tanzania** (Uwezo at Twaweza East Africa): 10000+ Downloads. Updated September 11, 2018. Dataset date: Dec 31, 2018. This dataset updates: Never. Options: XLSX, XLS, ZIP.
- Tanzania Road Network** (WFP - World Food Programme): 30+ Downloads. Updated February 27, 2019. Dataset date: Oct 19, 2018. Options: ZIPPED SHAPESHFILE.

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.

The screenshot shows the HDX homepage. The main title is "The Humanitarian Data Exchange" with the subtitle "Find, share and use humanitarian data all in one place". Below this is a "LEARN MORE" button.

To the right, there are two main sections: "FIND DATA" and "ADD DATA".

FIND DATA: A search bar with "Search Datasets" placeholder and a magnifying glass icon. Below it are statistics: 8,567 DATASETS, 248 LOCATIONS, and 1,121 SOURCES.

ADD DATA: Contains two buttons: "UPLOAD FILE" (with a cloud icon) and "ADD METADATA" (with a person icon). Below these buttons is the text: "Make your dataset available on HDX" and "HDX Connect: let others request your data".

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

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 appropriate 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.

The screenshot shows the official QGIS website homepage. At the top, there's a dark navigation bar with the QGIS logo (a green 'Q' with an orange arrow), the text '3.8.0' and '3.4.9 LTR', and links for 'DISCOVER QGIS', 'FOR USERS', 'GET INVOLVED', and 'DOCUMENTATION'. A search bar and a language dropdown set to 'English' are also present. Below the header, the word 'QGIS' is prominently displayed in large white letters, followed by the subtitle 'A Free and Open Source Geographic Information System'. A large banner features a group photo of the QGIS development team outdoors, with the text 'QGIS is a team effort' and 'Support our community events!'. At the bottom of the banner, it says '22st Developer meeting' and 'Come along to [A Coruña, Spain](#) to find out more about QGIS!'. Below the banner, descriptive text reads 'Create, edit, visualise, analyse and publish geospatial information on Windows, Mac, Linux, BSD (Android coming soon)' and 'For your desktop, server, in your web browser and as developer libraries'. Two green buttons are at the bottom: 'Download Now' on the left and 'Support QGIS' on the right.

Resources

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

Considerations when installing QGIS for large numbers of individuals

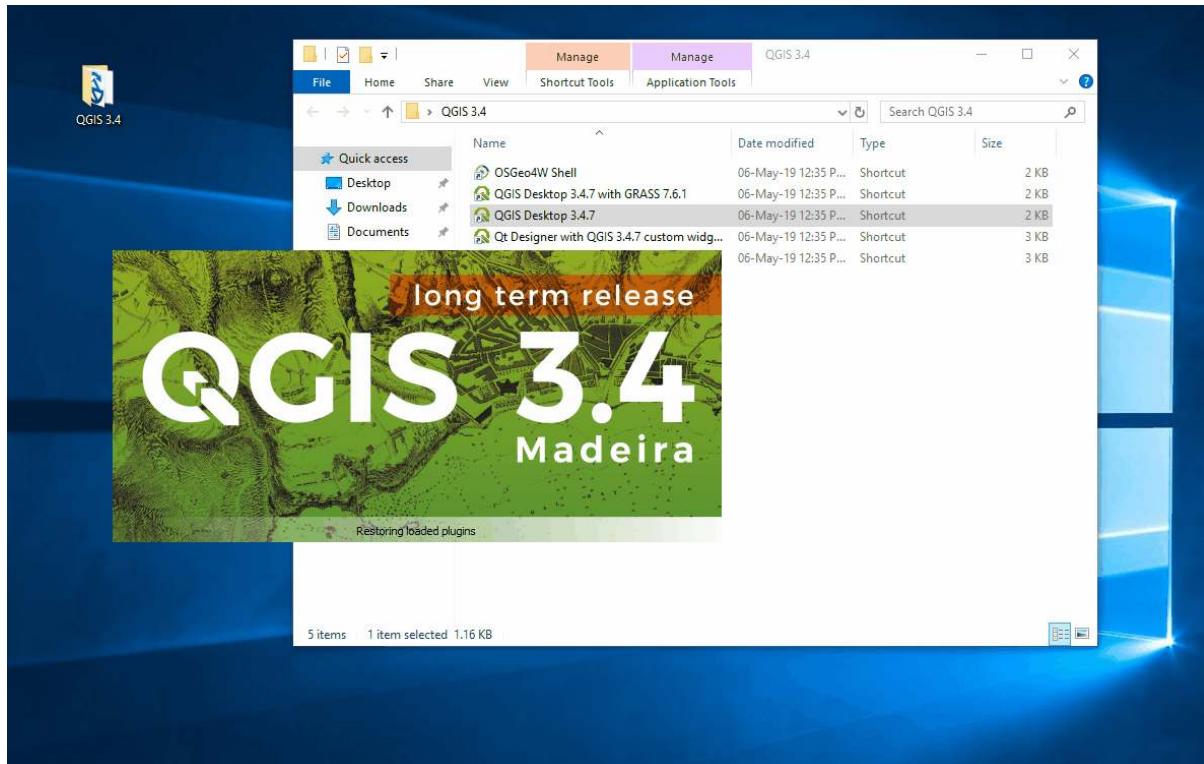
- Consider internet connectivity and capacity prior to installing QGIS for large numbers of individuals via internet. It is highly recommended that prior to the training/workshop, installation files are downloaded and loaded onto USB drives for offline installation.
- When downloading offline installers 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 download 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 adherence 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

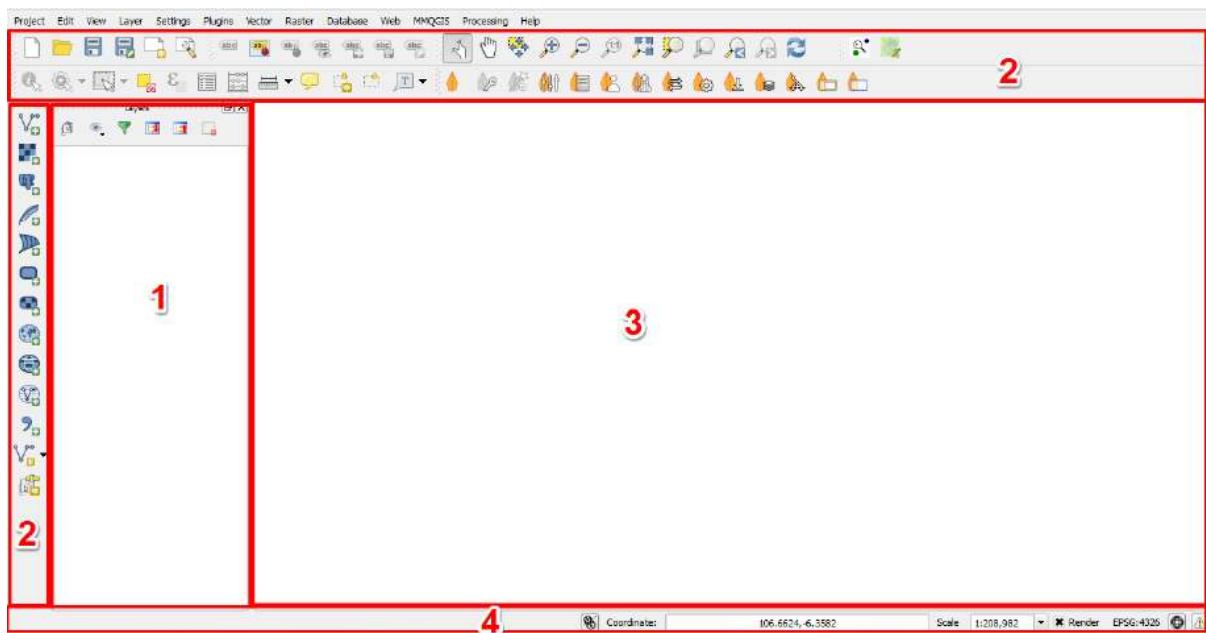
To open QGIS, open the QGIS folder on your desktop. In this folder, find QGIS Desktop. Double-click to open this program



