Contents

The HOT Toolbox is designed to provide the OSM Community with a repository of training materials, complete with step-by-step guides developed by the HOT training team. The material covers everything from setting up mobile devices to exporting OSM data for quality control and analysis. In addition to consolidating HOT's extensive training materials, this toolbox curates a large amount of other OSM resources that support mapping projects; from software guides to guidelines on running mapathons. HOT's training materials are uploaded under a CC by 4.0 license which means they are free to use and adapt - we simply ask that you credit HOT and maintain a Creative Commons License. Learn more about Creative Commons and free use here.

1.0. Introduction to Designing a Field Mapping Project

Overview

In this section, Project Managers will find guides, tools and resources to design a mapping project including:

- Considerations and question guides for determining project factors such as scope, scale, and logistics;
- Resources for selecting hardware;
- Guides and materials for planning workshops/trainings.

- 1.1 Defining Needs and Requirements poses questions to answer when defining the scope of the project, such as purpose, geographic scale, and what features to map, as well as ensuring that the project takes into account the various contexts and stakeholders involved in the project.
- 1.2 Safety and Security contains guiding questions to help plan for project logistics and security concerns. As all field operations involve some level of risk and can involve many moving parts, it is vital to conduct a safety, security, and logistics review before beginning field work on any project, regardless of experience.

These first two sections provide guiding questions and considerations, however, it is important to understand that each project will have different variables that might not be covered. When designing a project, be sure to use past experience, consult with other organizations, and meet with stakeholders to ensure that you are covering all variables.

- 1.3 Selecting Hardware provides a guide on the various hardware, such as phones and laptops, that could be needed for a project. Additionally, HOT has provided lists of specific models that have been used in HOT field projects that have proven suitability.
- 1.4 Trainings and Workshops covers the requirements for running trainings as well as providing resources such as example agendas and materials to provide.

Further resources and reading

In addition to this Toolbox, there are several guides that were developed to help teams in the project planning process, some of which were borrowed from to develop this Toolbox.

- Open Mapping 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

1.1 Defining Needs and Requirements

Course Objectives

This section includes guiding questions and considerations that Project Managers and OSM communities should take into account when beginning a project, by the end of this section, you should be able to:

- Understand factors to consider when deciding needs and requirement
- Learn how to build the team
- Learn how to collaborate with community

***

Learning Activities

When starting a mapping project, it is important to define the scope of the project and understand the larger context in which the data is needed, this includes understanding how to work with local stakeholders and how the data will impact them.

Planning and Preparation

The first step that you must take before designing a field mapping project is to decide what object/features to map. 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 is by trying to ask these questions:

Source: Activity Sheet: Deciding What to Map

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. 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.

Example SDG data models for OpenStreetMap can be found in Chapter 2

Coordinate with the Local Administration

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 organizations 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.

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

⊠ Did you know? ⊠

Traditionally the term "beneficiary" has been used only to describe those affected by a crisis. Now it is widely recognized that beneficiaries should also be active participants in determining their own fates. This is also the core of participatory mapping – beneficiaries should be actors and partners in humanitarian projects.

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.
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.

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

Community	Motivation	Non-discrimination
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.	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.	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

After your team is assembled, you also need to train your team in order to make them familiar with the tools you will use. Consider the following tips when training your team:

- **Technical literacy** - Certain groups will require longer lengths of time to learn an application or tool than others.
- **Tools to be used for the project** - 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.
- **Practical session** - Training teams in tools using hands-on approaches, including conducting trial fieldwork greatly increases the success rate of mastery and improves data quality. All training should incorporate a practical session if possible.
- **Consistent access to internet and electricity** - Some tools require internet and computer use for training (i.e. mapping with iD/JOSM).

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.

⬚ Did you know? ⬚

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.

Here are the tips that you can do for community entry: * Have a consultation meeting to gather feedback from refugees * Include a community member as part of the team * Create a WhatsApp group to communicate quickly * Articulate benefits to host community * Establish relationships and work through partners already based in the community to ease activity implementation and enable integration into existing initiatives

[Quiz] Check Your Knowledge

1. When you want to plan your first field mapping project, what is the first step that you need to take?

 a. Understand the problem that the project trying to solve

 b. Define the tools that you will use

 c. Prepare template for reports (either monthly or quarterly)

 d. Conduct training sessions with government officials and community leaders

2. Why we need to include the local communities, beneficiaries, and partners in our participatory mapping activities:

 a. To identify the focal point immediately

 b. Because our donor require to work with them

 c. To empower local community and understand their needs and values

 d. Reduce project budget greatly

Answers: 1. A | 2. C

Activity Checklist

By the end of of this section, you already understand: * Things to consider when planning and prepare the field project * Building an effective mapping team * How to establish effective relationships with community

1.2 Safety and Security

Course Objectives

In this section, Project Managers will find considerations for assessing the needs for safety and security for field operations. As a project manager, you should be able to:

- Understand the topics to consider when discussing security plans

***

Learning Activities

Safety and Security

In accordance with the first protection principle – do no harm – organizations must prioritize safety, especially of refugee populations. In non-camp situations one of the key goals is expanding the amount of protection space available.

The idea of 'protection space' does not have a legal definition – it is a concept that means the extent to which a conducive environment exists for people to be respected and their needs to be met. In most situations, protection space is not static, but expands and contracts over time according to changes in the political, economic, social and security environments.

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.

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. To understand safety and security, please consider the following questions in Activity Sheet - Safety and Security.

Tips:

[Quiz] Check Your Knowledge

1. What is the best way to plan if you need to conduct a field data collection activity in a conflict area?

- a. Set the working hour early and encourage to work alone and fast
- b. Establish a process for regular monitoring of your team, avoid working alone, and establish a contingency plan for each scenario
- c. Directly collect data to the field without prior safety and security preparation
- d. Develop a global security plan

Answer: B

Activity Checklist

By the end of this section, you should be able to understand: * Factors to consider when planning the safety and security of field operations * Establish procedures for the safety and security of field personnel

Additional resources

- HOT General Hazard Mitigation Advice
- HOT Uganda | Country Security Plan
- HOT DRC | Country Security Plan
- [Template] Security Plan Template - Short Project

1.3 Hardware Selection

Course Objectives

In this section, you will learn and find information on selecting the appropriate hardware to support the mapping project. By the end of this, you should be able to:

- Determining what hardware may or may not be needed
- Understand the minimum hardware specifications based on the project needs
- Understand additional document(s) that may be required to record the hardwares

***

Learning Activities

Hardware Considerations

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. Below this is a hardware requirement based on the type of mapping activity:

	Remote Mapping	Field Mapping	Capture Latest Imagery	Capture Street View
PC/Laptop	☒	☒	☒	☒
Smartphones/tablets	☒	☒	☒	☒
Power bank	☒	☒ **Optional** (if you need to collect data > 4 hours/day)	☒	☒
External hard drives	☒	☒ **Optional** (if you need back-ups)	☒ **Optional** (if you collect a large number of drone images)	☒
Drones	☒	☒	☒	☒
Action camera/360° camera	☒	☒	☒	☒

Table 1. Hardware requirements based on specific mapping activity

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

- 14" screen or larger
- Processor: Core i5, with a relatively new CPU generation
- RAM: preferably at least 8GB (or 16GB if you need to run GIS/imagery processing)
- 512 GB hard disk or larger
- Operating system: Windows or Linux preferred for most applications

Smartphones & 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.

Since most of the data collection will be run on the Android operating system, it is important to ensure that the minimal Android operating system is version 5.0.1 (the minimal OS for running ODK Collect).

While currently there are a lot of smartphone manufacturers that offer different specifications, the following general requirements that HOT suggest to be able to run field data collection activity without worry are:

- A 5" (inch) screen size for usability
- At least 2GB of RAM
- Minimal 16GB of storage (might need larger storage if you heavily collect pictures/videos)
- A decent-sized battery. For extended usage (data collection > 4 hours/day), it may be necessary to have battery packs/power banks.

Tips:

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 but also protects against 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 a different drain on mobile devices, in general, HOT has found that consistently collecting surveys with ODK Collect 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.

Tips:

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. Consider the following questions:

External Hard Drive   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 backups 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 backups and hard drives are effective ways of keeping backups, even if your team is using a cloud server. Storage devices should have **at minimum 1 terabyte of storage**.

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 capturing 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 the 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 km2	$3-65k
Fixed Wing UAV	45 minutes	40-110 mph	1-3 kg	<12 km2	$25-120k
Hybrid UAV	60 minutes	70-120 mph	1-6 kg	<13 km2	$30k+

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

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

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

Tips:

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

Hardware Management

As a project manager, one of your primary responsibilities is to ensure that your team has all the necessary equipment to complete their tasks. This includes survey equipment, which can be expensive and integral to the project's success. To avoid mismanagement of this equipment, creating a careful flow that tracks usage and responsibility is essential.

One way to accomplish this is to require all team members who obtain temporary survey equipment to sign an agreement outlining their responsibility and liability for the devices. This process ensures that everyone understands their role in maintaining the equipment's condition and preventing loss or damage.

In addition to the agreement, keeping a record of who is responsible for each piece of equipment at all times is also crucial. This helps to prevent misunderstandings or disputes and ensures that the equipment is always available when needed.

To assist with this process, there are numerous hardware management resources available. These include software solutions that can track equipment usage and maintenance, as well as physical resources like lockers or cabinets for secure storage. Utilizing these resources can streamline the equipment management process and ensure that your team has the tools they need to succeed. These are some examples of hardware management resources:

- Example equipment log
- Equipment sign-out log

[Quiz] Check Your Knowledge

You create a field project where you need to collect the latest information on the field. Upon preparing the base data in OSM, you realized that the imagery is unusable (blurry and outdated). In order to get the latest information, you need to collect the latest imagery before your field data collection begins. What equipment that you need to prepare during the planning process?

1. 360 camera, laptop, power banks
2. Laptop, smartphone, drone, power banks, and external drive
3. Action cam, paper form, name-tag, & laptop
4. Laptop

Answer: 2

Activity Checklist

By the end of this section, you should be able to perform the following: * Figure out which equipment and its specification you should consider for your mapping activity * Understand the importance of hardware management and sign-out log document to record your hardware movement

1.4 On-site Training and Workshop

Course Objectives

In this section, Project Managers will find information on considerations and resources to use while planning on-site trainings and workshops for mapping and OSM, including: * Understanding on how to plan effective training and workshops * Learn examples and resources for creating training agendas

***

Learning Activities

Most mapping projects will involve trainings or workshops of some kind, whether training field mappers to use OpenDataKit, training local government stakeholders how to export and use OSM data, or training students in QGIS for creating maps. During the planning stage, project managers and OSM communities should anticipate what trainings are necessary and what resources will be required to run each training or workshop.

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 that able to connect to the internet.
- Have a 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 Beside participants requirements, it is also important to setup a workshop/venue that have several requirements, such as:

- Strong wi-fi connection
  - 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 or with limited wi-fi capability, consider the option of using a mobile hotspot 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.

Training Needs Assessment

A training needs assessment is the process of identifying knowledge and skill gaps of learners to ensure that training is targeted at their specific needs. It is important because it allows learners to participate and contribute to the training design process by:

- Shedding light on their mental models on a current topic, which can inform our training structure and language;
- Surfacing possible barriers that they might encounter during the learning experience, whether based on language, ability, time commitment, access to technology, or others; and

- Understanding their goals and motivations for joining the training, which can help with the alignment of expectations and tailoring the learning experience to cater to their needs.

During workshop or training for project, you might already have a sense of what the goals of the training are, and some of core materials that you intend to teach it during the workshop. However, this training needs assessment could become a tools for you to assess the learners' current needs, strengths, and their weaknesses. You can assess them in various ways:

- **Relevance**: How important is X to your work?
- **Confidence**/ Self-efficacy: How confident are you that you can carry out X?
- **Competence**: use scenario-based tests or knowledge checks to assess whether learner is competent in X

Tips:

While the training needs assessment is important, you also needs to consider some of the factors such as:

Building an Agenda

It is crucial to take the time to create a detailed agenda for your workshop. This not only helps you to estimate the time required to complete the workshop, but also ensures that you cover all of the necessary topics. By building an agenda, you can also plan for a simulation for field data collection, which can be a valuable learning experience. Furthermore, by having a clear understanding of the expected time for all participants to begin the simulation, you can better manage the workshop and ensure that everyone is able to participate fully. In summary, taking the time to develop a comprehensive agenda can greatly enhance the effectiveness and impact of your workshop. Consider the following example of training agenda:

- Three Day Mapping Workshop Agenda.pdf
- Two Day GIS Training Agenda
- Agenda Template.docx

Presentation and Resources to Provide

After developing the agenda, you will need to determine what presentations are needed for each activity. HOT Training Presentations provided in this Toolbox are available for teams and OSM Communities to use with credit provided to HOT. Navigate through the Toolbox to appropriate sections for presentations needed. It is highly recommended that prior to the training/workshop, all necessary installation files are downloaded and loaded onto USB drives for offline installation. Sections throughout this Toolbox introducing tools include links to the installation files you will need.

[Quiz] Check Your Knowledge

Before conducting an on-site training session, which of the following key aspects is correct?

a. Participant requirements, workshop requirements, building training needs assessment, training agenda, and resources to be shared to the participants.

b. Phone specification, government approval letter, participants registration form, and training agenda

c. Trainer list, training agenda, participants seating strategy, field survey simulation location

d. All of the answers above are correct

Answer: a

Activity Checklist

At the end of this section, you already have understanding of: * How to plan effective training or workshop * Example of training material resources

Additional resources

- Beginning OpenStreetMap Trainer Toolkit
- Intermediate OpenStreetMap Trainer Toolkit
- TeachOSM
- LearnOSM

2.0 Introduction to Technical Set-up for Field Mapping

In this section, Project Managers will find tools and resources to determine which data collection tools are appropriate and how to navigate the technical steps needed to prepare for a field mapping project including:

- Presentations and step-by-step guides for developing a data model suitable for uploading to Open-StreetMap
- Resources for determining the correct mobile data collection, navigation applications, and server options for your project
- Detailed guides and resources for setting up applications such as ODK Collect

---

Any field project will require some degree of Field Mapping Technical Set-Up regardless of the complexity of the data collection workflow. This section is designed to guide project managers and community members through the decision making process to determine what tools and steps are necessary for their specific project. Many technical guides exist on setting up and using specific tools such as ODK Central. To support project managers effectively, step-by-step guides are provided for some tools and processes where external documentation is lacking or HOT has previously created tailored materials. For tools and processes with quality guides and materials outside of HOT resources, external links have been provided.

- Designing the Data Model covers the workflow and tools needed to develop a data model for OSM data collection.
- Data Collection Applications provides guidance on selecting the appropriate data collection application for your project. Sub-pages also provide detailed instructions and resources on setting up specific tools such as ODK.
- Navigation Applications provides an overview of navigation applications and how they can be used by project managers for their project.
- Data Collection Servers provides guidance on determining if a server is necessary for your project and selecting the appropriate server for based on data and resource needs.
- Creating XLSForm for ODK provides guidance on how to create a XLSForm for ODK Collect or other ODK-based applications (i.e. Kobo Toolbox).
- Setting up Field Mapping Tasking Manager provides guidance on HOT's new tool to support field mapping, a Field Mapping Tasking Manager.
- Creating MBTiles for ODK Collect provides guidance on building a mbtiles to support offline mapping activities.

The following presentation(s) can be used to lead a training or workshop:

- Data Models and Tagging

2.1 Designing the Data Model

Course Objectives

In this section you should be able to:

- Understand the concept of data structure in OSM
- Learn to use OSM wiki
- Learn to use TagInfo
- Understand the data model workflow
- Understand to create the data model
- Learn to use HOT data models

***

Learning Activities

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.

Introduction to Data Structure of OSM

OSM doesn't work with layers or attribute tables, but **tags**. When you draw any feature (i.e. point, line, polygon) in OSM, you still need to add information about the object such as its name, address, and other supporting information. This helps other users when they utilize OSM data for various purposes.

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 you know as an apartment building that has 40 floors and is named 'Luna Gardens.

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**.

Key is the general information that explains the function of an object. One key can consist of many values. For example schools, mosques, and hospitals all have the same key which is amenities (important facilities). Although the three objects have different types of functions (or value), all three of them have the same key because they are all amenities.

Whereas **Value** is information that more specifically explains the type of an object. Because this value describes specific information about an object, there can only be one value for a specific key to describe the object. In OpenStreetMap, an attribute is added by formatting a key-value pair that represents physical features on the ground.

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.

Tools for Creating your Data Model

Tips:

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
- Recommended: computer mouse

How to Use the OSM Wiki

1. Navigate to https://wiki.openstreetmap.org/wiki/Map_Features in a Google Chrome or Mozilla Firefox internet browser.
2. 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.
3. 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 you 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 is a system for finding and aggregating information about OSM tags and making it browsable and searchable.

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 distrubtion 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.