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

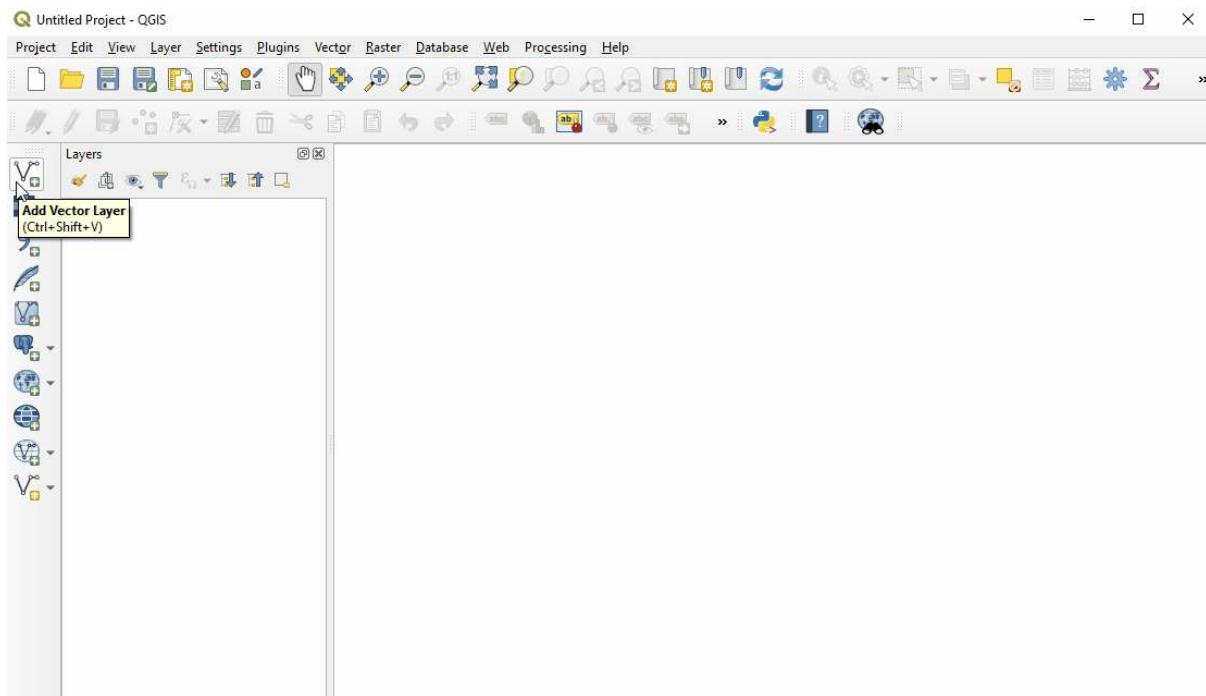
Familiarize yourself with the various parts of the QGIS browser, hover your mouse over icons to view names of various tools. Note: Your browser may have different tools than the image below.

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.

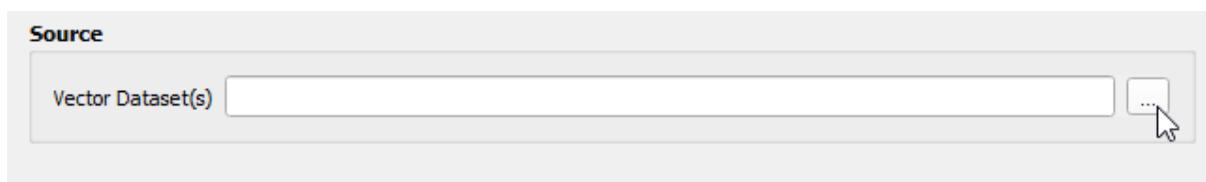


Adding Data

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.

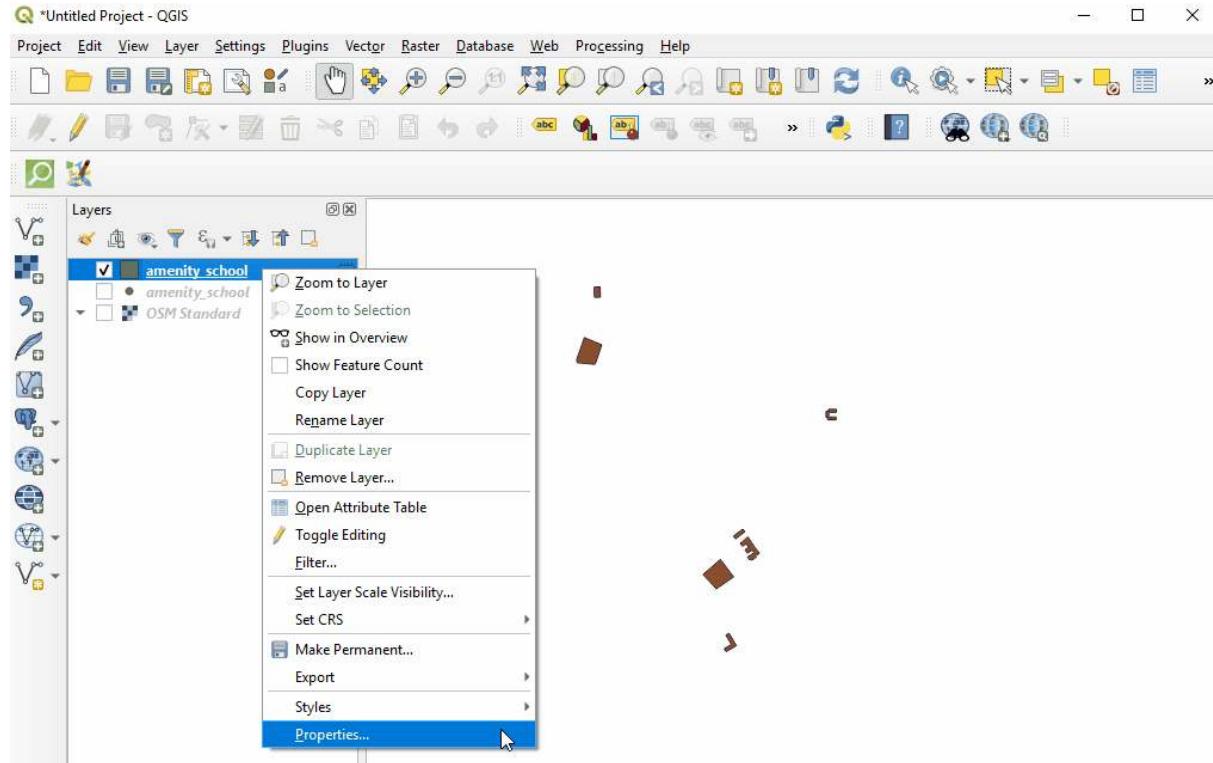
Practice data can be found here:

Styling Layers

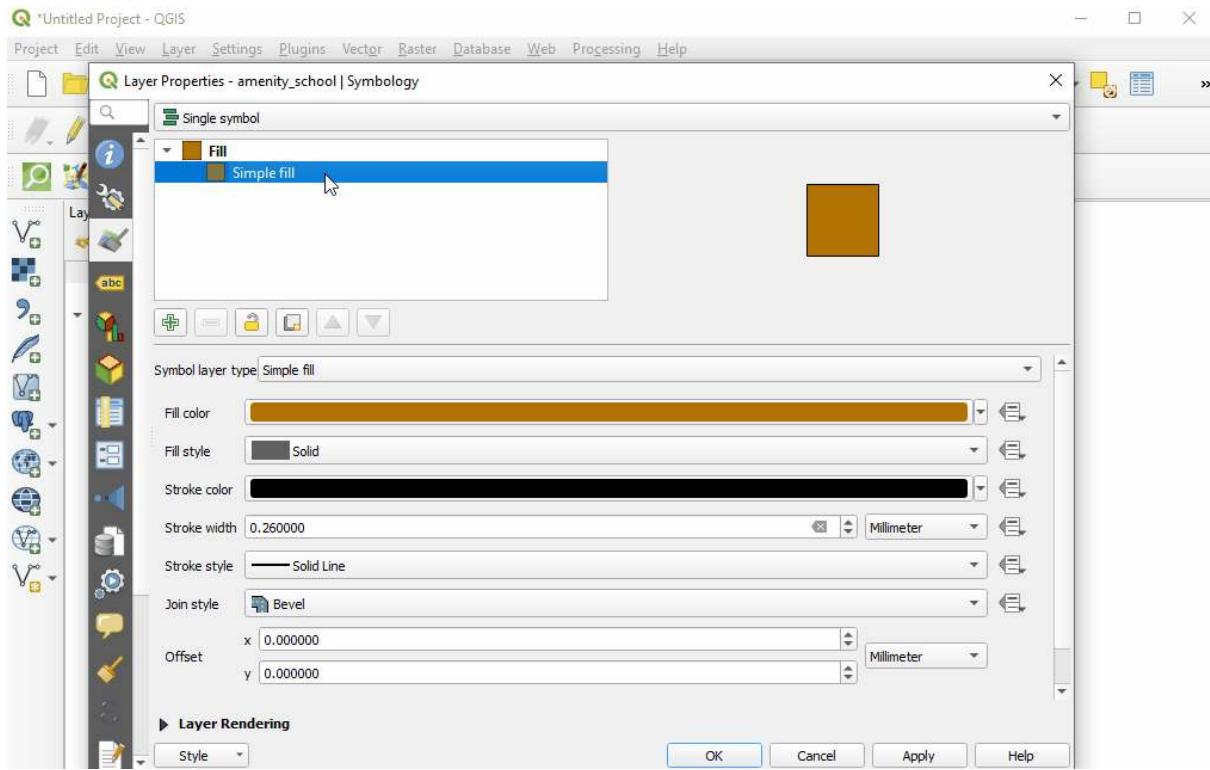
Data layers can be styled in three ways: opening the properties tab, copying from other layers in the project, and importing a .qml style.

To manually select a style:

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

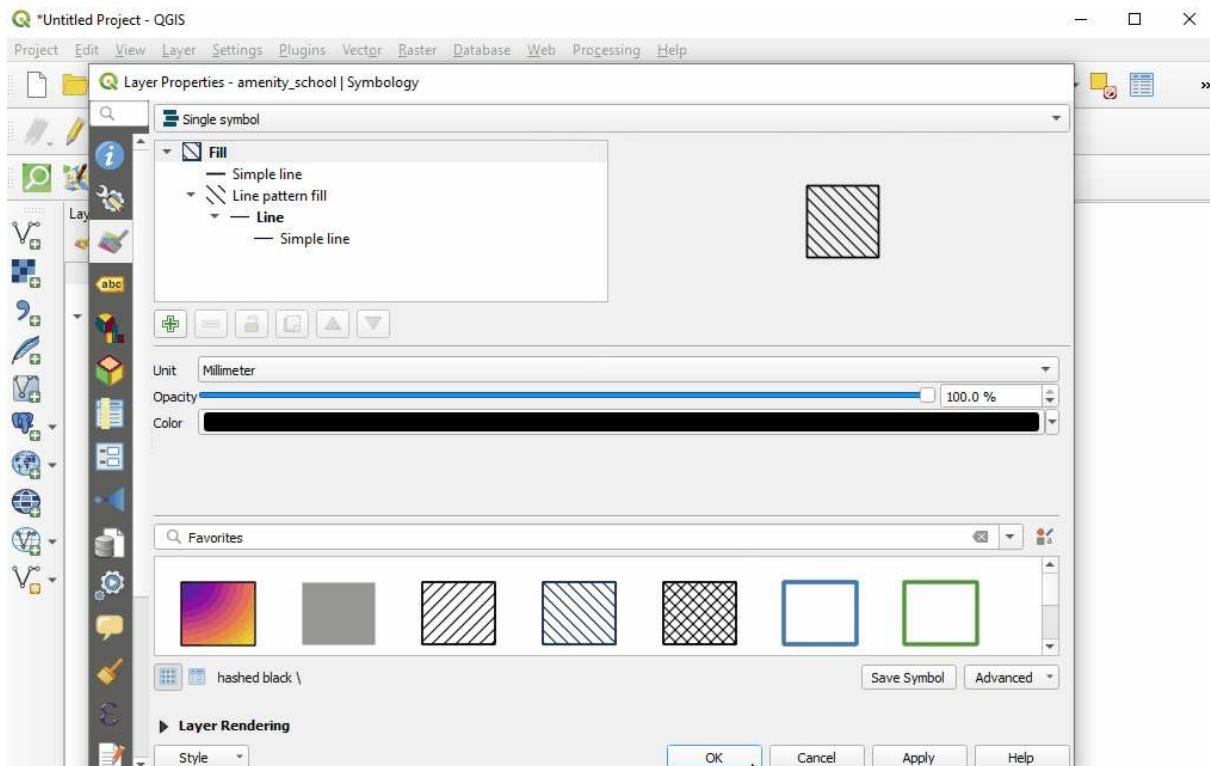


Select 'Style' from the left-hand menu. There are many changes and styles that can be made in this window. To complete a basic style change, select 'Simple Fill' near the top of the window. Now you can change the Fill Color, Fill Style, Stroke (outline) Color, Stroke (outline) Width, Stroke (outline)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