Data Model Workflow

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

Questions	Suggested Strategies
What is the focus of the data collection?	Consider how the data will be used
What features do you want to collect?	CIdentify the focus of the data collection
Where are you collecting data?	Data models can differ based on their location
What has been done before? What tags exist for features?	Draft data model by leveraging similar models
What is the correct tags for features?	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!)

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.

1. Create a list of all of the features that you want to collect. For example: buildings, water points, roads. Fill this on the first column in your spreadsheet.

Feature	Key	Possible values
Buildings		
Water Points		
Roads		

2. Go toOpenStreetMap 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	

3. For features with multiple values, such as buildings, use the OSM Wiki page for that key as well as TagInfoto find appropriate values. These values should only be what is reasonable for your data collection.

Tips:

|Values in your data model should make sense for the context of your geography. 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. Another example, you need to collect educational facility for your project area and you already aware that your project area do not have an university or college. In that case, you should not put university or college into your data model|

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

4. 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 building:material building:levels roof:material	residential, school, civic
Water Points	amenity status	water_point
Roads	highway name condition surface width	primary, secondary, residential

5. 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 building:material building:levels roof:material	residential, school, civic cement_block, brick, wood, mud numeric thatch, metal, concrete, plastic, tile
Water Points	amenity drinking_water	water_point yes, no
Roads	highway name condition surface width	primary, secondary, residential user defined excellent, good, poor gravel, paved, dirt numeric

6. 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**.

 Did you know

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.

HOT Data Models

To support HOT and community's project, HOT developed a reference for the data model that can be used for public. It already checked through OSM Wiki, TagInfo, and previous HOT's projects. You can try to access it through this link: Impact Areas - Data Models V.1.1.

You can check the document and filter it using Filter View function in Google Spreadsheets to filter the data models into different categories, such as Disaster and Climate Resilience, Gender Equality, Public Health, Sustainable Cities & Communities, and Displacement & Safe Migration.

[Quiz] Check Your Knowledge

1. **…..** is the general information that explains the function of an object.

    a. Attributes

    b. Tags

    c. Key

    d. Value

2. **…..** is information that more specifically explains the type of an object.

    a. Attributes

    b. Tags

    c. Key

    d. Value

3. If you want to build a data model for your project, you can try to use these following site:

    a. Wiki and Google

    b. OpenStreetMap Wiki and Github

    c. OpenStreetMap Wiki and TagInfo OSM

    d. Wiki and TagInfo OSM

4. A site that uses for finding and aggregating information about OSM Tags in browsable and searchable format

    a. Wiki OSM

    b. TagInfo OSM

    c. Google

    d. Github

5. You will have a project to collaborate with a local redcross organization. During data model creation phase, you understand that there was a similar project from other country that collect a similar object in OSM and already made a data model for it. Please identify the following action that you need to take:

    a. Identify focus of the project → Leveraging similar data model → Check data model through OSM Wiki and TagInfo → Review data model and incorporate feedback from partners

    b. Identify focus of the project → review similar data model

    c. Identify focus of the project → create new data model for OSM → integrate new data model into existing OSM data

    d. All correct

Answer: 1. C |2. D| 3. C| 4. B| 5. A

Activity Checklist

In this section, you already understand the concept of OSM data and how to create a data model to support your project. By the end of this section, you should be able to: - Finding existing tags in OSM Wiki and TagInfo - Understand the steps for creating a data model - Using HOT data models to find approved data model - Building your own data model

Additional resources

Example data models:

- Uganda Refugee Crisis
- Ramani Huria

Presentation:

- Data model and Tagging

2.2 Data Collection Applications

Course Objectives

In this section, you will learn and find information on selecting the appropriate application to support the mapping project. By the end of this, you should be able to: - Understanding data collection application options - Able to determine on selecting a data collection application for your project needs - Understand brief overviews of ODK Collect, KoboCollect, OSMTracker, and Mapillary

***

Learning Activities

Choosing a Data Collection Application

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 ODK Collect, KoboCollect, OSMTracker, and Mapillary. If you feels confused about figuring out which data collection application should be used, you can use the following table to decide. These are not the only options available, but instead, applications that **HOT has used and tested** in the field for mapping projects.

I want to collect...	ODK	Kobo	OSM Tracker	Mapillary
Qualitative Survey Data	☒	☒	☒	☒
Quantitative Survey Data	☒	☒	☒	☒
GPS Points	☒	☒	☒	☒
Photos attached to GPS Point	☒	☒	☒	☒
GPX Tracks	☒	☒	☒	☒
Streetview Imagery	☒	☒	☒	☒
Data attached to OSM Point of Interest	☒(with FMTM)	☒(with FMTM)	☒	☒
Data Attached to OSM Polygon (i.e. buildings)	☒(with FMTM)	☒(with FMTM)	☒	☒

ODK Collect   ODK is a free open-source set of tools that help organizations author, field, and manage mobile data collection solutions. ODK Collect 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. Use ODK Collect if:

- You want or need to have an easy setup for data collection
- You want to replace the paper-based survey form
- You want to collect data in remote locations which have limited connectivity

To download ODK Collect, you can go to Google Playstore or download the latest version release directly from Github

Setup and use

- For set-up, see SectionOverview Data Collection using ODK Collect.
- For use, see Section Using ODK Collect.

KoboCollect   KoboCollect is in almost all ways similar to ODK Collect and is built on top of the ODK platform under the name Kobo Organization. Kobo also has prebuilt analysis tools and is another popular option for humanitarian organizations. It has its own server as well with the name KoboToolbox Server that everyone could use for free. However, you could also register an account using a server hosted by UN OCHA for humanitarian purposes here: https://kobo.humanitarianresponse.info/.

OSMTrackers   OSMTracker is an Android application that allows us to record our survey data. Similar to GPS, OSMTracker is able to record waypoints and also track. What makes OSMTracker different from common GPS devices is its capability to take pictures when you collect survey data. With these images

taken, it will make your mapping easier because you can track back what object you have taken and take a look at your pictures for more detail. Waypoint and track that you have collected can be converted into a .gpx file so you can open your survey data using JOSM or you can directly upload your data into Open-StreetMap.

If you want to use OSMTracker you can download the application on your smartphone. Open your Google Play store and search OSMTracker in the search box. **Please keep in mind that the latest version of OSMTrackers was published on 8 Mar 2021**.

Mapillary   Mapillary is the platform that collects street-level imagery data and provides its data accessible to the OSM community. They offer a technology that is able to turn images into connected street-level views and extract map data from them. Mapillary uses technology designed to blur any faces or license plates to help protect privacy. They also have image segmentation and traffic sign recognition. The street-imagery data can be acquired by using the Mapillary mobile app (android and ios) or using an action cam (i.e. GoPro).

Mapillary could help you for generating new data or conducting quality assurance for OSM. It's available in both iD and JOSM as additional map data/plugins that needs to be enabled first. One of our use-case for using Mapillary was during the Meta Road Mapping project in Indonesia. We conducted street-imagery data collection to validate the road tagging type in Kalimantan.

Please keep in mind that not every countries or place have street-level imagery data available in Mapillary. You need to check the coverage at https://www.mapillary.com/app/. If you think your project area is not covered by Mapillary, you can consider collecting the data using the app.

[Quiz] Check Your Knowledge

1. Mapillary can help us to collect street-level imagery data for quality assurance purposes.

    a. True

    b. False

2. We use OSMTracker to collect quantitative and qualitative survey data.

    a. True

    b. False

3. ODK Collect is a free and open-source app to collect qualitative data. Meanwhile, Kobo Collect is paid app to collect quantitative data.

    a. True

    b. False

4. We need to consider the type of data that we want to collect to ensure we choose the right app and right platform to use during our field project.

    a. True

    b. False

Answer: 1. A | 2. B | 3. B | 4. A

Activity Checklist

By the end of this section, you should be able to understand: - Application/platform to consider using depending on the type of data that you want to collect - Difference between applications that HOT already uses until now for field projects.

Additional 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
- OSMTracker LearnOSM: https://learnosm.org/en/mobile-mapping/osmtracker/
- Intro to Mapillary: https://help.mapillary.com/hc/en-us/articles/115001881105-Introduction-to-Mapillary

2.3 Data Collection Servers

Course Objectives

This section will explain on overview of server for field data collection. You will find several options to choose from. By the end of this, you should be able to learn:

- Understand server storage options to store field data
- Guidance on selecting a server for your project needs
- Brief overview of server options

***

Learning Activities

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.

Choosing Storage Option

Cloud Server vs. Physical storage - 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 server) and/or internet connection (access to cloud server). Servers used in HOT workflows include:

- Kobo Toolbox
- Field Mapping Tasking Manager
- Ona.io

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.

Which server should i use?

If you do decide to use a server, use the following table to decide which table is best for your project and resource restrictions. These are not the only options available, but instead, servers that HOT has used and tested in the field for mapping projects.

I want to use a server that...	Kobo Toolbox	FMTM	ODK Central
Is physical or does not require internet connection to upload	⊠(require technical team to setup the server)	⊠(require technical team to setup the server)	⊠(require technical team to setup the server)
Is cloud-based (data upload via internet)	⊠	⊠	⊠
Accepts ODK or Kobo Collect Data	⊠	⊠	⊠
Export as OSM xml or GeoJSON	⊠	⊠	⊠
Split area into smaller tasks	⊠	⊠	⊠
Can provide data visualization	⊠	⊠(limited capability)	⊠

I want to use a server that...	Kobo Toolbox	FMTM	ODK Central
Free to use	☒(using Kobo for humanitarian)	☒	☒(require technical team to setup the server)

ODK Central   ODK is an integrated data collection tools, that covers all aspects of data collection activities, from building data collection instruments, to the collection of the data. ODK Central will lets you to build powerful offline forms.

Skill level to implement and manage

Beginner

Use ODK Central Server if:

- You have technical knowledge/technical person that can setup ODK Central in your own server
- General data collection.
- Data is collected in .xml format, such as with ODK or Kobo Collect
- Geospatial data collection does not include polygons - GPS points are accepted

Set-up and Data Management Visit https://docs.getodk.org/central-install/.

Kobo Toolbox   Kobo Toolbox is an online platform 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

Beginner

Use Kobo Toolbox Server if:

- You want to conduct data collection related to humanitarian response
- General data collection.
- Data is collected in .xml format, such as with ODK or Kobo Collect
- Geospatial data collection does not include polygons - GPS points are accepted

Set-up and Data Management Visit kobo.humanitarianresponse.info

Field Mapping Tasking Manager (FMTM)   Field Mapping Tasking Manager (FMTM) is a tools that helps project managers to organize and manage mapping tasks. It assigns those tasks to volunteers and tracks their progress. The FMTM facilitates collaborative mapping by supporting and extending existing mature tools - Open Data Kit (ODK). FMTM recently developed by HOT in 2022 and had two pilot projects to test the platform. FMTM supports data export as OSM XML file which will helps you download field survey data and open directly in JOSM.

Skill level to implement and manage

Beginner

Use Kobo Toolbox Server if:

- You want to conduct data collection related to OSM
- You want to split your project area into smaller grid to assign to your surveyor/volunteers
- Data is collected in .xml format, such as with ODK
- Geospatial data collection that will read OSM data extract as geojson (polygon, centroid, or line)

Set-up and Data Management Visit https://fmtm.hotosm.org/

[Quiz] Check Your Knowledge

1. ODK Central is designed to manage data collection project into smaller task/grid

    a. True

      b. False

2. Field Mapping Tasking Manager allows you to download field data as OSM XML format

      a. True

      b. False

Answer: 1.B | 2.A

Activity Checklist

Now you already understand three different types of data collection servers that HOT uses. By the end of this section you will able to: - Differentiate between each data collection server providers - Choosing the right data collection server according to the project goals

Additional resources

- https://docs.getodk.org/
- https://docs.getodk.org/
- https://github.com/hotosm/fmtm/wiki/User-Manual-For-Project-Managers

2.4 Navigation Application

Course Objectives

In this section, you will learn overview of the navigation applications. By the end of this section, you should be able to:

1. Understand the navigation application to choose
2. Understand what is Maps.me and OSMAnd

***

Learning Activities

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

Choosing a Navigation Application

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	⊠(require additional steps outside the phone)	⊠(via add plugin)
Add data to OSM within app	⊠	⊠(require additional plugins)

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. It runs on Android and capable to operate with/without internet connection. You can download OSMAnd in here: 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. It runs on Android/IOS and capable to operate with/without internet connection. You can download Maps.me in here: https://play.google.com/store/apps/details?id=com.mapswithme.maps.pro&hl=en_US.

Additional Considerations

When downloading applications to be used by large numbers of individuals, managers should consider:

- Downloading 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.

[Quiz] Check Your Knowledge

1. You can use Maps.me if you want to collect information such as GPX track, OSM data, and waypoints.

    a. True

    b. False

Answer: 1. B

Activity Checklist

By the end of this section, you should be able to: - Choosing the right navigation application based on requirements on the field

Additional resources

Presentation:

- Navigation Applications

Additional information:

- OSMAnd tutorial: https://learnosm.org/en/mobile-mapping/osmand/.
- OSMAnd Wiki: https://wiki.openstreetmap.org/wiki/OsmAnd
- Maps.me Wiki: https://wiki.openstreetmap.org/wiki/MAPS.ME.

2.5 Overview Data Collection Using ODK Collect

Course Objectives

This section will provide general overview of the ODK Collect. By the end of this section you should be able to:

- Understand the overview of data collection using ODK Collect

***

Learning Activities

OpenDataKit (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.

Not sure if OpenDataKit is right for your project? Review Data Collection Applications.

Set-up Process

To set-up OpenDataKit for devices, you will need to follow the following steps:

1. Create ODK forms
2. Download and set up the ODK application

Creating ODK Forms

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

- Create ODK forms
- Example ODK form
- Blank ODK 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. If using KoboToolBox server, you will not need to complete form conversion. The server will complete this process for you.

Download and set up the ODK application

Download application

- The ODK application can be found on Google Play here.

- If installing on multiple devices with low internet resources, it is recommended to download and share the apk offline. The APK file for OpenMapKit can be downloaded here.

- Further information on how to use ODK Collect can be found here.

Setting up application on devices

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.

[Quiz] Check Your Knowledge

1. OpenDataKit (ODK) is a free an open-source set of tools which help organizations author, field, and manage mobile data collection solutions.

    a. True

    b. False

Answer: 1. A

Activity Checklist

By the end of this section, you should be able to: - Understand the overview of data collection using ODK

2.6 Creating XLS Form for ODK COllect

Course Objectives

In field survey activities sometimes you need a survey form to collect the data. Imagine if you need a form survey with dozens of questions for each respondent, you will certainly experience difficulties when filling data and also when entering data into a laptop. In this material you will learn how to create a survey form in digital format which will later be entered into your mobile phone. By the end of this, you will be able to:

- Explain the concept of XLSForm
- Operate the creation of an XLSForm for ODK Collect

***

Learning Activities

Understanding the concept of XLSForm

XLSForm is a standard form created to help speed up the process of creating survey forms in Excel. The creation of this survey form is done in an easy-to-read format and uses a familiar tool - Excel / Google Sheets. XLSForm produces standard standards for sharing and cooperating in making survey forms. XLSForm is very easy to use but can also be very complicated if you are familiar with making it.

XLSForm will then be converted to XForm, an open standard format, where the format allows you to create a form with very complex functions, such as multilevel questions, into a format that has been recognized by both data collection tools or in the form of sites on the internet, as well as in mobile devices.

Tips:

The main requirement in making XLSForm is the final survey form must in this type of Microsoft Excel format (**.xls or .xls**). If you create survey forms using other applications such as Google Sheets or Libre Office, you must ensure that the final file is saved in format .xls or .xlsx.

Making XLSForm for ODK Collect applications

You may be wondering how to create an effective XLSForm for your survey form. Now we will learn how to create it by understanding the basic format, basic questions, and additional format/questions type.

Standard Format In making survey forms, there are some conditions that you must follow so the survey forms that we make can be changed into format XForm. Some rules that must be followed to create an appropriate survey form are:

1. Having three main worksheets (survey, choices & settings)
2. Having three main columns in each worksheet
3. All entries must be starting from the first box

1. Three main worksheets/sheets In the spreadsheet we create, it must consist of 3 main worksheets, the named worksheet **survey**, **choices**, and **settings**. The naming of this worksheet must match and must not be mistaken because it will fail when uploading your survey form.

Tips:

---
survey	All questions we make must be put on this worksheet. All questions that we make do not need to be included with the list of answers. All the list of answers we need will refer to the next worksheet
choices	On this worksheet we include all of our answer lists for each question that requires answer choices

34

| **settings** | On this worksheet we can only enter the name of our form if the name of our form is different from the name of our file. For example, if our file name is *form_survei_air_bersih.xls* then in this worksheet we can name our form with the name we want, for example the *Water Condition Form* |

2. Three main column name   There are at least three main column that needs to be written in each worksheet

1. Worksheet **survey**

   In survey worksheet we have to insert three columns name: **type**, **name**, and **label**. Column with name **type** indicates the type of question that will appear later, whether the question is in the form of choices, free entries or capture locations.

   Column with **name** indicates the unique variable for each question list. These variables cannot be the same, do not use spaces, and are only numbers, letters or underscores.

   Column **label** shows the question that will appear on the user's mobile device. There is no standard format for this column, you are free to use letters, numbers, and special characters in this column.

2. Worksheet choices

   At the choices worksheet we have to insert three columns namely **name**, **list_name**, & **label**. In **list_name** you create a group that contains a set of answer choices. For example like a set of answer choices that will appear under multiple choice questions.

   Column **name** - All must be in unique variables that are not the same as the others both on the **survey** worksheet or **choices**; do not use spaces but are replaced by underscores; and do not use special characters such as question marks, exclamation marks, etc.

   Column **label** - This column contains the answer text that will appear on the user's cellphone. You can freely use spaces, special characters or letters in this column.

Tips:

For naming variable in **list_name** this must follow the naming provided in **survey** worksheet. For example on survey worksheet we enter a multiple choice type with the name **select_one jns_bencana**. So on the choices worksheet we must fill **list_name** with name **jns_bencana**.

---

3. Worksheet **settings**

   Worksheet **settings** used when you want to make additional settings such as giving the name of your survey form, giving form a specific id, and version of your survey form. In order to use this feature, you must provide these three column names: form_title, form_id, & version.

   Column **form_title**, you can provide free naming for your form. This naming will later appear on the user's cellphone.

   Column **form_id**, you can provide your form id. The terms for naming this column are that you can't have the same id as the other forms, don't use spaces, and don't use special characters.

   Column **version**, you can provide a **version** of your form. Adding column **version** is not mandatory. If you frequently add / change your survey forms, by providing column version, it will be easier for you to upload the forms on the server.

3. All entries must be starting from the first box   One of the most important requirements is that when we make a survey form, everything must start in the field /quadrant **A-1**.

All entries form must start in those quadrant/field because the system will convert spreadsheet file to XForm, so if you do not start from that position, and error will occur in the system.

In addition, the other main requirement is that you cannot use table formats such as merge, center, hide row / coloum, wrap text,etc. Everything must be in a standard format. Settings that we can use are to add letters in bold, give color to columns or rows, and change the shape and size of letters.

Basic Question Format for XLSForm   In the paper survey form, we usually find several questions such as short answers, long answers, entering the date of birth, and multiple choices. The more you are good at creating XLSForm, you might ask if there are other types of questions that can make your survey forms easier to use and retrieve data according to your wishes. To see all types of questions that can be used in making XLSForm, you can go to the site http://xlsform.org.

1. text   This type will generate a type of question with a free response question format. Users can freely enter numbers, letters, and special characters if we use this type of question.

2. *integer/decimal*   This type of question will produce a question format with answers of integer numbers (specifically for integer type) or decimal numbers (specifically for decimal type). Users can only enter numbers with this type of question, a combination of numbers and letters cannot be entered if we use this type of question.

3. *select_one*   This type of question will give the user a choice of answers where the user may only choose one answer. In creating this type of question, you must use a format such as **select_one [options]**. Where **[option]** is a group variable that will be included in the **list_name** inside worksheet **choices**.

4. *select_multiple*   This question type is the same as the previous question type. The answers presented to the user are of several choices and the user may choose more than one answer. The rules for creating this type of question are the same as **select_one**. You must use a format such as **select_multiple [option]**, where **[option]** is a group variable that will be included in choices under **list_name**.

5. *geopoint*   This type of question will ask the user to record the coordinates of their position and will produce data in the form of latitude and longitude coordinates.

6. *note*   This type is used to add a note or notification page. Users will be presented with a single page containing only the appearance of the text without having to fill in any information. For the writing format, it still follows the writing conventions in **label**, where we are free to give any writing format.

7. *Image, video, or audio*   This type of question will ask the user to take a picture, sound or video.

8. *hint*   By using this feature, we can provide additional information or instructions on how to fill in a question that we make. To create this feature, we must add a new column in the **survey** worksheet called **hint**. By adding this column, for each type of question we make, we can add it with the information, such as instructions to filling the form, in column hint.

9. *required*   By using this feature, users will not be able to fill in further questions if they have not answered the question first. The types of questions that use this feature will also have a red asterisk when viewed on your phone. To use this feature, you only need to create a new column called **required** on the **survey** worksheet. In order to set questions becomes mandatory, you must add the value **yes** or **1** in this required column.

[Quiz] Check Your Knowledge

1. What type of file format that you should create in order to create a survey form for ODK Collect?

    a. .pdf

b. .json or .geojson

c. .xls or .xlsx

d. .img or .png

2. What is standard main worksheet name that you need to put into your XLSForm

   a surveys, options, settings

   b. survey, choices, settings

   c. survey, choices, preferences

   d. questions, choices, settings

3. What type of question format if you want to create a question that collect a gps data?

   a. Geopoint

   b. Polygon

   c. Decimal

   d. Location

4. If you want to collect age of respondent, what type of question format that you need to put into your xlsform?

   a. Text

   b. Decimal

   c. Note

   d. Integer

5. You will have five questions that must be answered by the respondent and they cannot skipped the question, what type of format that you need to put into your xlsform?

   a. Hint

   b. Note

   c. Required

   d. Text

Answer: 1. C | 2. B | 3. A | 4. D | 5. C

Activity Checklist

Congratulations! Currently you have successfully learned how to create a survey form for ODK Collect. By the end of this section, you will be able to: - Understand what is XLSForm - Standard format in XLS-Form - Basic question type

Additional resources

- http://xlsform.org/
- https://docs.getodk.org/form-design-intro/
- XLSForm example for Field Mapping Tasking Manager (FMTM): Copy this! [TEMPLATE] buildings.xls

2.7 Creating MBTiles for ODK Collect

Course Objectives

When you use the ODK Collect application to conduct field surveys, sometimes you will have difficulty in determining objects in the application. You can use MBTiles file for background map, which is a satellite imagery, to make it easier for you to identify objects in the field. By the end of this section, you should be able to:

- Understand the concept of MBTiles
- Learn create MBTiles using Export Tool

***

Learning Activities

The Definition of MBTiles

MBTiles is the spatial data format for storing several map tiles that are combined into one file as raster format, so that it looks like satellite imagery. You can use MBTiles as a basemap in the ODK Collect, which makes it easier for users to mark objects in the field. Basemap is a basic map that is used as the background of an application. It can be in the form of satellite imagery and OSM map.

Creating MBTiles using Export Tool

Export Tool is one of the sites that is used to download OpenStreetMap data for free based on certain features and regions. Spatial data formats that are commonly used, namely Shapefile (.shp), GeoPackage (.gpkg), and MBTiles (.mbtiles). The steps to create MBTiles using export tools are:

- Open your web browser and go to link URL https://export.hotosm.org/, you need to login first to your OpenStreetMap account. If you do not have an account, you should go to https://www.openstreet map.org to create one. You can refer to Getting Started with OpenStreetMap for the details.
- After you successfully login, click Start Exporting.

- Complete the dialog box on the left as a project description and select the area that you want. Area selection can be made with several ways using tools in the right panel. If you have administrative boundary in .geojson format, you can use the **Import** option.

⬜Tips:⬜

You should not make too large area selection for MBTiles area, because it will cause failure during the process.

- Next step, click **Format Menu** → Give a check mark on **MBTiles** option.

- Then click on the **Data** menu section, you must copy the URL address of the tilemap from the satellite imagery that will be used as the basemap. You might only see OpenStreetMap as one of the options for creating MBTiles. By default Export Tools only provides OpenStreetMap as the background for your MBTiles by default.

- After you paste the link, you can swipe to the left and select the link that you entered.

- You can change the Zoom Range setting to select the zoom level for MBTiles display. We need to keep in mind that if the distance between the zoom range is getting farther away, the file size will be even greater.

- Last step is select **Summary** menu, this section will show the summary of your project. If your project wants to be seen by other users, you can choose **Publish this Export**. Then click **Create Export** to process the creation of MBTiles.

- The process of making MBTiles will take several minutes depending on the internet network, the area size, and the zoom range that has been set previously. You do not need to wait, because the export tool will notify you through email when the process is complete. You can also see other projects that have been created in the Exports Menu.
- After the process completed, the project status should be changed to COMPLETED. Click the file name in the blue color to download .mbtiles file directly.
- MBTiles can be opened using mapping software such as QGIS, so that it displays offline satellite imagery. This way can be used to check the .mbtiles file first before inserting it into the ODK Collect application, open **QGIS → Add Raster Layer**.

[Quiz] Check Your Knowledge

1. What is spatial data format for storing several map tiles that are combined into one file as raster format?
    a. MBTiles
    b. QTiles
    c. RasterTiles
    d. Geopackage

2. You can create MBTiles for your preferred area using Export Tool site by define satellite imagery URL in the MBTiles source field
    a. True
    b. False

3. The process of making MBTiles will take several minutes depending on area size and zoom range that has been set previously.
    a. True
    b. False

Answer: 1.A | 2.A |3. A

Activity Checklist

By the end of this section, you should be able to: - Understand the definition of MBTiles - Create MBTiles using Export Tool

Additional resources

- Build MBTiles using QGIS: https://www.fulcrumapp.com/blog/mbtiles-from-qgis/

2.8 Setting Up Field Mapping Tasking Manager

Course Objectives

This section will provide you general information about Field Maping Tasking Manager, by the end of this section you should be able to:

- Understand what is Field Mapping Tasking Manager
- Able to setup Field Mapping Tasking Manager project

***

Learning Activities

FMTM Overview

Field Mapping Tasking Manager (FMTM) is a platform that helps project managers to organize and manage mapping tasks. It assigns those tasks to volunteers and tracks their progress. The tool includes features for collaborative editing, data validation, and error detection. This ensures that the data collected by volunteers is accurate and reliable.

FMTM works much like a tasking manager (TM), a platform that works to manage and coordinate remote mapping project. FMTM and TM divide area of interest into smaller tasks/grids that can be completed rapidly with many people working at the same time.

FMTM is designed to be used in conjunction with Open Data Kit (ODK). ODK is a free and open-source set of tools that allows users to create, collect, and manage data with mobile devices. The ODK provides a set of open-source tools that allow users to build forms, collect data in the field, and aggregate data on a central server. It is commonly used for data collection in research, monitoring and evaluation, and other development projects.

Project managers use FMTM to manage tasks and assign them to volunteers. The data collected by the volunteer via ODK is typically uploaded to OpenStreetMap (OSM) where it is used to create more detailed and accurate maps of the affected area. OSM is a free and open-source map of the world that is created and maintained by volunteers.

Overall, the FMTM tool is an important component of HOT's efforts to support disaster response and humanitarian efforts around the world. By coordinating mapping activities and ensuring the accuracy and reliability of the data collected by volunteers, FMTM helps to provide critical information that can be used to support decision-making and improve the effectiveness of humanitarian efforts.

Skills and technology needed

- Stable Internet connection
- Knowledge of field mapping especially related to building XLSForm for ODK. Please read this Creating XLSForm for ODK to learn more.
- Account on **ODK Central Server**. Here are the instructions for setting up an ODK Central server on Digital Ocean (it's very similar on AWS or whatever)

Tips:

FMTM uses ODK Central server as their back-end. It is important for you to build ODK Central first or have access to ODK Central server, especially in the following information:

Creating Field Mapping Project for FMTM

Note: this guide assumes that you already have access to ODK Central

1. Go to fmtm.hotosm.org
2. Click on **Sign-up** to create a new account with your email address. If you already have an account, click **Sign-in**

3. Click on **Create New Project**

4. In the **project detail** tab, enter all required information.

    Note: you can put your own ODK Central, Username, and Password in this section

5. Click **Next** after you filled out all the information
6. In the **Upload Area** tab, you will need to upload your area of interest in .geojson format. If you want to create a geojson, you can use https://geojson.io/.

7. Click **Next** after you uploaded the AoI.
8. In the **Define Tasks**, you will need to choose how FMTM split your AOI (whether Divide on Square, Choose Area as Tasks, or Task Splitting Algorithm). Click **Next** after you are good with the tasks size.

9. In the **Data Extract** tab, you need to select your form category, as well as the Data Extract. FMTM will try to extract OSM data to be used in ODK.
10. If you choose **Data Extract Ways**, you will use the FMTM data extract feature. You need to choose whether you want to extract OSM data as a centroid or as a polygon.

11. Click **Next** after you define the data extract type.
12. In the **Select Form** tab, you need to upload your XLSForm. Upload your XLSForm as .xls/ .xlsx/ .xml

13. Click **Submit** to start uploading your form and create the project. There will be a notification from FMTM if your project is already finished.

[Quiz] Check Your Knowledge

1. HOT developed Tasking Manager to support remote mapping activities, while the Field Mapping Tasking Manager is focused on supporting the field mapping activities. Both platforms work by splitting the AoI into smaller tasks/grids.

    a. True

    b. False

2. To set up a field mapping tasking manager project, you need to provide a geojson AoI file and XLS-Form.

    a. True

    b. False

Answer: 1.A | 2. A

Activity Checklist

Field Mapping Tasking Manager (FMTM) is a new platform that currently develops by HOT to support field mapping activities. At the end of this section, you should be able to: - Understand the concept of FMTM - Learn how to create a project in FMTM

Additional resources

- FMTM presentation
- Github: FMTM User Manual for Project Manager

3.0. Introduction to Participatory Mapping with OpenStreetMap

Overview

In this section, Project Managers will find tools and resources to lead and implement organized Open-StreetMap editing activities including:Presentations and step-by-step guides for introducing teams to OpenStreetMap and editing tools such as the HOT Tasking Manager.

- Resources for determining if your project needs to meet OSM Organized Editing Guidelines
- Detailed guides and training activities for digitization teams to use during validation and data upload

---

Digitization, or remote mapping, is the process of tracing features such as buildings and roads from aerial or satellite imagery to create map data. OpenStreetMap relies heavily on users generating data through digitization.

With OpenStreetmap at the core of our tools and workflows, mapping projects using HOT tools and work-flows will likely incorporate digitization or editing of OSM data during one, in not multiple phases in the project timeline. While numerous resources exist to teach new users how to use OpenStreetMap for the first time, this section is largely designed to guide project managers and community members through the digitization process from the perspective of leading trainings and managing teams conducting OSM editing. Users looking for guidance on individuals mapping in OSM should look to LearnOSM.org as a resource.

- Introduction to OSM contains a brief overview of OpenStreetMap with the purpose of being dis-tributed as supplemental training guides.
- Organized Editing Guidelines covers considerations project managers and communities should make when organizing focused digitization or editing campaigns.
- Working with the HOT Tasking Manager provides an overview of HOT's tool for crowdsourcing Open-StreetMap edits, as well as a guide for setting up tasks in the Tasking Manager.
- Editing with iD and JOSM Editor provides guidance on selecting the appropriate OSM editing tool for your project or event, and training materials using both tools.
- Resolving conflicts in JOSM provides additional assistance for teams conducting advanced OSM editing.

The following presentation(s) can be used to lead a training or workshop:

- Introduction to OSM
- Introduction to HOT Tasking Manager
- Mapping with iD Editor
- Mapping with JOSM
- Validating with JOSM

3.1. Introduction to OpenStreetMap

Course Objectives

This section provides an overview of OpenStreetMap as well as on how to contribute to OSM. By the end of this section you should be able to:

- Able to present an introduction to OpenStreetMap
- Learn how to create an account in OpenStreetMap

The following materials are designed to assist project managers and others leading trainings and workshops. If you are an individual interested in learning how to map with OpenStreetMap, please visit LearnOSM.org.

***

Learning Activities

OpenStreetMap Overview

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 is open data: you are free to use it for any purpose as long as you credit OpenStreetMap and its contributors. If you alter or build upon the data in certain ways, you may distribute the result only under the same license. OpenStreetMap data is licensed under Open Data Commons Open Database License (ODbL), whereas the cartography of the map tiles is underCC-BY-SA.

There are many mapping applications and platforms offering their services as well, but here are some of the reasons why OpenStreetMap is still the best choice:

- OpenStreetMap is free and open so you won't be charged anything to use it. A lot of spatial data providers charge a great amount of money to obtain spatial data from them. OpenStreetMap can be your alternative free of charge source. With OpenStreetMap, you do not need to depend on a government agency/institution or other spatial data providers to obtain spatial data.
- OpenStreetMap data is richer and more updated. This is possible because every OpenStreetMap user can add, edit, or delete OpenStreetMap data anywhere anytime. For example, if there is a restaurant that no longer exists but it is still mapped on OpenStreetMap, you, as an OpenStreetMap user, can easily delete the restaurant mapped on OpenStreetMap since it no longer exists. In some big cities, the OpenStreetMap data tends to be richer than remote small cities because there are no users mapping the latter. So, data availability and data update depend on OpenStreetMap users.
- OpenStreetMap comes in handy. OpenStreetMap provides a lot of tutorials for new users. OpenStreetMap's user-friendly interface makes the mapping experience easy even for those who do not have a geography/mapping background.
- OpenStreetMap maps can be modified as needed. All OpenStreetMap data can be used and modified for your needs. For example, you want to make a tourist objects map in your area, you can download OpenStreetMap data and make a tourist objects map out of it.