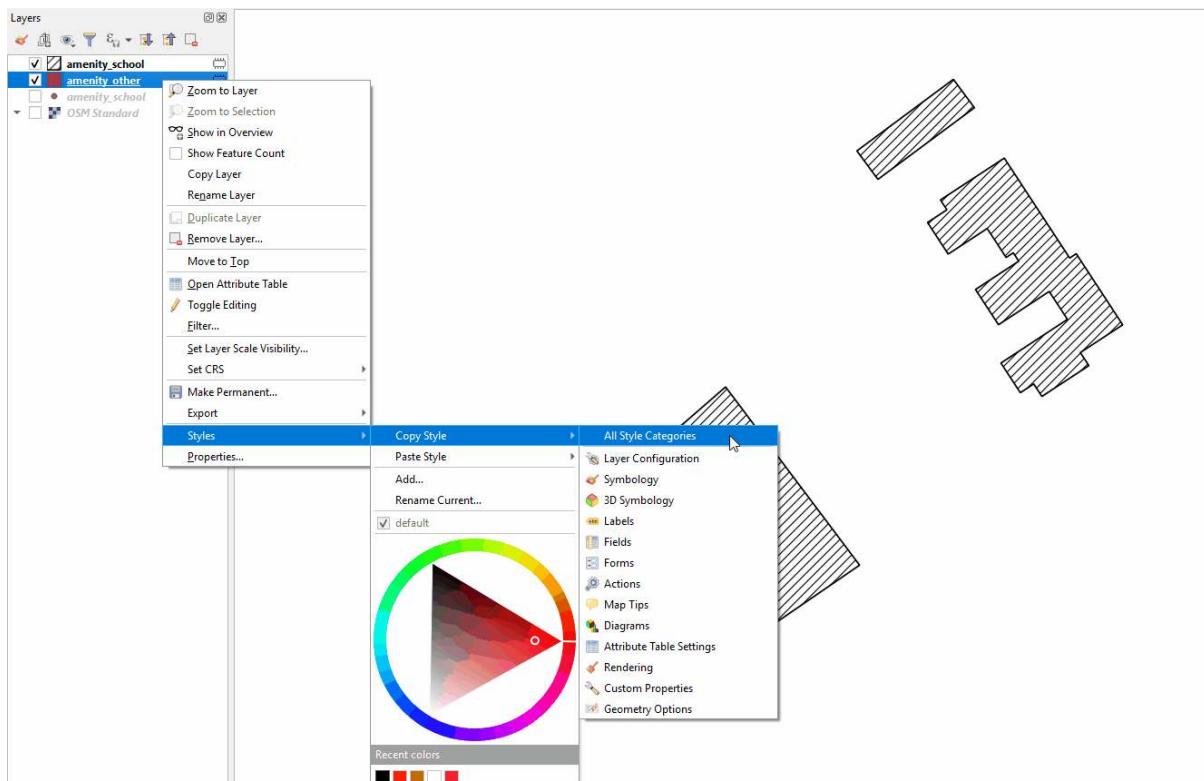
Select 'Ok' to see your changes in the project.

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

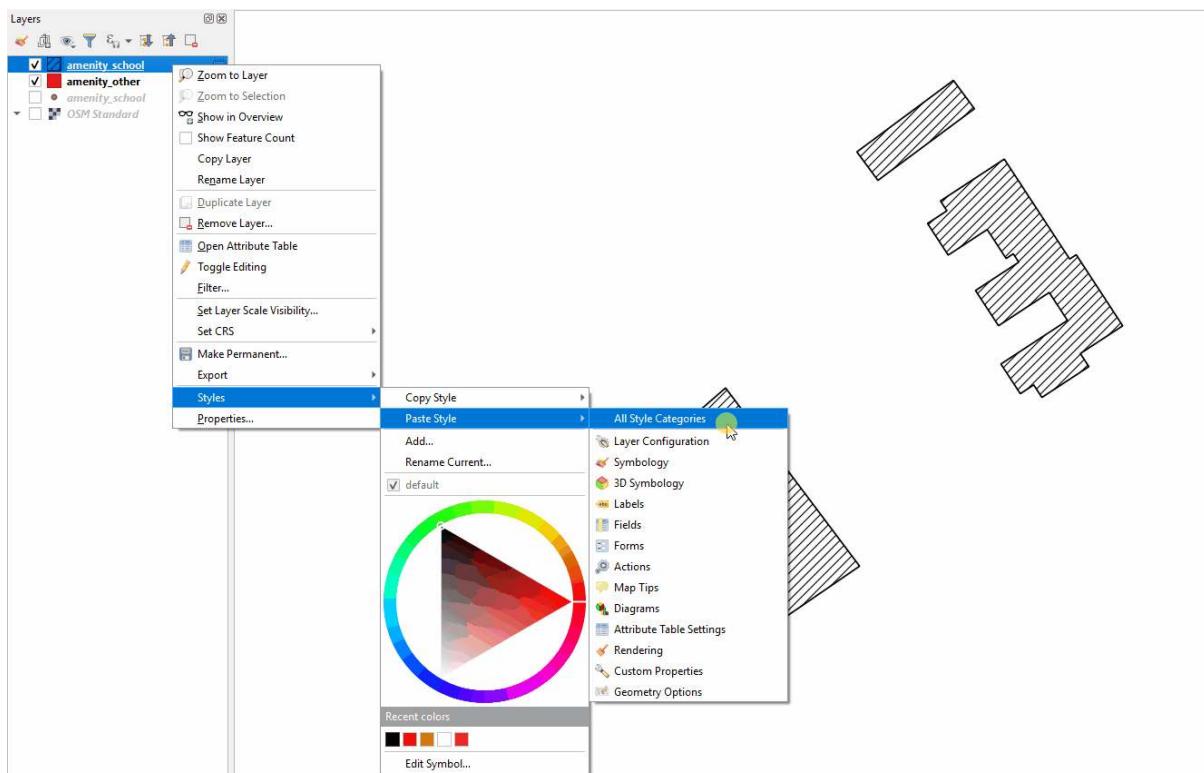


To copy styles from another data layer:

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

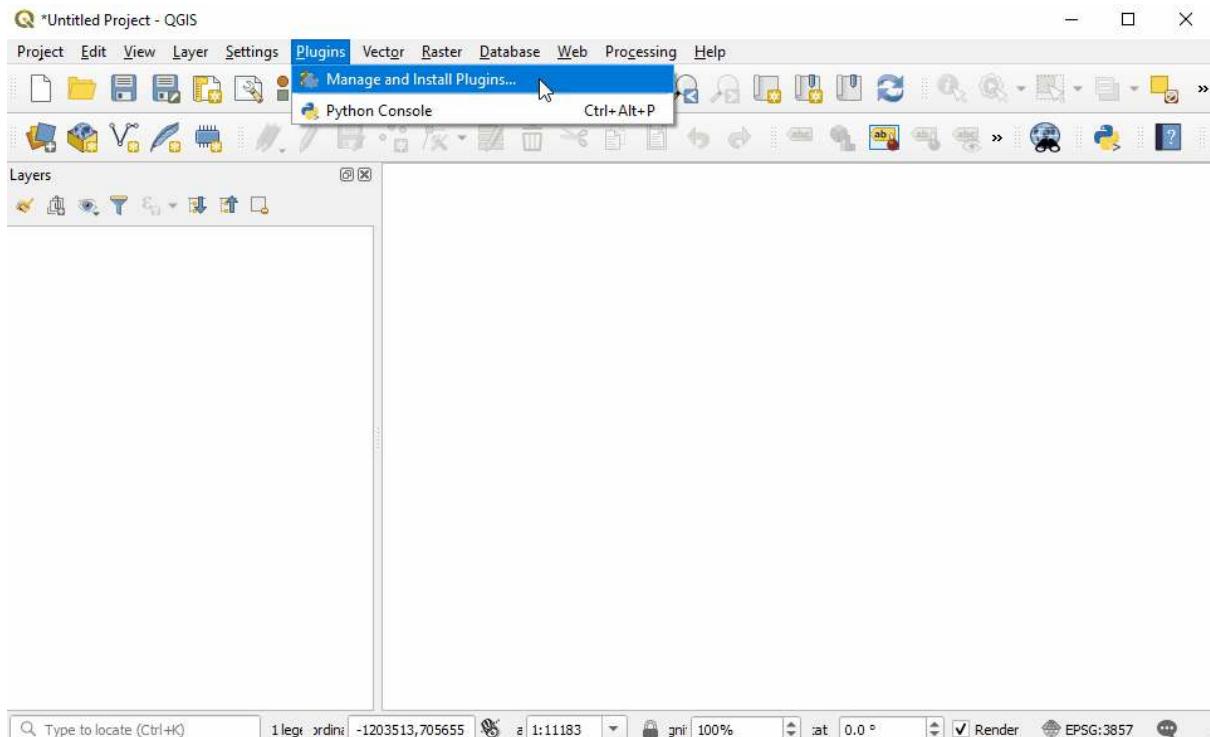
Plugins allow you to extend the functionality of QGIS. These plugins can range from allowing data to be directly downloaded from OSM to QGIS to tools that assist with analysis.

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.

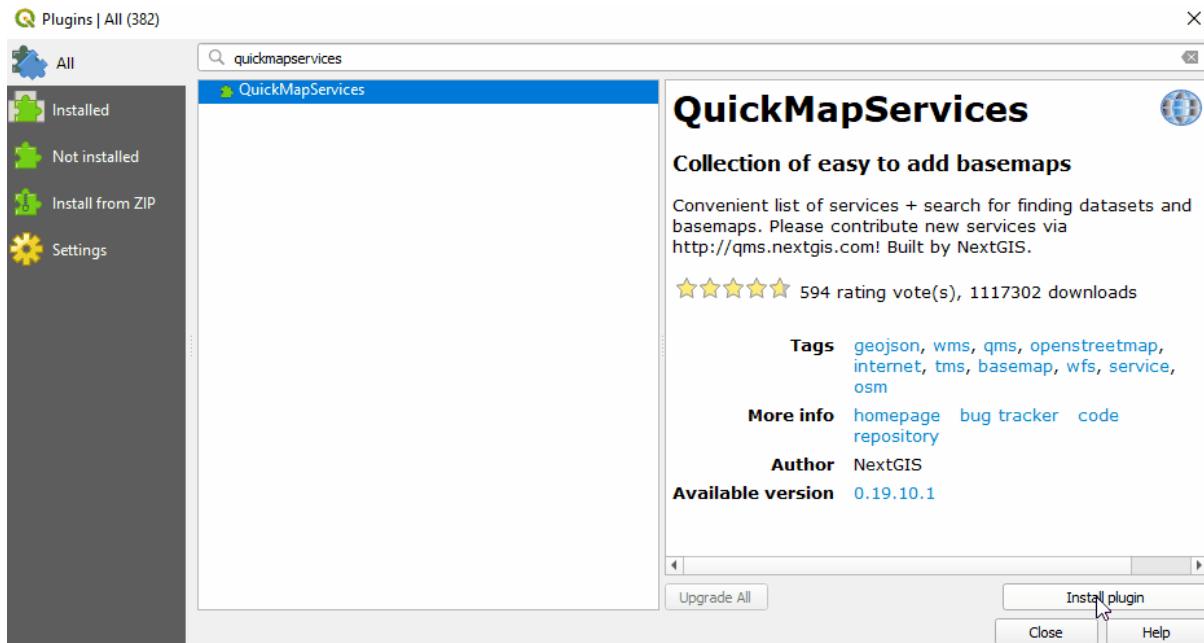


QuickMapServices

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

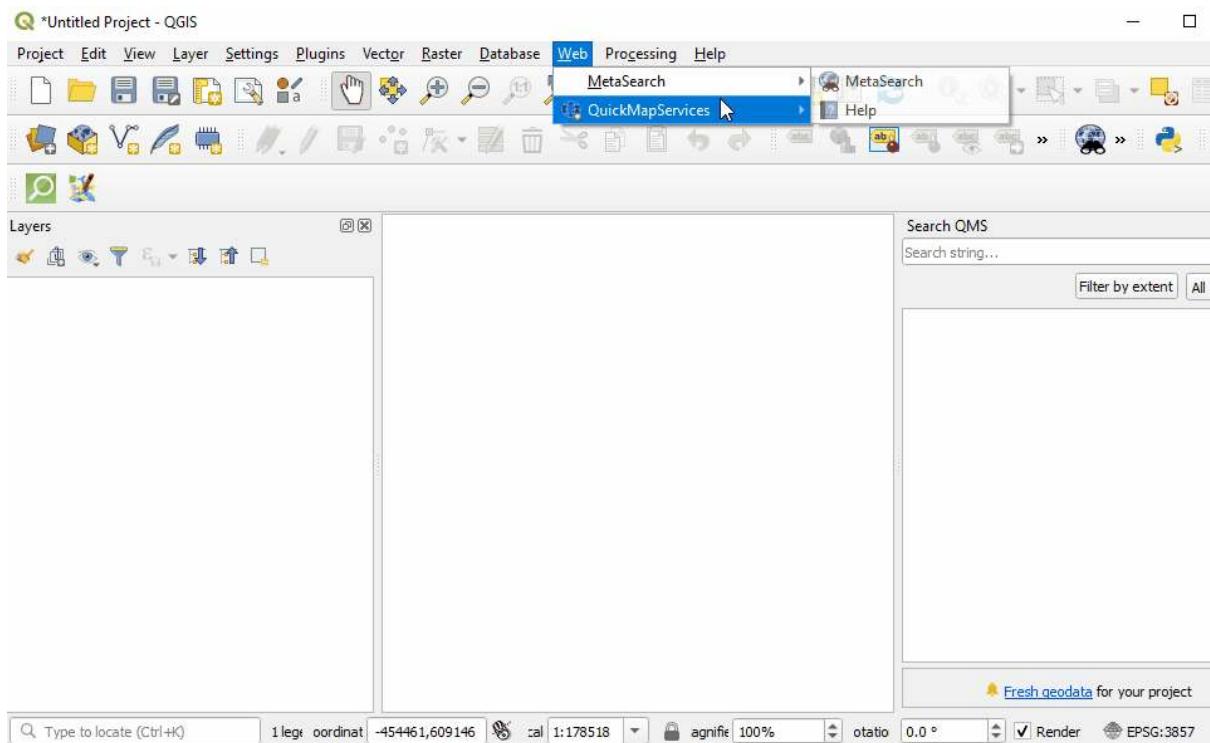
Note: as QuickMapServices provides online basemaps, use of these layers requires a consistent internet connection.