OpenStreetMap can also be used to make disaster-related maps. It is often used as a tool to map disaster areas and as a basis for damage assessments. It is also often used as a mapping platform for disaster response because it allows participatory mapping. The resulting data in OpenStreetMap can then be used for things such as evacuation route planning, but OpenStreetMap data should be processed first using a GIS software (e.g. QGIS).

Creating OpenStreetMap Account

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

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.

Tips

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.

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.

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.

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.

Using OpenStreetMap

After creating an OpenStreetMap account it is important to understand basic skills in navigating OpenStreetMap.

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.

- 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.
- 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.

- 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.

Change Different Style 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.

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

- Standard: This layer shows all the objects on the OSM map.
- Cycle Map : This layer emphasizes cycling routes and pedestrian roads.
- Transport Map: This layer emphasizes transportation routes on the map such as highways and bus stop.
- Humanitarian: This layer emphasizes important objects or amenities on the map such as school, hospital, etc.

View 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.
- 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.
- 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.

Share Location 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.
- 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.

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.

- 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.

View 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.

- 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.

Basic Concept of OpenStreetMap Attributes

OpenStreetMap is a good way to convey information since it has visuals that are representative of the world. Maps often deliver information and answer questions better than words (i.e. Where is the nearest hospital? Who has the easiest access to hospital facilities?). Maps answer these questions with the aid of lines and polygons that represent actual on-the-ground information. OpenStreetMap, in particular, utilizes several data types, namely **point**, **line**, and **polygon**.

- **Point/node** in OpenStreetmap usually represents an object on the earth defined by its latitude and longitude. Usually, a node is used to represent a point-of-interest (POI) such as a restaurant, bench, water well, or fire hydrant. These POIs can usually be found inside a larger polygon such as a bench in a park or a shop inside a shopping mall. In OpenStreetMap, points also have varying symbols to represent their location depending on their type (e.g. a restaurant is symbolized by a fork and spoon).

- **Line/way** in OpenStreetMap usually consists of several points or nodes that connect to each other. Lines usually represent roads, pedestrian lanes, canals, rivers, and other linear features.

- **Polygon/closed way** in OpenStreetMap consists of several points or nodes that connect with each other, with its first and last nodes connecting to form a closed shape. You can see an example of a polygon/closed way in OpenStreetMap by looking at buildings, land uses, parks, and lakes.

When you draw any feature (i.e. point, line, polygon) in OSM, you still need to add information about the object such as its name, address, and other supporting information. This helps other users when they utilize 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 you know as an apartment building that has 40 floors and is named 'Luna Gardens'.

You can add as many attributes/tags as you want to an object as long as they are verifiable and correct. Attributes are stored as a pair of text, named **Key** and **Value**.

Key is the general information that explains the function of an object. One key can consist of many values. For example schools, mosques, and hospitals all have the same *key* which is *amenities* (important facilities). Although the three objects have different types of functions (or *value*), all three of them have the same key because they are all amenities.

Whereas *Value* is information that more specifically explains the type of an object. Because this value describes specific information about an object, there can only be one value for a specific key to describe the object. In OpenStreetMap, an attribute is added by formatting a key-value pair that represents physical features on the ground.

[Quiz] Check Your Knowledge

Type of quiz: Gapfill ||| |—|—| | OSM Data : ODbL | (1)____ : CC-BY-SA | | Road : (2)____ | Building : Polygon |

A commercial building named ShoeMarket has 5 floors, and operates only from 9AM to 11AM. It is located in Marikina City. *Provide the missing key/value.*

Key	Value
(3)__	ShoeMarket
building:levels	(4)___
(5)__	09:00-11:00
(6)__	Marikina

Answer: 1.Cartography tiles | 2.Line | 3.name | 4.5 | 5.opening_hours | 6.addr:city

Activity Checklist

By then end of this section, you should be able to:

- Explain what is OpenStreetMap (from concept, difference, and benefit)
- Create an account in OpenStreetMap
- Navigate within OpenStreetMap website
- Understand the basic concept of OpenStreetMap

Additional resources

- LearnOSM - Introduction to OSM
- OSM Wiki - Abot OpenStreetMap
- Two Minute Tutorial - What is OpenStreetMap?
- Two Minute Tutorials - How to sign up for OpenStreetMap

Slides * Introduction to OSM

Step-by-step guide * Step-by-Step Instructions: Opening OSM Accounts * Step-by-Step Instructions: Using OSM

3.2. Organized OSM Editing

Course Objectives

This section will inform you on how to organized OSM editing activities. By the end of this you should be able to:

- Understand the considerations for managing and sourcing mapper for an organized editing
- Learn the organized OSM editing Guidance and Compliance
- Able to setup organized OSM editing guidance

***

Learning Activities

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.

Sourcing Your Remote Mapper

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. There are four sourcing options that you could consider when you want to organize your mapping efforts:

1. **Global HOT/OSM Communtiy:** The global HOT/OSM community is the first source that you could support your mapping efforts. As of August 2023, 454,800 volunteers from around the world have support us and mapped over 149 million buildings on HOT's Tasking Manager to support mapping efforts around the world.
2. **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
3. **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.
4. **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.

The resources and time needed to map your area of interest depends on these five factors:

1. **Size Area of Interest (AoI):** *Are you mapping one city or an entire district?*
2. **Timeline**: *Does the area need to be mapped in a few weeks? Months?*
3. **Resources needed**: *Does your project have budget to pay digitizers and validators?*
4. **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?*
5. **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?*

Factors	Global HOT/OSM Community	Dedicated team of digitizer (5+ people)	Mixed (Paid digitizer & OSM Community)	Mapathons
Size of AoI	Can cover any size of digitization efforts (neighborhood or countries)	Can cover any size as they can covers larger areas over shorter period.	If you have smaller team, combine with global volunteers could covers larger area	only recommended for smaller areas because it will depends on number of people attend, skills, and the duration of mapathon
Timeline	Suitable for rapid response (in wake of disaster or humanitarian needs). May not suitable for other type project with controlled timeline.	Favorable for project that have limited timeline. Newly trained digitizers can map 500-1000 buildings per day depending on density and imagery quality.	By including some paid digitizers, this method can help keep the project in development while relying on the global community.	This option can be faster than relying solely on the global community, but slower than having a dedicated team of volunteers.
Resources	Free	Requires to set budget for hiring the team. Also may need to provide workspace with consistent internet connection.	Smaller budget than a full team, but will still likely need to provide a dedicated workspace and consistent internet connection.	Smaller budget than a dedicated in-person team, but event space, internet, and refreshments will need to be covered.
Quality	Difficult to control the quality of data being immediately mapped. Additional effort to review and fix mistakes	Easier to train and control its quality	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.	mapathons have the possibility of requiring more effort on the validation side of mapping.

Example of mapping recap

Figure 1: Example of mapping recap

Features and attributes	Perfect for simple tasks (mapping building). Additional features to may still doable as long as not complex and require to extra checks afterwards.	Favorable if you have special features or tags that needs to be added. Having local context also extremely helpful for adding unique features and attributes.	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.	Mapathons allow for better training and management of volunteers to adding unique features or attributes. However, similar to data quality, this will still require a heavier lift in validation than using a dedicated team.

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 as 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.

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.

The following is based on HOT's suggested procedures for complying with the Organised Editing Guidelines (OEG) - as of June 2019

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)?

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

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? 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 Processes

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:Activatio 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
  - – 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
- 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

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.

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

[Quiz] Check Your Knowledge

1. What mapping sourcing you need if you want to map **ten districts, with detailed attributes and information, and expected to be mapped in two months**

    a. Mapathon

    b. Global HOT/OSM community

    c. Dedicated team of digitizer (+5 people)

    d. Internal HOT's staffs

2. We need to setup a simple digitization task for global HOT/OSM community. Which option that considered as a simple digitization attributes?

    a. Point of Interest

    b. Buildings

    c. Road networks with additional tags

    d. River, Buildings, and general health facilities

3. The OSM Foundation released organized editing compliance document for organization/company who lead digitization effort with a large team of digitized. Which aspect that they need to record in the wiki OSM?

    a. List of digitizers, active email of project coordinators/managers, and salary rate

    b. List of digitizers, active phone number of project coordinator/manager, and project overview

    c. List of digitizer, project area, project overview, and list of changeset comments

    d. All of them are correct

Answer: 1. C | 2. B | 3. C

Activity Checklist

Now you already know how to organized your mapping project. By the end of this section you should be able to:

- Determine the mapping size, effort, and type of sourcing
- Understand the difference between each sourcing options
- Tracking the digitization effort
- Setup Organized Editing Compliance document

Additional resources

- Campaign Management Guide
- HOT Organised Editing Compliance Procedures

3.3. Overview iD and JOSM

Course Objectives

By the end of this section, you will be able to:

- Understand the difference between iD editor and JOSM
- Learn how to teach people to use JOSM or iD editor

This section are designed to assist project managers and others leading trainings and workshops. If you are an individual interested in learning how to map with OpenStreetMap using iD Editor or JOSM, please visit LearnOSM.org.

***

Learning Activities

Difference between 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. This section provides an overview of each tool as well as presentations to be used in trainings. For self-paced materials and guides, visit LearnOSM.

Factors	iD Editors	JOSM
Edit OSM data	☒	☒
Interface	Simple	Quite complex for begineer
Internet connection	Requires stable internet connection	Requires stable internet connection
Tagging interface	Following consistent and simple tagging scheme (i.e. building or road)	You are able to using default tagging scheme or using your own preset (custom tagging scheme)
Data quality activities	Can be used for simple data quality fix (i.e. overlapping building or building without tags)	Mostly used by advanced validator because JOSM have lots of data quality tools (I.e. revert changeset, mass fix error/warnings, routing validation, etc)
Mostly HOT uses for	Mapathons or when you are restricted from installing program on the computer you are using	Data quality check, processing field data before upload to OSM, organized editing with paid digitizers
Skills and Technology Needed		

[Quiz] Check Your Knowledge

1. Advanced validator and digitizer often uses Potlach and iD for data validation activities

    a. True

    b. False

2. You are in the situation where you need to have a mapathon event. All participants registered in your Mapathon activities are intermediate mapper who already made an edits more than 3000 changesets. What is the best application to use for this mapathon event, especially if you also have validation activities at the end of your mapathon event?

    a. iD editor

    b. JOSM

Answer: 1. B | 2. B

Activity Checklist

This section provides you an overview of iD and JOSM, two most editing apps within OSM community. By the end of this section, you should be able to:

- Differentiate between JOSM and iD
- Teach people to use iD or JOSM

Additional resources

Training materials

- Introduction to iD Editor
- Introduction to JOSM

Additional resources

- LearnOSM
- Awesome OSM: A Comprehensive Guide on Mapping Building Footprints

3.4. Working with Tasking Manager

Course Objectives

By the end of this you should be able to:

- Understand how to navigate and operate the tasking manager
- Understand how to teach people to use the tasking manager to map with OSM

The following materials are designed to assist project managers and others leading trainings and workshops. If you are an individual interested in learning how to map with OpenStreetMap, please visit LearnOSM.org.

***

Learning Activities

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, fill out a form here, http://bit.ly/TaskManagers , to receive training and permissions to become a TM Project Manager.

Getting Started with Tasking Manager

Skills and Technology Needed

- Computer
- Internet connection
- OSM account

Head to the HOT Tasking Manager website: https://tasks.hotosm.org/. To sign in, click on the 'Log in' button in the top right corner of the page. Once you click on the login button a popup will appear with the OpenStreetMap login form. Please enter your OSM username and password.

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. Click 'Grant Access' so that your OSM login details will sync to the Tasking Manager. You will notice that your username now displays in the upper right hand corner of the page.

Finding a Project   The 'Explore Projects' button along the top of the Tasking Manager will display a list of current mapping projects as shown below:

Each project listed will describe:

1. The urgency of the project
2. The project number and name - this will often include the location, 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 project
5. The organization requesting the project
6. The category of the project
7. The level of experience a mapper needs to contribute
8. The percentage of the project mapped so far (dark grey in the progress bar)
9. The percentage of the project validated so far (red in the progress bar)
10. The total number of contributors

If you have a specific project 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
- Location
- Type of mapping (features being mapped)

You can also view the list of projects on the map. You can switch the map on and off by selecting the toggle in the upper right hand side. Projects are clustered together on the map into circles which display the number of projects in a particular area.

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

Selecting a Project   Once you have decided which project you want to map, you can click on a tile to open a project page. This page provides specific details on the project objectives and requirements.

Underneath the project description you will see a series of icons. The bold icons indicate which entities to map (which features e.g. buildings, roads).

Once you select 'Contribute' more detailed instructions are provided, with specific guidelines (mapping notes). The Project Specific Mapping Notes section gives detailed instructions on the imagery to use, how to trace specific features, and how to tag features.

Mapping features which are the focus point of the project are explained in further detail underneath the Project Specific Mapping Needs. These feature specifications will describe common tags used for each main feature and provide tips for mapping that feature.

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

- **White**: a tile is ready to be mapped and needs to be completed
- **Blue**: a tile has been mapped and is ready to be validated
- **Yellow**: a tile has been invalidated. This could be because an area was not fully mapped or multiple errors need to be corrected
- **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
- **Grey**: a tile has been marked as having bad imagery
- **Black padlock**: a tile is locked by another user
- **Red padlock**: a tile is locked by you

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 turn bold and the button in the lower right hand corner will display 'Map selected task'.

Prior to selecting a task you may also click 'Map a task', this will allocate one randomly to you. You can also specify the editor you will be using. Select 'JOSM' or 'iD Editor' from the popup list before you start mapping.

[Quiz] Check Your Knowledge

1. In order to be able to create a project in the tasking manager, you need to become a project manager by submitting the request and receive training and resource as TM Project Manager.

    a. True

    b. False

2. Each project in the Tasking Manager will describe:

    a. Project description

    b. Project priority

    c. Total number of contributors

       d. All correct

Answer: 1. A | 2. D

Activity Checklist

By the end of this section, you should be able to:

- Explain/teach the use of tasking manager to other
- Navigate the tasking manager

Additional resources

The following presentation(s) can be used to lead a training or workshop.

- Introduction to HOT Tasking Manager

Read

- OSM Tasking Manager Wiki
- Learn How to Use the Tasking Manager

Video

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

3.5. Resolving Conflict in JOSM

Course Objectives

This section provides:

- An overview of data conflict in OpenStreetMap
- Step-by-step instructions for resolving data conflict in JOSM
- Guidance on preventing and managing data conflict

***

Learning Activities

Other contributors may have edited the same features as you in JOSM. Alternatively, different data may have been collected in the field for the same features. Both situations cause data conflicts during the up-load process. Therefore, it is critical for digitizers to learn about data conflicts in OpenStreetMap, conflict types, and how to fix them using JOSM.

1. Data Conflicts in OpenStreetMap

While uploading your edits in JOSM, you might have received a message like this:

This indicates a data conflict in OSM. A conflict has occurred because you have been editing the same data/object(s) as another contributor simultaneously. Thus, the other contributor has uploaded their changes first and they have been received by the OSM Server. You are attempting to upload the same data/object(s) with your own changes. Therefore, your changes are automatically rejected by the server because it causes confusion.

You will come across data conflicts in JOSM when you are editing, adding, or deleting objects which are being worked on by another contributor. 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 are correct. If this happens, the data conflict must be fixed before you upload your changes.

The image above illustrates a potential conflict stemming from the different positioning of the rectangular object in **My version** and **Their version** (which has already been received by the server). To resolve this conflict, you have to choose either 'My Version' or 'Their Version'.

2. Types of Data Conflict in JOSM

2.1 Conflict of Properties   A conflict of properties occurs when an object has been moved or deleted and one or more of its nodes is in a different location than the other version.

The image above illustrates a conflict of properties in JOSM. In **My version** the object is square and in **Their version** a corner nodes has been deleted. To fix this, you need to choose which version is correct.

2.2 Conflict of Tags   A conflict of tags occurs when different tags have been assigned to the same object by multiple contributors. The tag can be deleted or changed to the other version.

The image above illustrates varied tags for the same object between two versions in JOSM. **My version** has Rumah Sakit tag (amenity = hospital) and a name value of 'Rumah Sakit Tebet Raya'. While **Their version** has tag (amenity = clinic) and a name value of 'RS Tebet Timur'. You have to choose which version has the correct information before uploading to the server.

2.3 Conflict of Nodes   A conflict of nodes occurs when there are differences in the direction of a way or if nodes in a way have been deleted or moved.

3. Fix Conflict Data in JOSM

Fixing conflict data in JOSM is quite simple, even though most OSM contributors do find it confusing. Essentially, you have to decide which is the correct version and choose to keep your version or delete your version and use their version. To fix conflict data in JOSM:

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

- JOSM will then display the number of conflicts, select OK.

- In the **'Windows'** menu, select **Conflict** to show the conflict window. This activates a list of conflicts in the Conflict panel to the lower right corner of JOSM. You can choose which conflict you want to fix and select Resolve.

- When you select the **Resolve** button, the conflict window appears and shows details about the conflict. This might look complicated but it is actually fairly straightforward. You can tell which conflict type has been detected because a red square symbol will display in the corresponding tab (either properties, tags or nodes). You can look at a list of changed or moved coordinates as shown in the image below.

- You can only resolve one conflict at a time. If you are 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 is more convincing select **Their version (server dataset)**. Select: in the version you think is right. If the conflict has been fixed then the symbol in the tab will change to:

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

- Select **Apply Resolution** as shown in the picture above. When you have resolved all conflicts, you can upload your OSM changes.

- You can also resolve conflicts by right clicking one in the conflict window and selecting either **Resolve to my versions** or **Resolve to their versions**. You can also right click and **Zoom to Conflict**.

Tips:

You cannot upload changes until you have resolved all conflicts. Be careful when resolving the conflicts and check them one-by-one.

---

4. Avoiding Data Conflict in JOSM

To avoid conflicts:

- **Upload your changes continuously**
  To minimize conflicts, you should frequently upload. Upload your changes every 20 buildings or every 15 minutes. The longer you wait to upload the higher the chance that another contributor has edited and uploaded the same data.

  You can update your OSM data first before uploading. This allows you to retrieve the latest OSM data from the server before uploading. **Select File → Update data** or **Update Modified** and wait until it has finished updating. Then you can upload your changes.

- **Edit Only in Downloaded Area**
  Restrict editing to your downloaded area to minimize conflict risk in JOSM. The area outside of your downloaded area is marked by diagonal lines, do not edit this region.

- **Using Tasking Manager**
  If you want to do collaborative mapping, you can use Tasking Manager. It divides a project area into a grid of tasks. Once a task is selected it is locked and cannot be chosen by another contributor. This allows many people to work in the same area at the same time while limiting the chance of conflicts.

[Quiz] Check Your Knowledge

1. **My version** means the local data that you will upload to OSM server, while **Their version** is the server data that already exists.

    a. True

    b. False

2. To avoid conflict, you should upload at night, when everyone is not awake and not using OpenStreetMap.

    a. True

    b. False

3. Conflict tags is the type where there are difference between the tags that you are going to upload with existing object in server

    a. True

    b. False

Answer: 1. A | 2. B | 3. A

Activity Checklist

By the end of this section you should be able to:

 • Understand the concept of data conflict in OSM

4.0. Introduction to Field Mapping Management

Overview

In this section, Project Managers will find tools and resources to lead and manage field mapping activities as well as resources designed for their team including:

- Step-by-step guides for surveyors, mappers and field supervisors to manage and use data collection tools in the field
- Resources and step-by-step guides for managers on how to organize and monitor teams in the field

---

Effective Field Mapping Management - knowing when, where, and what data is collected by each team member - is critical to ensuring that mapping efforts are done in a timely and safe manner with high quality and completeness. Additionally, field supervisors and team members will need the skills to set-up and manage field data collection tools. This section provides guides for setting up and using three tools: OpenDataKit, OpenMapKit, and OSMTracker.

- Creating Mapping Section using QGIS provides project managers and supervisors with step-by-step to assign and coordinate mapping assignment areas (or enumeration areas) to team members and mappers.
- Using ODK Collect serves as a step-by-step guide for surveyors, mappers, and field surveyors to set up and use ODK Collect.
- Using OpenMapKit serves as a step-by-step guide for surveyors, mappers, and field surveyors to set up and use OpenMapKit.
- Using OSM Tracker serves as a step-by-step guide for surveyors, mappers, and field surveyors to set up and use OSM Tracker.

4.1 Creating Mapping Section using QGIS

Course Objectives

In this section, you should be able to: * Understand how to create mapping section using QGIS * Understand how to load mapping section in OSMAnd

***

Learning Activities

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. We already understand on how to create mapping section using Field Mapping Tasking Manager previously. This section will explains on how to create a manual mapping section using QGIS and load it with OSMAnd.

Creating Mapping Sections in QGIS for Printed Maps

The following activity covers the process of generating mapping sections in QGIS for printing. 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.

To begin, open QGIS on your computer and start a new project. Using QuickMapServices as a basemap, navigate to Grootfontein Town, Northern Namibia.

Create an empty shapefile by selecting **Layer** –> **Create Layer** –> **New Shapefile Layer**. After selecting the location and name of the file, make sure to assign the file as 'Polygon'.

Enable editing, select the 'New feature' too. 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.

Once all sections are created, style for visibility.

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

The following activity covers the process of importing files into OSMAnd based on the previous activity (generating mapping sections in QGIS). 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.

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.

1. Create section centroids from the grootfontein_sections.shp giving you grootfontein_sections_centroids.shp. Create centroids by selecting the **Vector** menu –> **Geometry Tools** –> **Centroids**. In the sub-menu, select the grootfontein_sections.shp file as the Input layer, click **Run**.
2. Export 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.

3. Transfer these two .gpx files from you computer to the _/Phone/Android/data/net.osmand/files/tracks _folder
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.

[Quiz] Check Your Knowledge

1. During planning, 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.

   a. True

   b. False

2. OSMAnd can load .gpx files to shows the mapping grid and map markers

   a. True

   b. False

Answer: 1. A | 2. A

Activity Checklist

Now you already understand on how manually create a mapping grid to help your data collection project. By the end of this section you should be able to: - Create a mapping grid using QGIS - Load the mapping grid in OSMAnd

4.2. Using FMTM for Field Data Collection

Course Objectives

This section will covers on how the field surveyor uses Field Mapping Tasking Manager during their field mapping activities. By the end of this section, you should be able to:

- Learn how to navigate in FMTM site to download the QR Code
- Learn how to navigate within FMTM project

***

Learning Activities

Field Mapping Tasking Manager (FMTM) is a platform that helps project managers to organize and manage mapping tasks. It assigns those tasks to volunteers/surveyor and tracks their progress.

As a field user, you will heavily uses FMTM to select the grid, download the QR code, and mark grid as done (if you complete the task).

Working with FMTM Site

1. Go to fmtm.hotosm.org, you will see list of projects created in FMTM. In order to start working on the project on FMTM, you need to create an account first,
2. Click on **Sign-up** to create a new account with your email address. If you already have an account, click **Sign-in**

3. Select the project by clicking on the project thumbnail
4. You will be directed to the project overview page. Select the task/grid that **Ready** to map

- **READY** means that task is available to be mapped
- **LOCKED FOR MAPPING** means that task is already being mapped by another volunteer and therefore unavailable for mapping
- **READY FOR VALIDATION** means that task has been completely mapped and ready to be validated.
- **LOCKED FOR VALIDATION** means that task has been mapped and being validated.
- **VALIDATED** means that task has successfully been validated and completely mapped with no errors
- **MORE MAPPING NEEDED** means that task did not pass the validation process and needs more mapping

5. After you select the task, press **START MAPPING** to lock the task and to ensure no one work on the same area as you.

6. Scan the QR Code or download the QR Code by press the download button on the bottom left side.
7. Use the QR code to start mapping the selected task using the ODK Collect app on your mobile phone (if you do not know on how to operate ODK Collect to load the QR Code, please check this tutorial)

Marking the Task as Completed

After you have completed the field survey, you need to mark the task as completed. To do this you need to:

1. Go to your project area and select the grid that you locked previously
2. Press **MARK AS FULLY MAPPED** if you already finished the task

3. Your grid will turned into blue color to inform that your task is now complete and ready to validate

[Quiz] Check Your Knowledge

Please complete this following information regarding the status of FMTM ||| |—|—| |**1**|**......** means that task did not pass the validation process and needs more mapping| |**2**|**......** means that task is already being mapped by another volunteer and therefore unavailable for mapping| |**3**|**......** means that task has successfully been validated and completely mapped with no errors| |**4**|**......** means that task is available to be mapped| |**5**|**......** means that task has been mapped and being validated.| |**6**|**......** means that task has been completely mapped and ready to be validated.|

Options

READY FOR VALIDATION	LOCKED FOR VALIDATION	READYLOCKED FOR MAPPING	MORE MAPPING NEEDED	VALIDATED

Answer

1. MORE MAPPING NEEDED
2. LOCKED FOR MAPPING
3. VALIDATED
4. READY
5. LOCKED FOR VALIDATION
6. READY FOR VALIDATION

Activity Checklist

By the end of this section, you should be able to:

• Navigate FMTM site to select the grid and download the QR Code
• Navigate within FMTM project

4.3 Using ODK Collect

Course Objectives

By the end of this section, you should be able to:

- Understand to setup ODK Collect for the first time
- Able to operate ODK Collect for field data collection activities

***

Learning Activities

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. You can download ODK Collect in the Google Playstore to start this section.

Initial Setup for ODK Collect

1. Set the URL Server   When you first time open ODK, you will be prompted to set the URL server for your ODK application. It can be URL server that pointed to your ODK Central, Kobo Toolbox, or Field Mapping Tasking Manager Server.

In ODK, you can set the URL Server by two ways, by using QR Code or by setup the server URL manually. We will explain how to setup either using QR Code or Manually Enter the project detail.

A. Using QR Code to Setup Project

1. Select **Configure with QR Code**
2. Click on the upper-right corner part to open **Import QR Code** button. This will import the QR code that you downloaded manually from your ODK Central, Kobo Toolbox, or FMTM server.
3. Find QR Code images on your phone and select the QR image to start open the project

B. Manually Enter Project Details

1. Select **Manually Enter Project Detail**
2. Add the project by entering the URL Server (ODK Central, Kobo Toolbox, or FMTM URL), Username, and Password.
3. Click **Add** if all the information already entered.

2. Set the Image Size (Optional)   In addition to the location point, you can also take a picture as additional information. If you will be collecting images as part of your data collection surveys, 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:

1. Click on the upper right corner of your project homepage
2. Click on the **Setting**
3. In the Setting page, go to **Form Management**
4. In the **Form Management**, find **Image Size** and change into smaller size (by default it will set to the phone image size).

ODK Basic Operation

1. Get Blank Form from Server   Before you fill-out the form survey that you made before, you need to download the blank survey form from specified server. You can follow this step to take a blank survey from the server:

1. At your project homepage, click on **Download Form**
2. Wait few second until the ODK finish pulling the survey form from the server
3. Select the form that you want to download and click **Get Selected**

2. Fill the Survey Form

1. To start filling out the survey, click on **+ Start new form**
2. Select the blank form that you want to filling out
3. Enter all the information.

Tips:

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.

---

4. Swipe to right or left on the screen to move the next/previous page. You can also press **Next** or **Previous** button to navigate to each question.

5. At the end, press **Save as draft** if you still need to modify your form later or press **Finalize** if you already happy with the information you entered.

Tips:

If you press **Finalize**, you won't be able to modify the form later. It is better to **Save as draft** if you think you will modify some information before upload the submission to the server

---

3. Edit Draft Form   If you mark your submission **Save as draft**, you still can edit it through this step:

1. At your project homepage, press on **Drafts**
2. Click on the form that you want to modify
3. Press on the question that you want to modify. You can also press **Go To Start** to start the form from the beginning, so you can review all your entered information.
4. Press **Finalize** when you already finished modify your submission

4. Transferring Complete Form   After completing data collection, all forms will need to be transferred from the data collection device to a central storage location for data cleaning and processing.

A. Manual Download   If you do not have access to a server, forms can be manually downloaded from devices. To do so, plug the device into a computer.

1. 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 the 'instances' folder which contains the files from the survey results.

2. Copy the 'instances' folder to your computer. Rename the folder by date and surveyor.

B. Upload Survey Form to Server through ODK   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:

1. At your project homepage, press **Ready to Send**
2. Select forms that you want to upload, press **Send Selected** to start uploading your submission to the server
3. All forms that have been successfully uploaded will be stored in **Sent** menu and the icon turn into cloud with checkmark.

C. Upload the form to Google Drive   After you upload all the survey form to server, you may want 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:

1. 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 the 'instances' folder which contains the files from the survey results.

2. 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.

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

   • 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.

[Quiz] Check Your Knowledge

1. What is the step to setup ODK→ Ready to use for first time user?

   a. Set project (through QR Code or Manual) → Get Blank Form

   b. Set project (through QR Code) → Set Server URL → Set Image Size → Get Blank Form

   c. Set Server URL → Press Fill Survey Form

   d. Get Blank Form → Set the URL Server → Add Username and Password

2. If you press Finalize button at the end of your survey, you still be able to modify your form through Draft menu

   a. True

   b. False

3. To download manually, you need to connect your phone to your local PC and then find ODK folder → Instances

   a. True

   b. False

Answer: 1. A | 2. B | 3. B

Activity Checklist

By the end of this section, you should be able to:

   • Operate ODK and perform initial setup
   • Navigate through ODK to download the blank form and start using it
   • Send the final form to the server or through alternative way (manual copy to local PC)

4.4. Using OSMTracker

Course Objectives

In this section, you should be able to: * Understand how to setup OSMTracker for your phone * Understand basic operation of OSMTracker

***

Learning Activities

OSMTracker is an android application that allows us to record our survey data. Similar to GPS, OSMTracker is able to record waypoints and also track. 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.

Downloading and installing

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

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

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**.

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

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 OSMTracker 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.

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.

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:

1. **Text Note** - Use **Text note** to mark your current position as a waypoint. Just press this button and then fill the information. For example, you can label your waypoint with number and then the name of your object.

2. **Take Photo** - Use **Take Photo** to take your object photos. You can straight use your smartphone camera or you can select the photo from your 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.

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. 2. Then choose Resume Tracking

---

Tips:

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.

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

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.

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

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.

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**.

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 without time stamp.
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 can download your data but it will not connected with you.
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.

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.

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

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

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

You can use your survey result as a guidance for your mapping using JOSM. The photos taken will help you identify what object you should create in JOSM.

[Quiz] Check Your Knowledge

1. To start using OSMTracker, you need to enable the GPS first and then open the OSM Tracker.

    a. True

    b. False

2. Which one of the following option that we need to choose if we want to upload our track to OSM server that will shown to the public and other user can download your track data and refer to your username?

    a. Private

    b. Public

    c. Trackable

    d. Identifiable

3. If you start tracking with OSMTracker and you want to stop it suddenly due to several reasons. The OSMTracker cannot resume your track and you need to press Start tracking again later.

    a. True
    b. False

4. The OSMTracker cannot load pictures in JOSM to help you identify the object.

    a. True

    b. False

Answer: 1. B | 2. D | 3. B | 4. B

Activity Checklist

By the end of this section you should be able to use OSMTracker efficiently, to ensure this, please check if all of the following knowledges applies: - Able to setup OSMTracker for the first time - Able to run basic operation in the OSMTracker such as recording a track, record object, stop and continue track, saving track and waypoint, and opening the data in JOSM

5.0. Data Quality Assurance

Overview

In this section, Project Managers will find tools and resources to clean and upload field collected data to OpenStreetMap and manage data quality including:

- Step-by-step guides validating data in JOSM for upload to OpenStreetMap.
- Resources for data quality tools to use following upload to OpenStreetMap, including presentations.

Data Cleaning, Upload, and Quality Assurance is a critical step in any mapping workflow. This process covers cleaning raw field data for errors and mistakes, uploading clean data to OpenStreetMap, and using various quality control tools to monitor data that has been uploaded. Regardless of how (and if) you are collecting field data, any project that results edits in OpenStreetMap should have a quality assurance and control plan.

- Validating with JOSM covers the process and steps required to validate data and the uploading process using JOSM.
- Quality Assurance Tools provides a guide to tools HOT uses for monitoring and checking data quality of data uploaded to OpenStreetMap.

The following presentation(s) can be used to lead a training or workshop:

- Quality Assurance Tools

5.1. Quality Assurance and Quality Control Tools

Course Objectives

This section provides tools to conduct quality assurance during the field mapping activities. By the end of this section, you should be able to:

- Determine which quality assurance tool that you are going to use to support the project
- Understand how to use OSMCha to checking data quality
- Understand how to use Osmose to monitor multiple quality issue within OSM

***

Learning Activities

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.

While Quality Assurance and Quality Control should be performed at all stages of a mapping project, the following tools will help ensure that data uploaded to OpenStreetMap meets high quality standards.

Choosing a Quality Assurance Tool

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. Use the following table to decide when and why each tool should be used.

I want to check for…	OSMCha	Osmose	JOSM
Potential vandalism	☒	☒	☒
Contributions and upload issue by individual user	☒	☒	☒
Taggin issues	☒	☒	☒
Geometry issues	☒	☒	☒

Note: We won't cover how to validate with JOSM in this section. If you want to learn more, you can go tothis section instead.

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)
4. 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.
5. In this menu, unique filters can be applied such as OSM username, date range, locations.