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.

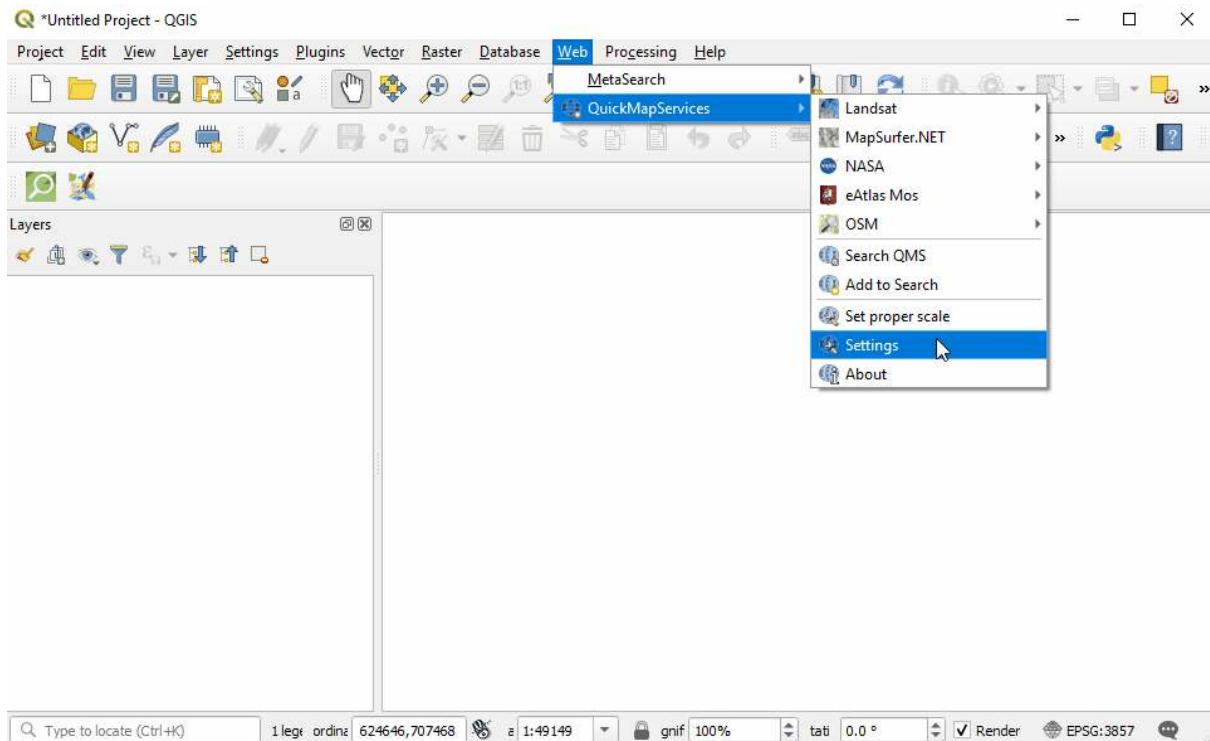


Once installed, QuickMapServices can be accessed in the top menu Web ▾ QuickMapServices

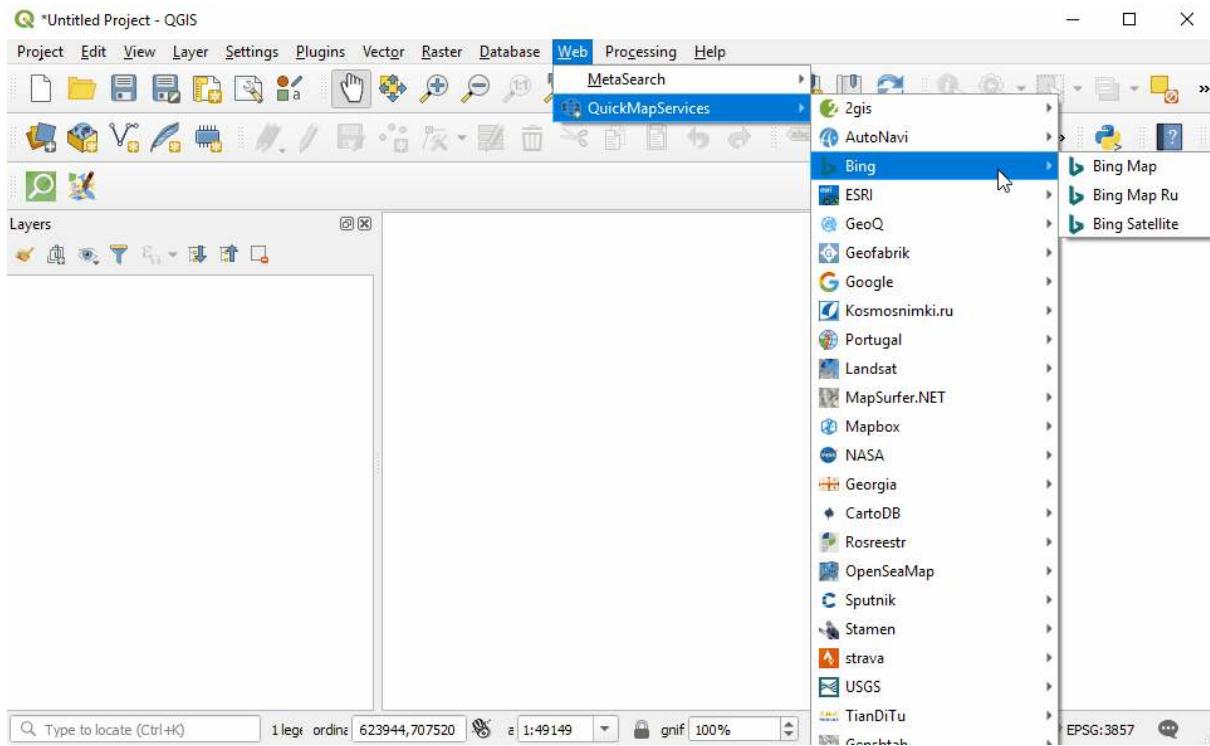
In the QuickMapServices sub-menu, several types of basemaps can be accessed including OSM.