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.

Tips:

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

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 using JOSM then re-upload to OSM.

[Quiz] Check Your Knowledge

1. OSMCha will let you understand the tagging issue and fix it automatically.

    a. True

    b. False

2. OSMCha will help detect vandalism and monitor user contribution at real-time.

    a. True

    b. False

3. It is easier to monitor multiple quality control issue using Osmose rather than using OSMCha

    a. True

    b. False

Answer: 1. B | 2. A | 3. A

Activity Checklist

By the end of this section, you should be able to:

- Determine which data quality tool that suitable with your mapping project
- Operate OSMCha to monitor changes
- Opreate osmose to monitor multiple quality issue

Additional resources

Presentation

- Quality assurance tool

5.2. Validating with JOSM

Course Objectives

This section provides:

- An overview of Validation in JOSM, including presentation slides
- Step-by-step instructions for practicing validation in JOSM

***

Learning Activities

Overview of Validation

Validation is a process of checking the data quality (in this case, map data quality) for accuracy, consistency, completeness and anomaly. Validation is important to maintain the quality of OSM data. There are lots of aspects that we need to consider during validation, namely accuracy, consistency, completeness, and anomaly detection.

When checking for accuracy, you need to make sure that the map data is aligned with the imagery and is correct in terms of geometry.

For consistency, make sure that all mapped objects are consistent in shape. For example, when you found a residential area, make sure all the buildings are consistently traced and orthogonalized.

For completeness, it depends on what information you want to collect when mapping and what mapping method is used. Information collected using remote mapping method would be different with the information collected by conducting field survey. Information collected using remote mapping method will be very limited since you only have satellite imagery and gpx tracks available as reference.

For anomaly, make sure there is no abnormal looking mapped objects. This can be acquired by checking the OSM data with visual checks and compare with your preferred imagery.

While light validation can be completed using iD Editor, HOT recommends that detailed validation be completed using JOSM.

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].

Skills and Technology Needed

- Computer
- Internet connection (for data download)
- OSM account
- JOSM
- Example .osm file

Estimated time for completion: 1 hour

Objectives:

- To be able to understand validation process for OSM data
- To be able to perform validation using Validation Tools on JOSM
- To be able to fix commonly error, warning and mistake found during validation

1. Opening OSM Data   After successfully downloaded sample data, open file validation_sample.osm into your JOSM by following these steps:

- Click menu **File ⊠ Open**

- Go to your directory where you save validation_sample.osm. Select the file **validation_sample.osm** and then click **Open**.

- After opening the exercise file, your JOSM will look like this:

2. Using JOSM Validation Tools   JOSM provides a built-in validator that checks and fixes invalid map data called Validation Tools. After checking for accuracy, consistency, completeness and anomaly, run this validation tools so that the map data is perfectly valid. To get started with the Validation tools, you need to activate the Validation Results Windows by following these steps:

- Click menu **Windows ⊠ Validation Results**
- Validation results Windows will appear on the left side of your JOSM

After activating the Validation Results Windows, now you can start validation using JOSM Validation Tools. Download OSM data first using either Slippy Map or Tasking Mananger, then you can click the Validation button in the Validation Results Windows. Let's use OSM data sample for exercise.

- To run validation on all the data in the current data layer, which is validation_sample.osm, make sure that there is no data selected. Then, click **Validation** button in the Validation Results Windows. Once the validation process is finished, Validation Results Windows will be filled with listed errors and warnings. The amount of errors and warnings found depends on the quality of the data. For example, on this OSM data sample, you will find one error and twenty one warnings.

- A new layer called Validation errors will also be added to the Layers Windows. This layer will highlight the errors and warnings found - red highlight for errors and yellow highlight for warnings.

3. Fixing Errors and Warnings   Errors are important to fix. **Do not ignore errors**. If you have errors on your OSM data, you won't be able to upload it into OSM Server until you fix the errors. Some errors can be fixed automatically using the Fix button on Validation Results Windows.

Warnings are problems that are important to fix, but in some cases, such as "Unnamed Ways", they are tolerable. Mostly, warning should be fixed manually. Now, let's try to fix errors and warnings found on validation_sample.osm. There are one error and twenty one warnings found on *validation_sample.osm*. They are:

- Error: Duplicated ways (1)
- Warning: Building inside building (4)
- Warning: Crossing building/highway (1)
- Warning: Crossing buildings (1)
- Warning: Crossing highways (1)
- Warning: deprecated tagging - amenity=hotel is deprecated, use tourism=hotel instead (1)
- Warning: missing tag - incomplete object: only name (1)
- Warning: node connects highway and building (1)
- Warning: Overlapping highways (1)
- Warning: Unclosed way - building (1)
- Warning: Unnamed ways (6)
- Warning: Untagged ways (1)
- Warning: Way end node near other highway (2)

Now, let's fix all the errors and warnings one by one.

3.1 Fixing Error: Duplicated ways   Duplicated ways error come up when there are ways that duplicate. This is usually caused by unstable internet connection when uploading OSM data into OSM server. Initially, to fix errors or warning, you should select the error or warning you want to fix. Go to the Duplicated ways error in the Validation Result Windows, click the + icon so that it looks like the picture below.

Select the objects where it is duplicated and **Right-click ⊠ Zoom to problem** to zoom and see the duplicated objects. Your map canvas will zoom in to the duplicated objects. Fortunately, duplicated ways can be automatically fixed. After selecting the duplicated objects, click **Fix**. Voila, your error is fixed!

3.2 Fixing Warning: Building inside building   Building inside building warning come up when there is a building object inside another building object. To fix it, go to the building inside building warning in the Validation Results Windows, click the + icon so that it looks like the picture below.

Select the objects listed under the warning Building inside building and **Right-click ⊠ Zoom to problem** to zoom and see the objects. Your map canvas will zoom in to the objects.

Most of warning should be fixed manually. To fix building inside building, simply delete one of the buildings. To decide which one to be deleted, please take a look at the imagery and carefully decide which one to be deleted. Voila, you just fixed a building inside building.

3.3 Fixing Warning: Crossing building/highway   Crossing building/highway come up when there is a building crossing with highway. To fix it, go to the crossing building/highway warning in the Validation Results Windows, click the + icon so that it looks like the picture below.

Select the objects listed under the warning Crossing building/highway and **Right-click ⊠ Zoom to problem** to zoom and see the objects. Your map canvas will zoom in to the objects.

To fix crossing building/highway, simply move one of the crossed objects, either the building or the segment/node of the highway. To decide which object that should be moved, please take a look at the imagery.

3.4 Fixing Warning: Crossing buildings   Crossing buildings warning come up when there are two or more buildings overlapped with each other. To fix it, go to the crossing buildings warning in the Validation Results Windows, click the + icon so that it looks like the picture below.

Select the objects listed under the warning Crossing buildings and Right-click ⊠ Zoom to problem to zoom and see the objects. Your map canvas will zoom in to the objects.

To fix crossing buildings, simply move one of the overlapped buildings so that they wont be overlapping anymore. To decide which buildings that should be moved, please take a look at the imagery.

3.5 Fixing Warning: Crossing highways   Crossing highways warning come up when there are highways that cross each other with no crossing node. To fix it, go to the crossing highways warning in the Validation Results Windows, click the + icon so that it looks like the picture below.

Select the objects listed under the warning Crossing highways and Right-click ⊠ Zoom to problem to zoom and see the objects. Your map canvas will zoom in to the objects.

To fix crossing highways, simply add a crossing node in the highway intersection. To add node at intersection, you can use JOSM additional tools, but first you have to activate plugin **utilsplugins2**. You can go to menu **Preferences⊠ Plugins**, search for **utilsplugins2** and give a check for **utilsplugin2**.

To add node at intersection, select the two crossing highways, and go to menu **More tools ⊠ Add nodes at intersections**. And voila, your crossing highways now have a crossing node.

3.6 Fixing Warning: deprecated tagging   Deprecated tagging warning come up when there is an object or more in your OSM data that used deprecated tagging. To fix it, go to the deprecated tagging warning in the Validation Results Windows, click the + icon so that it looks like the picture below.

Select the objects listed under the warning deprecated tagging and Right-click ⊠ Zoom to problem to zoom and see the objects. Your map canvas will zoom in to the objects.

Fortunately, deprecated tagging can be fixed automatically using Fix button. After selecting the object that has deprecated tagging, press the **Fix** button. JOSM will automatically change the deprecated tag into the new one.

3.7 Fixing Warning: missing tag   Missing tag warning come up when there is one or more objects that have no tag or the tag is incomplete. To fix it, go to the missing tag warning in the Validation Results Windows, click the + icon so that it looks like the picture below.

Select the objects listed under the warning missing tag and Right-click ⊠ Zoom to problem to zoom and see the objects. Your map canvas will zoom in to the objects.

In this case, the object "Monrovia Park" only has tag name. It does not have the tag that identify it as park. What you have to do is simply add a tag to define that it is a park, named Monrovia Park. To add tag, click

menu **Presets ⊠ Search preset…** and search for **Park**. Select one that suits the kind of park you map, in this case you can select **Geography/Landuse/Park,** then click **Select**. Leave the name as is, then click **Apply Preset**.

3.8 Fixing Warning: node connects highway and building   Node connects highway and building warning come up when there is a building node connects with highway. To fix it, go to the node connects highway and building warning in the Validation Results Windows, click the + icon so that it looks like the picture below.

Select the objects listed under the warning node connects highway and building and Right-click ⊠ Zoom to problem to zoom and see the objects. Your map canvas will zoom in to the objects.

To fix this, simply separate the connected nodes by selecting the connected nodes first then click menu **Tools ⊠ Unglue Ways or press G** on keyboard for shortcut. After separating the connected nodes, keep in mind to move either the whole building or the highway's node since both nodes are still overlapping.

3.9 Fixing Warning: Overlapping highways   Overlapping highways come up when there are highways overlapping each other. To fix it, go to the overlapping highways warning in the Validation Results Windows, click the + icon so that it looks like the picture below.

Select the objects listed under the warning overlapping highways and Right-click ⊠ Zoom to problem to zoom and see the objects. Your map canvas will zoom in to the objects.

To fix this warning, firstly you should split the overlapped segment of the highway. Select one end node where the highways are overlapped, then click menu Tools ⊠ Split way or press P on keyboard for shortcut. Selet the other end node where the highways are overlapped, and then menu Tools ⊠ Split way or press P on keyboard again. Now the overlapped segment have splitted. All you have to do now is to delete the overlapped segment by selecting the segment and then press delete on your keyboard.

3.10 Fixing Warning: Unclosed way - building   Unclosed way - building warning come up when there is one or more buildings drawn as unclosed polygon. This happens when you draw building manually using node tools without building tools and the first node and the last node are not merged. To fix it, go to the unclosed way - building warning in the Validation Results Windows, click the + icon so that it looks like the picture below.

Select the objects listed under the warning unclosed way - building and Right-click ⊠ Zoom to problem to zoom and see the objects. Your map canvas will zoom in to the objects.

To fix this, select the first node and the last node of the building and merge it by clicking menu **Tools ⊠ Merge Nodes or pressing M** on keyboard. And voila, now your building is a closed polygon.

3.11 Fixing Warning: Unnamed ways   Unnamed ways warning come up when there is one or more highways (main road) that do not have names. This warning is one of the tolerable warning, so you can just ignore this. If you know the name of the road, you can add the road's name by adding tag name to the road. However, if you do not know the name, please just leave it as is rather than giving a random name that could be misleading. To ignore this warning, you can just leave it as is or you can also put it on your Ignore list so that this warning does not come up when you perform validation in the future. Click the "Unnamed Ways" warning in the warning list, then click **Ignore** and click **Whole Group**.

You can always put it back to your warning list if you change your mind, so that this warning will come up again when you perform validation by clicking **Manage Ignore**, then right-click on the warning you want to put back and choose **Don't Ignore.**

3.12 Fixing Warning: Untagged ways   Untagged ways warning come up when there is untagged object. To fix it, go to the untagged ways warning in the Validation Results Windows, click the + icon so that it looks like the picture below.

Select the objects listed under the warning untagged ways and Right-click ⊠ Zoom to problem to zoom and see the objects. Your map canvas will zoom in to the objects.

To fix it, just simply add tag/preset to the object. Please take a look at the imagery to decide what tag to add to the object. Select the object and then go to menu Preset and select the tag that suits the object. For example, if this object turns out to be hospital, add tag/preset hospital.

3.13 Fixing Warning: Way end node near other highway   To fix way end node near other highway, go to the way end node near other highway in the Validation Results Windows, click the + icon so that it looks like the picture below.

Select the objects listed under the warning untagged ways and Right-click ⊠ Zoom to problem to zoom and see the objects. Your map canvas will zoom in to the objects.

To fix it, select the end node and then activate Draw mode by pressing A on keyboard. Then, draw the road so that it is connected to the road nearby.

[Quiz] Check Your Knowledge

Type of quiz: multiple choice

1. What is the function of the Validation Tool in JOSM?

    a. Automatically checking the number of objects

    b. Checking the completeness of attribute data in OSM

    c. Checking the OSM data quality by showing errors and warnings

    d. Manually checking the accuracy of objects

Type of quiz: choose the right word

[2] are important to fix. You should not [3] it. If you can not fix it, then you will not be able to upload it into the OSM Server. Whereas you can ignore [4] depending on its type. Both types give you information that there are some things that need to be [5] in your data.

[a] Errors [b] Ignore [c]Warnings [d] Repaired

Type of quiz: Multiple choice

Review the error and warnings and its corresponding solution. Identify which of the issues the passage is referring to:

6. This warning is the most commonly found warning during validation. Most OpenStreetMap users digitize two buildings too closely to the point that they might be sharing a line or even overlapping with each other. To fix this warning, you just need to move or delete one of the overlapping buildings.

    a. Building Duplicated Nodes

    b. Unnamed ways

    c. Crossing Building

7. This warning comes up when there are two lines or highway objects overlapping without an intersection node between those lines or highway. To fix this warning, you just need to add an intersection node between those lines/highway.

    a. Crossing Ways

    b. Unnamed ways

    c. Crossing Building

8. It shows that there is a way or road without a name on it. If you know the name of the street, then you have to update it. However, for most cases, you can just ignore this warning if you do not know the place. Most mappers who do their mapping remotely do not usually have local knowledge to know the names of the roads.

    a. Building Duplicated Nodes

    b. Unnamed ways

      c. Crossing Building

Answer: 1. C | 2. A | 3. B | 4. C | 5. D | 6. C | 7. A | 8. B

Activity Checklist

By the end of this section, you should be able to: - Understand how to validate OSM data using JOSM - Understand what errors and warnings are - Understand how to fix the errors - Understand how to repair and ignore the warnings

Additional resources

Training presentation

  • Validator training

6.0 Introduction to Data Export Tools

Overview

In this section, Project Managers will find resources on how to export OpenStreetMap data, including:

- An overview of data export tools, including presentation slides
- Step-by-step guides for exporting data with the HOT Export Tool and HDX

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, follow the step-by-step guides in each of the following sections.

- HOT Export Tool covers the HOT Export Tool which allows users to download OSM data by specifying tags, area of interest, and file type.
- Humanitarian Data Exchange (HDX) covers the Humanitarian Data Exchange (HDX) data platform for storing and sharing humanitarian data managed by OCHA's Centre for Humanitarian Data.
- Information on QuickOSM, a QGIS Plug-in that allows users to directly download OSM data for specific tags into QGIS, can be found in section Introduction to QGIS.

The following presentation(s) can be used to lead a training or workshop:

- Data Export Tools

6.1 Hot Export Tools

Course Objectives

This section will explain on how to use HOT Export Tool to download OSM data in your preferred area. By the end of this, you will be able to:

- Understand overview of HOT Export Tool
- Understand how to export OSM data using HOT Export Tool

***

Learning Activities

The HOT Export Tool is an open service that creates customized extracts of up-to-date OSM data in various file formats, such as ESRI shapefiles (.shapefile), google KML (.kml), GeoPackage (.gpkg) dan MBTiles (.mbtiles). We can select the area and specific categories that we necessary. Download and use the data simply by crediting the © OpenStreetMap contributors. Anyone can create a custom Open-StreetMap export with the Export Tool - just register an account. You can register with an OpenStreetMap account from OpenStreetMap.org and a valid email address. Learning resources and walkthroughs can be found at the HOT Export Tool Learn page.

Using the HOT Export Tool

Tools and Technology Needed:

- Computer
- Internet Connection
- OSM Account

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

Select 'Create' in the top menu.

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

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

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

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

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

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

⬚ Did you know? ⬚
This process will take several minutes to process depending on how large your downloaded area, type of OSM data you export, and the density of OSM data. City-sized regions should be a few minutes - larger regions can take upwards of 20 minutes

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.

[Quiz] Check Your Knowledge

1. Below are the file types that you can download in the HOT Export Tool, except:

   a. Shapefile (.shp)

   b. Geopackage (.gpkg)

   c. Google KML (.kml)

   d. MBTiles (.mbtiles)

   e. Image (.jpg .png or .JPEG)

Answer: 1.E

Activity Checklist

By the end of this section, you should be able to: - Understand what is HOT Export Tool - Using HOT Export Tool to download OSM data

Additional resources

Training presentation

- Data Export Tool
- Export Tool Learn Page

6.2 Humanitarian Data Exchange

Course Objectives

By the end of this section, you should be able to:

- Understand the concept of Humanitarian Data Exchange platform
- Learn step-by-step on downloading data using HDX

***

Learning Activities

HDX Overview

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

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

Working with HDX

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

Tools and Technology Needed: * Computer * Internet Connection

Downloading data

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

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

Adding data

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

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

[Quiz] Check Your Knowledge

1. In HDX, we can download geospatial, spreadsheet, text and images file related to humanitarian dataset.

    a. True

    b. False

2. You can upload your dataset into HDX easily without any requirements

    a. True

    b. False

Answer: 1. A | 2. B

Activity Checklist

At the end of this section, you should be able to: - Navigate HDX platform to download dataset - Understand that to be able to upload a dataset in HDX requires to be added to the organization

Additional resources

Presentation * Data Export Tool

Resources * HDX FAQ

7.0 Data Use and Data Analysis

Overview

In this section, Project Managers will find tools and resources on how to use OSM data to create map products for decision-making including:

- A step-by-step guide for getting started with QGIS, including presentation slides
- A step-by-step guide for creating maps and atlases in QGIS
- Detailed guides and resources for using data in web and interactive maps

---

There are a handful of free Data Use and Analysis tools available to use your field generated data, extract and utilize OSM data, or combine datasets to create maps, atlases, and other visuals for decision making.

- Introduction to QGIS provides an introduction to the open source geographic information system (GIS) software that allows you to analyze and edit spatial information, as well as compose and export geographic maps. Additionally, the section includes a step-by-step guide that project managers can use in trainings for installing QGIS and learning basic skills.
- Creating Maps and Atlases in QGIS covers more advance skills in QGIS, providing managers with training materials to create maps and atlases in QGIS.
- Web & Interactive Maps provides a basic guide to two interactive mapping tools, uMap and Overpass Turbo Query.

The following presentation(s) can be used to lead a training or workshop:

- Introduction to QGIS

7.1 Introduction to QGIS

Course Objectives

This section cover basic skills necessary to use QGIS. By the end of this section, you should be able to:

- Learn to install QGIS
- Be able to navigate QGIS
- Understand on how to adding the data in QGIS
- Understand on how to style layer in QGIS
- Learn how to install plugin QuickOSM and QuickMapServices in QGIS

***

Learning Activities

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

Installing QGIS

QGIS is available for download for the following operating systems:

- Windows
- Mac OS
- Linux

Skills and Technology Needed

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

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

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

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

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

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

To install:

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

5. Once installed, open the installer to begin the installation process.

Considerations when installing QGIS for large numbers of individuals

- Consider internet connectivity and capacity prior to installing QGIS for large numbers of individuals via internet. It is highly recommended that prior to the training/workshop, installation files are downloaded and loaded onto USB drives for offline installation.
- When downloading offline installers for a large group, make sure to download an installer for all operating systems. Note: it will be important to download the Windows installer for BOTH 32-bit and 64-bit.
- The downlaod and installation process often takes longer than anticipated, especially when factoring in technical skills and hardware compatibility. Therefore, it is recommended to begin download and installation process early in the training or during breaks to ensure a smooth process and adherance to agenda.
- Prior to the training/workshop, request attendees to make sure that they have enough space on their computers (10GB+) for installation of QGIS.

Navigating QGIS

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

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

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

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

Adding Data

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

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

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

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.

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.

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.**

Tips:

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.

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:

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.

amenity	school
	place_of_worship
	bar
	bank
highway	primary
	residential
	path
office	goverment
	ngo
shop	clothes
	tailor

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.

[Quiz] Check Your Knowledge

1. QGIS requires you to donate to their platform to support the development and QGIS community.

    a. True

    b. False

2. What is plugin that allows you to download OSM data directly from OSM to QGIS?

    a. QuickLoad

    b. QuickMapServices

    c. OSM Download Manager

    d. QuickOSM

3. Below are several ways to load and style layers in QGIS, except:

    a. Manually select a style

    b. Copy styles from another dataset

    c. Styling layer from .qml

    d. Read style from ESRI symbology

Answer: 1. B| 2. D| 3. D

Activity Checklist

Now you already understand what is QGIS and how QGIS can help you to visualize your dataset, especially OSM dataset. By the end of this section, you should be able to:

• Download and install QGIS
• Navigate QGIS
• Adding data in QGIS
• Styling data layer
• Installing additional plugins

Additional resources

Presentation:

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

7.2 Creating Map and Atlasses in QGIS

Course Objectives

In this section, you should be able to:

- Understand how to load the dataset
- Understand how to symbolize the dataset
- Understand how to create a map
- Understand how to create an atlas

***

Learning Activities

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:

- Open Cities in Monrovia, Liberia
- LEGIT in Liberia
- Ramani Huria in Dar es Salaam, Tanzania (Dar es Salaam, Tanzania)

The following guide provides instructions and screenshot from QGIS 3.30. Versions before and after may have different icons and steps

Skills and technology needed:

- Installation of QGIS
- Navigating QGIS and adding data
- GIS data files (i.e. shapefiles, geojson)
    – Example shapefiles zip

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

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.

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 '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 **Symbology** from the side menu. Style as described below:

- Select '**Simple Fill'** from the upper right 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 **'Symbology'** from the side menu. Style as described below:

- Select 'Simple Fill' from the upper left window.
- Change 'Symbol layer type' to 'Simple fill'
- Change the color to the html code #edeae2 (or select a light grey color).
- Change the 'Outline style' to 'No pen'.
- Select 'Apply' and then 'OK'.

Style the sub-ward layer (Dar_sub-wards_EPSG_4326) by right-clicking on the name in the Layers Panel and selecting **'Properties'**. In the pop-up window, select **Symbology** from the side menu. Style as described below:

- Select 'Simple Fill' from the upper right 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 'Single Labels'.
- For 'Value', select the option 'Ward_Name' 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 Map Layout in Print Layout

Open the **'Project'** menu from the main toolbar, and select **'Layout Manager'**. A layout manager window will appear. Select **Empty Layout** and click **Create**.

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 'Add Item' menu on the top toolbar or by using the quick access buttons on the left-hand toolbar.

Add your map by selecting 'Add Map' from the 'Add Item' menu (alt: use the Add Map tool from the left-hand toolbar). 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 'Add Item' menu (alt: use the Add Label tool from the left-hand toolbar). Like the map, you will need to draw the box by clicking and dragging the corners. The default text is 'Lorem ipsum'. 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 'Add Item' menu. The size of the Legend will be generated based on its contents. You can change the size as well as add or remove legend items in the 'Item Properties' panel.

Add a scale bar to your map by selecting 'Add Scalebar' from the 'Add Item' 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. Saving Maps

At this stage, you can decide if you want to save the map as a single map or move on to generate an atlas. If you would like to save the current map as a stand-alone map, open the 'Layout' Menu and select one of the 'Export as...' options depending on your file preference.

4. Generating Multiple Map using Atlas Generation

After completing the layout for your map, you are ready to generate the atlas. Select the map box and in the 'Item Properties' panel, check the box for 'Controlled by 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 'Atlas' menu from the top toolbar, then select 'Atlas Settings'.

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

4.1. 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'. (This field is the sub-ward name.) * Check the box for 'Sort by' and select 'Vil_Mtaa_N'. (This field is the sub-ward name.)

4.2. 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.

4.3. Building Expression 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.

4.4. 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 "inverse_sub-wards".

4.5. 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'.'

4.6. 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

4.7. 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.

4.8. 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.

4.9. 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.

[Quiz] Check Your Knowledge

1. If we want to build multiple map at the same time, which feature from QGIS we need to use?

   a. Map Batch Creator

   b. Atlas Generation

   c. QuickMapService

   d. Layout Manager

2. Once the atlas is generated, you will be able to preview and navigate through the atlas with the atlas toolbar by selecting...

   a. Preview atlas

   b. Preview document

   c. Preview manager

   d. Preview page

3. Atlas templates can be created and added to other QGIS project as a *.qpt or* .QPT file.

   a. True

   b. False

Answer: 1. B | 2.A | 3.A

Activity Checklist

Now you already understand how to create a map using QGIS. By the end of this section, you should be able to: - Preparing data - Style the dataset using symbology and label - Building map layout using map composer and export the map - Create atlas using atlas generation feature

7.3 Create Web & Interactive Map

Course Objectives

This section will provides you on how to visualize OSM data as a web and interactive map. By the end of this section you should be able to:

- Understand on how to use overpass-turbo to visualize OSM data as an interactive map
- Understand how to use uMap to visualize data spatial
- Undesstand how to link overpass-turbo data to uMap

***

Learning Activities

Interactive maps are viewed as the modern equivalent of visual communication with maps. This involves the creation and study of the visual representation of data (maps). To communicate information clearly and efficiently, data visualization uses statistical graphics, plots, information graphics and other tools. The use of interactive maps gives users an opportunity to change the display of the map to one's preferences freely.

This section covers two tools for creating interactive maps using OSM data: **uMap** and **Overpass Turbo**. **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. **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.

Building Map with Overpass-turbo

Overpass Turbo Query is a web-based data mining tool for OpenStreetMap. It runs any kind of Overpass API query and shows the results on an interactive map.

Skills and Technology Needed

- Computer with
- Internet connection
- Recommended: computer mouse

Skill level required: Beginner/Intermediate

How to use Overpass Turbo

1. In your web browser enter https://overpass-turbo.eu/ to load Overpass Turbo
2. Click Wizard on the Top Bar to create a data query
3. Create a query. For example, type highway=* (This query searches for all highways in the area of interest) in the search box and click 'Build Query'.
4. In the search box on your right (Map Canvas) type the area of interest (such as Kampala, Uganda) after which, zoom in to the area.
5. On the top bar, click Run to get the data. (After data points load on the map canvas)
6. Click on Export in the top bar. Under the **Map** section download as an interactive map and share the url.

Building Map using uMap

uMap lets you create a map with OpenStreetMap layers and embed it in your site. All within a few minutes. You can create custom maps (see the examples below). It is powered by open-source, WTFPL-licensed software.

Skills and Technology Needed * Computer with * Internet connection * Recommended: computer mouse

Skill level required: Beginner/Intermediate

How to use uMap 1. In your web browser enter http://umap.openstreetmap.fr/en/ 2. On your top bar click login/signup and choose the third party (OpenStreetMap - Icon) application to use. 3. Using OpenStreetMap account grant access to Umap and you will be redirected back to the uMap interface. 4. On your top right corner, click create map tab 5. On the top bar, Click Editing, Untitled Map to provide title map, map description and configure interactive and symbology settings of the map.

6. Click SAVE after every action to prevent losing changes made.
7. Click Import Data Icon on the editing tools (right bar) to add data to the map. Navigate to where your data is stored and import it.

8. Click Manage Data Icon on the editing tools (right bar), then click the edit (pencil) button to edit the visual properties of the data such as color and icon style.

9. Click Save on the top bar to have changes made saved.
10. Refresh the page and on the left panel, click the sharing icon to copy the link that can be shared for the interactive map generated or embed the map in a custom website.

Linking uMap and Overpass-turbo

Linking uMap and Overpass Turbo makes your interactive uMap update as OpenStreetMap data is being updated.

Skills and Technology Needed * Computer with * Internet connection * Recommended: computer mouse

How to link uMap and Overpass Turbo 1. After creating a query in overpass-turbo.eu, click **Export**, **Query**, and then **compact**. 2. Copy the query link as text and paste into a text editor (e.g. notepad). If you use the "copy link" feature of your browser you may first have to decode the URL by pasting in here and clicking Decode before copying to output to a text editor. 3. Next, we need to take this text and generalise it to work on any map area: 4. Add **http://overpass-api.de/api/interpreter?data=** before the copied text. 5. Replace the hard-coded latitude and longitude coordinates with **({south},{west},{north},{east})**. This will need to be done three times; after node[x], way[x], and relation[x]. 6. The final result should look like:

```
**http://overpass-api.de/api/interpreter?data=[out:json][timeout:25];(node["source"="HOT-UG"]({south
```

7. Now navigate to umap.openstreetmap.fr.
8. Click Create a map and pan/zoom in to the area of interest.
9. Click the layers button and then click Edit (the pencil symbol).
10. In the right-hand pane click Remote data and paste the URL we constructed in step 6 into the Url box.

11. Select "osm" from the drop-down Format list.
12. Tick the dynamic checkbox.
13. Optional: If you have a lot of data you may want to limit the display to certain zoom levels (so as to not put too much strain on the Overpass servers). You can do this by entering a min zoom level in the From Zoom box. Here I have entered 13 as my minimal zoom level.
14. Customise using the options on the right. Here I've changed the map background to OSM monochrome and changed the colour of the overlay data.
15. Click More on the left-hand side, followed by Embed and share this map.
16. Copy and paste the embeddable iframe (You may need to click Current view instead of default map view in the iframe options box).

[Quiz] Check Your Knowledge

1. uMap will let you to create your own interactive map using OpenStreetMap data and other geospatial dataset

   a. True

   b. False

2. By linking your uMap with Overpass API, your OpenStreetMap data will keep updated according to the data version in the actual OSM server

    a. True

    b. False

Answer: 1. A| 2. A

Activity Checklist

By the end of this section, you should be able to: - Operate Overpass-turbo to visualize OSM data - Building interactive map using uMap - Link uMap project with overpass API to keep OSM data update

8.0. Use case in Field Mapping Management and Open Data Usage

Overview

In this section, Project Managers will find example use case from HOT projects on how the processes, tools, and workflows contained in previous sections of this Toolbox have been applied to real field projects. Project Managers can use these example workflows to identify a project similar in scope or goal to their own and identify which tools and processes may be needed for their own project. Each workflow example contains:

- An overview of the project
- A step-by-step guide of phases, steps, and tools used
- Links to various parts of the Toolbox to learn how the step was completed

---

There are many ways to complete a mapping project. HOT has provided overviews of how we've completed projects with the following workflows:

- Mapping POI with ODK + KoboToolbox Server showcases the tools and processes used in a simple field mapping project used by a local NGO to integrate into existing programs using OpenDataKit and KoboToolBox Server.
- Post-Earthquake Building Damage Assessment using OpenStreetMap (OSM) explain the step-by-step process for conduct building damage assessment with OSM.

8.1. Mapping POI with ODK + KoboToolbox Server

The following workflow showcases the tools and processes used in a simple field mapping project during which HOT trained local NGOs to integrate mapping into existing programs using OpenDataKit and KoboToolBox Server.

***

Learning Activities

Project Overview

Bridging Gaps in Development and Emergency for the Refugee Crisis in East Africa

East Africa (and Uganda specifically) continues to be the center of one of the world's largest and fastest growing refugee crises. Uganda's progressive open-door policy alone has led to an influx of approximately 1.4 million refugees into the country. High mobility of refugees means distribution and size of refugee settlements changes constantly and the need for standardized accessible information to make timely informed decisions about where services need to be planned and built becomes more crucial than ever. Through the use of open-source technical tools combined with a community-based methodology, HOT has been able to address the critical data gap in these contexts by increasing real-time comprehensive data production on infrastructure and services where refugees and host communities reside. To ensure that government and organizations involved in the refugee response know that, first, this data exists and, second, how to effectively use it, HOT has worked extensively to support and train actors on how to systematically incorporate citizen-generated data into their programs to address and fill existing gaps.

Project page: BRIDGING DATA GAPS: MAPPING REFUGEE CONTEXTS IN EAST AFRICA

Dates: June 2018 - May 2019

Status: Complete

Tools used: * **Field and Remote Data collection**: OpenDataKit (ODK) Collect, Kobo server, HOT Tasking Manager (ID Editor, JOSM) * **Data Field Monitoring:** OSMand and Maps.me * **Data Cleaning:** OpenRefine, Excel, JOSM, Python scripts * **Data Extraction and Visualization:** HOT Export tool, OSM Analytics, QGIS, Overpass Turbo, Umap, HDX

Field Mapping Workflow

1. **Identifying Partners' Need and Area of Interest/Operation** Through regular interactions and planned meetings with various stakeholders & partners - including UNHCR, OPM, LWF, etc. - the Project Manager and/or Country Manager would work to understand the technical gaps and needs that institutions were facing in strengthening their contributions to the national refugee response. From this point, we would identify data gaps and the institutional skills needed to fill these areas and co-devise an implementation plan to train the group/organization over multiple days to achieve the intended results and outcomes.