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

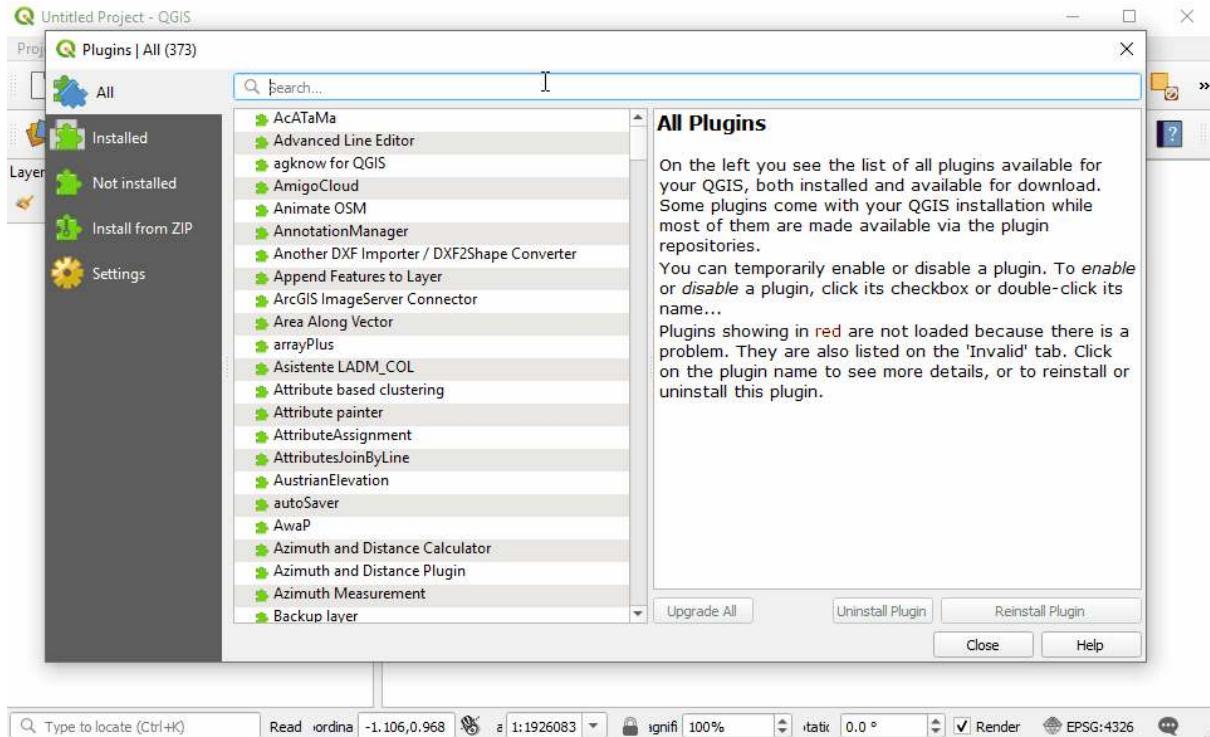


Return to the QuickMapServices sub-menu. There will now be a long list of options for basemaps, including Bing.



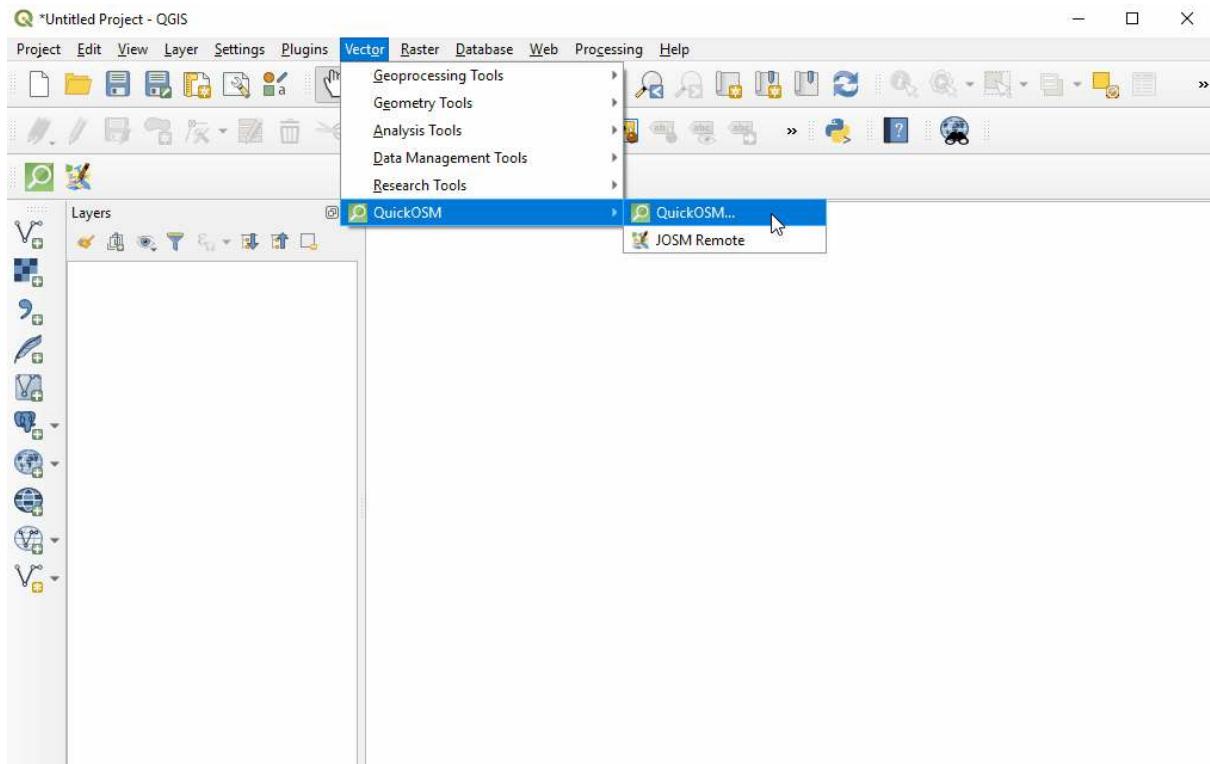
QuickOSM

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 |

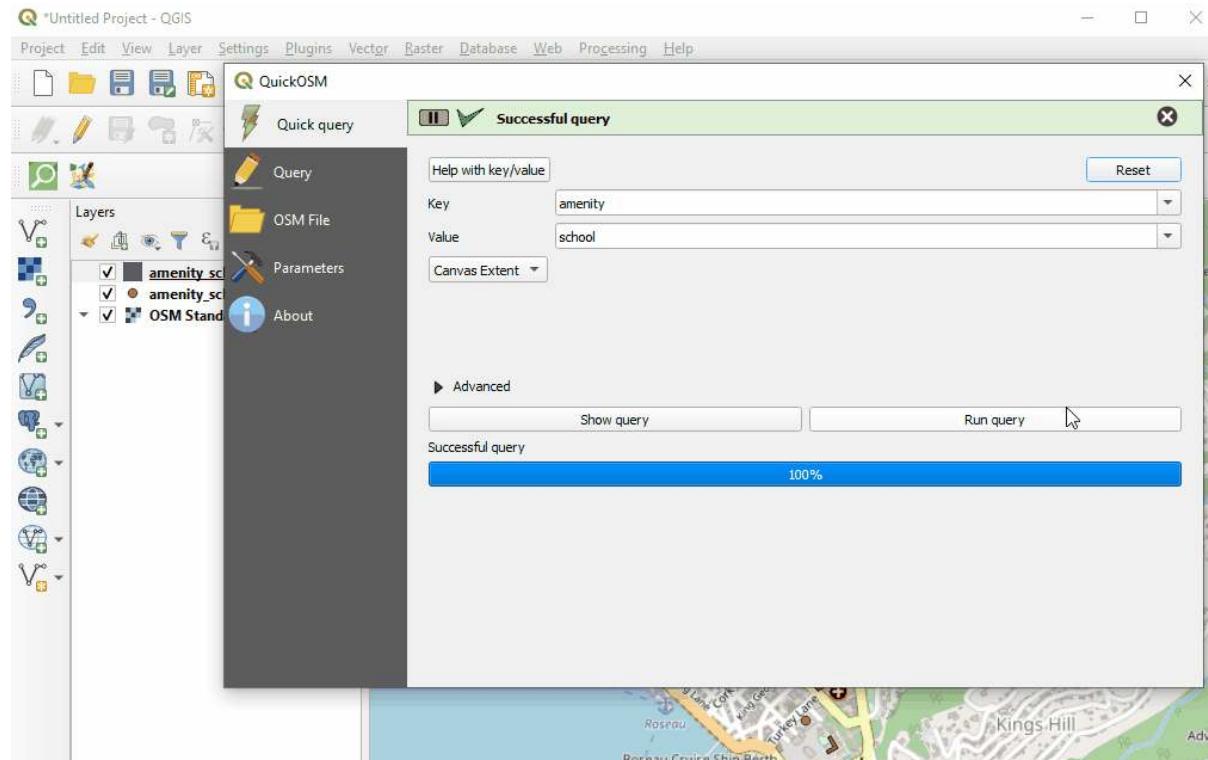
In the pop-up QuickOSM window, at a minimum, you will need to fill in: key, value, and select the extent. This

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 #edaeae2 (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](#).

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]

[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
-

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>

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.

The screenshot shows the homepage of the HOT Export Tool. At the top, there's a navigation bar with the HOT logo, the text "EXPORT TOOL", and links for "About", "Learn", "Create", "Exports", "Configs", "English" (with a dropdown arrow), and "Log Out". Below the navigation is a large background image of a satellite map of a city. In the center of the map, the text "Download OpenStreetMap Data" is displayed in a bold, dark font. Below this, a smaller text block reads: "The Export Tool is an open service that creates customized extracts of up-to-date OSM data in various file formats. Download and use the data simply by crediting the OpenStreetMap contributors." A blue button labeled "Start Exporting" is centered on the map. At the bottom left, there's a "Get Started" section with text: "Sign up for an OSM account to start creating exports. Our Quick Start guide will get you using the tool straight away, or read about the Export Tool in more detail through the Learn page."

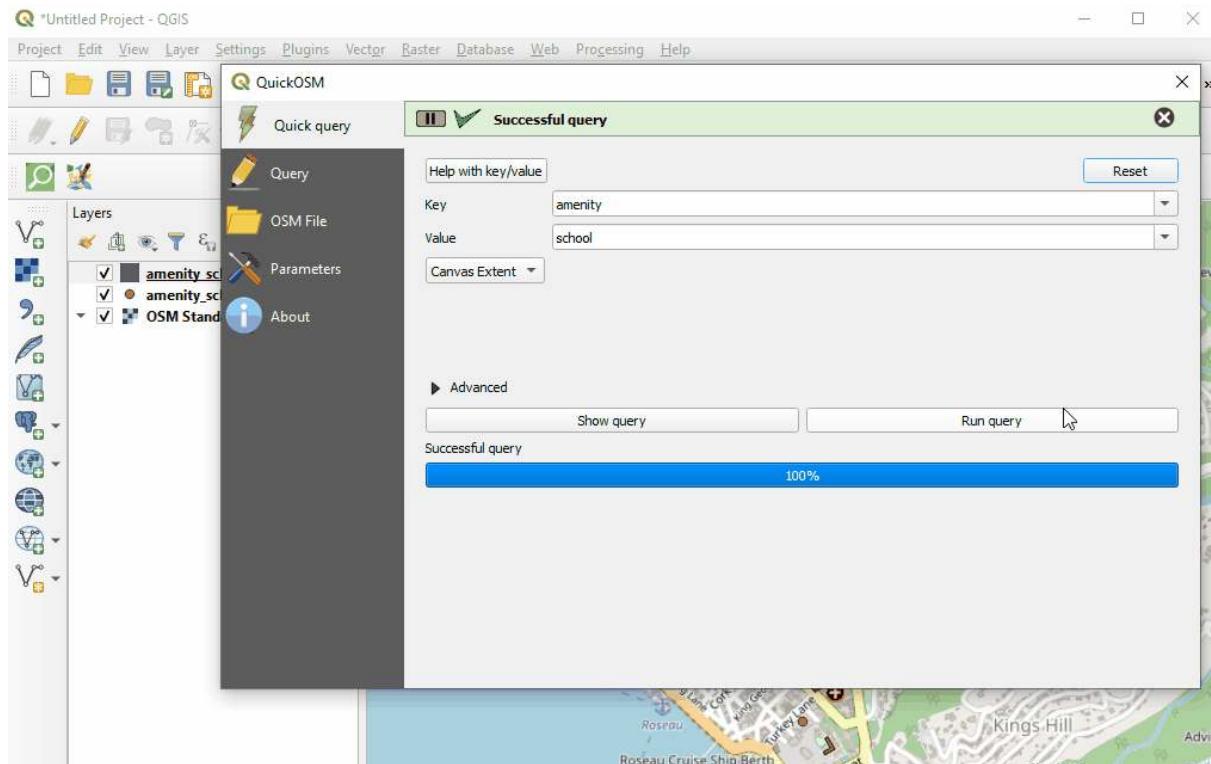
Humanitarian Data Exchange (HDX)

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.



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