Steps used in this phase: * Defining Needs and Requirements

2. **Trainings and Capacity-building Exercises** After the extensive consultation process, trainings would be planned and conducted in house or at a partners' premise. The main objective of these trainings would be to introduce - and attempt to instil - GIS tools and support capacity building with refugee response partners through custom lessons over a short number of days. These training materials were all specifically designed for each partner organization to ensure the resources matched their level of skill/understanding and enable them to adequately improve their practical knowledge. Trainings generally lasted between 2-5 days and covered topics including data collection, storage, extraction, analysis and visualization.

Steps used in this phase: * Trainings and Workshops

Trainings provided to partners included: * Introduction to OSM * Mapping with JOSM * Mapping with ID editor * Mobile Data Collection Tools * Introduction to QGIS * Downloading data from OSM (Hot Export Tool and Quick OSM)

3. Data collection Data collection activities were consultative and participatory in nature, where data collectors were chosen from the local communities that we were interested in generating data to support the refugee response. Data collectors used their personal smartphones and those who didn't have proper functioning smartphones were equipped with one by HOT. OpenDatakit was the main data collection tool/application used and 6 unique forms - incl. Health, Education, Water, Sanitation - would be implemented by surveyors and used for mapping in every village visited both in and around the refugee settlements.

Steps used in this phase: * Choosing a Data Collection Application: OpenDataKit (ODK) * Overview ODK Collect * Using ODK Collect

4. Data Storage and Monitoring The data from the field was stored on the online UNHCR kobo server space. This allowed for different UNHCR and OPM implementing partners to access the data easily and effectively. The data was uploaded by the field data collector at the end of each working day. Uploading ODK requires as low as a 2G connection to send the files to the server. The surveyors were always provided with at least 50 MB of data to accomplish such tasks. The Kobo server was also used as a monitoring tool to determine the number of data points collected and quickly assess any data quality gaps in the field.

Steps used in this phase: * Data Collection Servers

5. Data Cleaning and Analysis After storing the data on Kobo, the data would be downloaded then cleaned and uploaded using JOSM. Steps used in this phase: * Data Cleaning with JOSM

6. Data Visualization For this project, HOT used a number of methods to visualize data; from using QGIS to create static maps and atlases to using tools such as Overpass turbo, Umap and Mapbox Studio to create dynamic & informative map products. The types of visualizations were mainly developed included distance matrices, resource gap identifiers, location and navigation maps and proximity indicator maps.

Steps used in this phase: * Downloading data with HOT Export Tool * Creating Maps and Atlases in QGIS * Web & Interactive Maps

8.2. Post-Earthquake Building Damage Assessment using Open-StreetMap (OSM)

Course Objectives

This section provides: * An overview on the relevance on the use of OSM data for damage assessments post eathquake * Deep dive into data models and acquisition of datasets * Step-by-step instructions for creating damage assessments using OSM data on GIS

***

Learning Activities

Overview

Performing a building damage assessment is crucial after a natural disaster to prevent further casualties and identify safe locations for temporary shelters. The assessment can aid in response and recovery efforts by prioritizing areas with the most damage, and provide data to evaluate property damage and estimate repair costs. This document provides a step-by-step guide for using OpenStreetMap data in post-earthquake building damage assessments, which can be customized based on available datasets and the level of assessment needed.

OpenStreetMap Building Data

The first thing to consider before conducting such an assessment is the availability of publicly accessible and downloadable datasets. This document's Data Inputs section contains a good number of data repositories that are useful for a post-earthquake building damage assessment. One of them is the Open-StreetMap database, which is a free and open-source mapping platform that provides building footprints with valuable information such as height, material, and capacity. It is driven by OSM contributors all over the world, who are mostly volunteers mapping geospatial features and adding critical information based on local knowledge.

Figure 1 shows a health clinic in the Philippines that was mapped in OSM by the PhilAWARE Project. The PhilAWARE Project, like many other OSM-based mapping projects, created its own data model 1, which is a collection of OSM tags that best describe the attributes of a feature that are significant to the project. Because the PhilAWARE Project was designed to provide situational data to local DRRM offices, tags like backup_generator=no, building_material=concrete, and capacity_persons=<50 are critical in determining the possibility of this clinic remaining operational during a disaster event.

Fig 1 ._Health clinic mapped in OSM through the PhilAWARE Project_

In 2017, the Humanitarian OpenStreetMap Team (HOT), in collaboration with the Global Earthquake Model (GEM) and ImageCat, created a data schema for a global exposure database (GED4ALL) with the goal of assisting local and global actors in identifying risk and equipping them for data-driven decision-making. The table below shows a simplified data model 2 of the commonly used tags for building attributes selected by GEM as crucial in describing the structural integrity of infrastructures during a hazard event.

Table 1. GED4ALL Simplified Data Model on Buildings

Building Attribute	OSM Key	OSM Description
—	—	—
Occupancy	building=	*Describe the building purpose (residential, commercial, public, mixed_use, industrial, agriculture, assembly, government, educational, unknown)*
Surroundings	building:adjacency=	Describe the neighboring condition of the building(attached, free_standing)
Date of Construction or Retrofit	building:age=	*Proposed OSM age tag, associated with buildings (pre_2000, post_2000, unknown)*
Condition	building:condition=	Describe the condition of the building (good, average, poor, unknown)
Geological Base	building:geological_site=	*Describes the geological site the building is built upon (flat_land, river_bank, slopy_land, landslide_prone_area, flood_prone_area, river_bank)*
Material of the Lateral Load-Resisting System	building:lateral:material=	Proposed lateral load resisting material tag (concrete_reinforced, concrete, concrete_steel, metal, masonary_reinforced, masonry, masonry_confined, earth, earth_reinforced, wood, other, unknown)
Lateral Load Resisting System	building:lateral:system=	*Identify structural system of buildings (moment_frame, infilled_frame, braced_frame,*

post_beam, wall, dual_framewall, flat_slab, waffle_slab ,infill_flatslab, infill_waffleslab, hybrid, unknown) | |*Height*| *building:levels=*| Number of above-ground levels of a building| |Capacity| capacity:persons=| *Describe the number of people a building can support| |Roof| roof:material=*| Outer material for the building roof (masonry, earth, concrete, metal, wood, fabric, slate, stone, clay, unknown)| || roof:shape=*| Well known roof shapes (flat, pitched, monopitch, sawtooth, curved, complex_regular, complex_irregular, unknown)|

Although not all OSM buildings would have the same number of attributes as described in the data model above, providing users with rich building-level data allows them to generate secondary analyses that can support or validate the results of the building damage assessment.

Data Inputs

1. **Determine your area/s of interest**: Prior to collecting data, you must first identify an area of interest to which the assessment will be bound. It can be at the national or district level, as long as it is within the disaster's priority area or impact zone.
2. **List and download all necessary data sources**: Start organizing and collecting data on the post-earthquake disaster event, exposure data, existing building damage assessments, etc.

Table 2. List of Opensource Datasets and Repositories

Data	Description	Link to Source
USGS ShakeMap	ground motion and shaking intensity information	https://earthquake.usgs.gov/data/shakemap/
Global Earthquake Model	earthquake risk assessment to locate probable impact of seismic hazards	https://data.humdata.org/organization/gem-foundation
Copernicus Emergency Mapping Service	results of analyses (like building damage assessment) on requested activations from Copernicus	copernicus Dashboard
Copernicus Emergency Mapping Service Request	guide on how to request for Copernicus mapping service	Copernicus How To Use
UNOSAT Analyses	results of analyses (like building damage assessment) on requested activations from UNOSAT	https://unosat.org/products
UNOSAT Humanitarian Rapid Mapping Service Request	guide on how to request for UNOSAT mapping service	https://unosat.org/services
MAXAR Open Data Program	satellite imageries showing post-earthquake situation and damage	https://www.maxar.com/open-data
Humanitarian Data Exchange (HDX)	hosts disaster layers and exposure data like OSM data exported by HOT	https://data.humdata.org/
Global Disaster Alert and Coordination System (GDACS)	list of disaster event datasets (also contains USGS ShakeMap)	https://www.gdacs.org/
OpenAerialMap	stores post-earthquake satellite and drone imageries from organizations and individuals	https://openaerialmap.org/

Tips

Many of the data sources that can be used to generate a building damage assessment are spread out across various databases and repositories. Just make sure you have all of the necessary up-to-date datasets before beginning the assessment. Remember that the data you use will have a large impact on the quality and accuracy of the assessment results.

---

3. **Properly cite data sources:** Make sure to check the license type of each dataset and learn how to properly attribute them to your work.

Example Use Case

Scenario *Following the 7.8, 7.5, and 6.3 magnitude earthquakes affecting Syria in February 2023, a group of trained responders is planning to assist people in evacuating their homes. For an effective response plan, they want to first identify the city hotspots where buildings are most likely to be destroyed. They then intend to categorize the different types of building damage within the hotspots for better prioritization. There are no public building damage assessments available, but MAXAR has released post-earthquake satellite imagery for the area.*

1. **Download all available datasets:** Make sure the file formats are compatible with the mapping software you intend to use. Note that the QGIS application will be used throughout the various processes in this demonstration.

Data	Description	Link to Source
USGS ShakeMap	Intensity polygons from USGS through the GDACS Event Resources	M 7.8 in Türkiye on 06 Feb 2023 01:17 UTC - M 7.5 in Türkiye on 06 Feb 2023 10:24 UTC - M 6.3 in Türkiye on 20 Feb 2023 17:04 UTC
Pre-event OSM Building Footprints	OSM building data uploaded to the HDX repository	https://data.humdata.org/dataset/hotosm_syr_buildings (can also be downloaded from the (6.1) HOT Export Tool, Geofabrik, (7.3) Overpass API, etc.)
OCHA Administrative Boundaries	Admin bounds uploaded to the HDX repository	https://data.humdata.org/dataset/cod-ab-syr
MAXAR Open Data Program	Post-earthquake satellite imageries	Satellite Imageries (includes Planet and Maxar imageries)

2. **Consolidate USGS ShakeMaps:** Especially for disasters with multiple major events, such as the Turkey-Syria Earthquake, which has three main triggers (M 7.8, M 7.5, and M 6.3 events), it is critical to understand where the events overlap to see where the risk is greatest. With that, you need to perform a union of the disaster layers while making sure that the attribute fields corresponding to the intensity levels are all imported to the output layer.

Fig 2. Consolidation of USGS ShakeMaps using QGIS

3. **Clip consolidated disaster layer:** Clip the consolidated USGS ShakeMap within Syria using the OCHA Administrative Boundary dataset.
4. **Join attributes of the disaster layer to the OSM Building Footprints**: Overlay the OSM Building Footprints to the disaster layer and search for Join Attributes by Location in the QGIS Processing Toolbox. You may use within as the geometric predicate to capture footprints that are within the disaster layer extent. Add the Total Intensity Score field to the resulting layer and use it to classify the building footprints.

Fig 3. Parameter settings for the Join Attributes by Location process in QGIS

A total of 967,813 buildings were identified to be within the USGS Consolidated ShakeMap. This represents 90% of all buildings mapped in OSM for Syria.

5. **Overlay administrative layer for visual inspection:** Identify cities where buildings experienced severe to violent shaking intensities, as these are the most likely to have suffered damage as a result of the earthquake hazards.

Fig 4. Classified OSM Building Footprints over Syria Administrative Bounds

Visual inspection reveals that the most vulnerable buildings are in Harim/Harem and the northwest portion of Idlib/Idleb. Buildings in the northwest part of Afrin are also likely to be damaged. Depending on the available OSM tags, opening the attribute table of the classified building footprints will display critical exposure information such as the name, type, and address of the building.

Fig 5. Part of the classified building's attribute table

6. **Use MAXAR's post-earthquake imageries to validate and identify damage types:** Use MAXAR's post-earthquake imagery as a validation layer on the predicted areas of building damage. The example below shows how Copernicus damage grades were used to determine the level of damage per building in Harim/Harem, Syria.

Fig 6. Damaged building was identified using MAXAR's post-earthquake imagery

Fig 7. Building Damage Grade from Copernicus 5

Remote validation using post-earthquake imagery is beneficial, particularly in identifying heavily damaged buildings. Minor infrastructure damage, on the other hand, is difficult to identify from images. This is why field validation is still recommended to better categorize the different types of building damage.

Conclusion

OpenStreetMap (OSM) data is helpful in performing rapid analyses such as assessing post-earthquake building damage. Crowdsourcing is commonly used to collect OSM data, which allows for a large volume of data to be collected quickly and efficiently. This information can then be used to determine the extent of building damage in the affected area.

One way that OSM data can be used for post-earthquake damage assessment is by serving as exposure data. This means that the OSM building footprints can be used to estimate the number of buildings with probable damage based on the intensity datasets of the earthquake event. By overlaying the intensity dataset onto the OSM building footprints, it is possible to identify which buildings are likely to have been damaged.

In addition, **OSM data can be linked to existing damage analysis, allowing the building footprints to assist in identifying and validating different damage grades within an area.** This means that OSM data can be used to complement other types of data and provide a more comprehensive understanding of the extent of damage caused by the earthquake.

It is important to note that the quality and quantity of OSM data available for post-earthquake damage assessment will depend on the level of mapping that has been conducted in the affected areas prior to the disaster. Areas that are well-mapped will have an advantage in terms of the quantity and quality of assessment that can be conducted. This is why it is critical to prioritize the mapping of disaster risk hotspots in OSM even before a disaster event occurs. By doing so, it is possible to collect more accurate and useful data that can be used to assess the damage and assist in relief efforts in the aftermath of an earthquake.

Additional resources

1. PhilAWARE Data Model, Retrieved from https://wiki.openstreetmap.org/wiki/PhilAWARE_Data_Model ⧉
2. GED4ALL Data Model, Retrieved from https://wiki.openstreetmap.org/wiki/GED4ALL ⧉
3. HOT Export Tool, Retrieved from https://toolbox.hotosm.org/pages/data-export/6.1-hot-export-tool/ ⧉
4. Overpass Turbo, Retrieved from https://toolbox.hotosm.org/pages/data-use-and-analysis/7.3_web_and_interactive_maps/ ⧉
5. Copernicus Damage Assessment, Retrieved from https://emergency.copernicus.eu/mapping/book/export/html/138313 ⧉

Credits

This guide has been developed as part of the Humanitarian OpenStreetMap Project, funded by The World Bank's Global Facility for Disaster Reduction and Recovery (GFDRR). The toolbox builds upon previous HOT projects including the Open Mapping for SDGs Guide and the Refugee Mapping Toolkit.

Launch Version 1.0

Initial Release Date: December 2019

Project leads * Jess Beutler, Humanitarian OpenStreetMap Team - Project Manager; Content generation and management * Russ Biggs, Humanitarian OpenStreetMap Team - Technical Project Manager; Site development

Content Support from:

- Adityo Dwijananto, Humanitarian OpenStreetMap Team - Content creation
- Tri Selasa, Humanitarian OpenStreetMap Team - Content creation
- David Luswata, Humanitarian OpenStreetMap Team - Content creation
- Geoffrey Kateregga, Humanitarian OpenStreetMap Team - Content creation

Translation:

- Marcel Shabani, Humanitarian OpenStreetMap Team
- Demeveng Derrick
- Kpogbe Luc

Post-Launch Contributors

- Sam Colchester, Humanitarian OpenStreetMap Team

Copyright info

Questions and Info

info@hotosm.org

How to use the HOT Toolbox

The HOT Toolbox is designed to take a project manager or community through the entire mapping work-flow, from planning, through initial mapping, data use and analysis. Not every mapping project is the same. Some projects involve extensive field data collection components, others might not even conduct field mapping activities but run desktop-based digitization projects instead.

The **Toolbox** has seven sections (overview below) that can be used in the order presented, or combined to suit your individual project training needs.

If you do not want to go through each section, use the left-hand navigation, or the search bar to look for a particular guide.

If you are not sure where to begin a project use the **Mapping Project Workflows** section to find an ex-ample workflow that best suits your project's goals and resources. Each example will guide you through the exact steps, while linking to the relevant sections in the Toolbox and highlighting the tools and pro-cesses used.

Overview of the Toolbox Sections

1. **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.

2. **Digitization and Editing in OSM** provides project managers with training materials and guides on managing the digitization process and which remote mapping tools are best for a project.
3. **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.
4. **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.
5. **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.
6. **Data Export Tools** covers the various tools used for exporting data from OpenStreetMap and which tools are best for different use cases.
7. **Data Use and Analysis** provides an introduction to how data can be turned into effective maps for decision making.

Toolbox Guides and Resources

Sections in this toolbox contain different types of guides, depending on their user and purpose. We've made it easy to determine the type of guide or resource with the following icons.

This icon represents presentation slides that can be used to lead a training or workshop.

This icon represents step-by-step instructions that are designed to serve as self-paced material that can be used both during trainings, and by self-guided learners.

This icon represents guides that are designed to assist project managers with making decisions that im-pact project design and implementation.

This icon indicates additional resources that are recommended for reading outside of the HOT Toolbox. These may or may not be resources created by or in partnership with HOT.

This icon indicates additional resources that are recommended for watching outside of the HOT Toolbox. These may or may not be resources created by or in partnership with HOT.