Open Mapping for the SDGs

Open Mapping for the SDGs:

A practical guide to launching and growing open mapping initiatives at the national and local levels

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PART II - Integrating and Implementing Open Mapping Efforts

1. Setting the Stage for Program Sustainability

Maps have the power to tell stories about people and places and the ability to show patterns of ideas or issues through space and time. Citizen-generated data can leverage the local knowledge and expertise of individuals living in these communities to participate in addressing and identifying the societal issues being faced. Combining the power of maps and the value of community-led data collection enables a new way of understanding a group of people that a traditional approach to surveying, for example, may be unable to capture. To arrive at such granular parcels of community insight, however, requires preparation and, among other things, like deciding what the questions being asked are and who is doing the asking.

The impact and value of open mapping activities largely depends on the level of engagement and investment of those in your program - your team and your beneficiaries. Like any project, a team's ability to think laterally and propose out of the box solutions is measured by how well - or willing they are - to understand a specific problem and the people who face it. In the context of working with refugee or host communities, it is particularly important to assess at the start of a project how prepared and equipped your team is to engage with different actors from various backgrounds both cautiously yet effectively. The following section will explore six specific areas that represent important components to assess at the beginning of a project to understand what needs to be strengthened in order to enable successful implementation of activities and, eventually, lead to program sustainability.

1.1 Developing Map Literacy

Spatial, or map literacy, isn't universal. When designing your program, it is important to avoid assumptions about what people do or do not know about maps. For these reasons, it is important to consider at the start of the project what the basic level of understanding is amongst your team and project partners are on the use, purpose and value of maps and data. This assessment - and the map sensitization that follows - will consist of different approaches depending on the specific group you are working with as needs will vary.

If your team, beneficiaries or partner organization has never used or worked with a map before, it is important to start the sensitization process with basic map literacy training to ensure all are on the same page before the project begins. Remember - most people already have a mental map of the community in which they live or the routes they take daily. Your approach to building one's map literacy should be a gradual, self-driven process where your group should be afforded the opportunity to self-identify what they already know about maps and explore what they may not know. There are a few exercises to consider walking through with your team to assess and build their map literacy:

- ☐ Determine your group's ability to read and interpret maps by asking them them to locate themselves on a printed (or digital) map, identify landmarks, draw their route from home to their friend's house, etc.
- ☐ Facilitate an open-ended brainstorm session with sticky notes to encourage discussion about the value and use of maps: what is a map, what can a map be used for, how are maps useful, what can maps tell us that words/photos cannot, etc.
- ☐ Support your group in identifying the type of information that would be useful to their everyday lives and how this information may be projected onto a map
- ☐ Encourage your group to think about and suggest questions that may (eventually) be used to collect or map information to ensure they understand the reason and logic behind why questions are asked (direct involvement early in the process leads to higher engagement and buy-in later)

1.2 Building Empathy and Cultural Sensitivity

Understanding the complexity and sensitivity around issues in any given community is a foundational step to initiating an open mapping project. Empathy and cultural sensitivity is a skill that can be practiced

Figure 1: GPSDD Yumbe Sharebacks

and improved with enough time, background information to understand the situation at hand and the right (team) attitude and mindset.

First, to build empathy and cultural sensitivity about a group or community that you're intending to collaborate with, it is vital to have knowledge and understanding of the context. By 'mapping' out the situation, issues, possible dangers and players involved, it allows you to be more informed when interacting with a group and enable a more responsible approach to project planning and subsequent implementation. Additionally, it can help your team prepare for the challenging stories or details they may hear from working with a particular community. In the context of working with host and refugee communities, consider the following questions to measure how prepared and informed your team is to initiate a project in a new community:

- ☐ Understand the historical context and current situation:
    - ☐ What is driving the displacement and migration of people?
    - ☐ Where are refugees coming from? How many refugees are there?
    - ☐ Are refugees entering crossing borders formally or informally?
    - ☐ How accurate/inaccurate is the projected number of refugees in country?
- ☐ Understand the governing system and actors involved:
    - ☐ What is the government's position on refugees and migration?
    - ☐ What government body or agency is responsible for monitoring such issues?
    - ☐ Which international organizations or NGOs are responding? Which actors are providing what services or assistance?
- ☐ Become familiar with the existing projects and information being produced:
    - ☐ What projects are being implemented by partners on the ground?
    - ☐ What sectors do the projects fall under? WASH, Health, Education, etc.
    - ☐ What kind of data or information is being collected? What type of tools are being used? Is the data open and accessible?

Second, the underlying meaning of empathy is to feel what another person is feeling. Empathy can be built with enough perspective taking and reflecting on, for example, _what it would be like to be them (the "other" person, group, etc.). _Consider the following questions or activities to assess and build your group's level of empathy and cultural sensitivity before implementing open mapping activities:

1. Reflection Dialogue:
    1.
    2. Why is this project important or necessary?
    3. Refugee contexts
        1. What would it be like to be forced to leave your home and move to a new country? What would you pack? What would you miss?
        2. What could help make someone new to our country feel more comfortable and less scared in their new home?
2. Activities
    4. Experience Roleplay - Split the group into actors with different backgrounds; workshop a specific situation or problem and encourage participants to act based on their assigned role. After 5 minutes, switch roles so participants have opportunity to experience different perspectives of the same situation.
    Resource: UNHCR "Passages" Simulation for Refugee Experiences
    5. Survey Roleplay - Teams should practice conducting the surveys that will be completed in the field, with part of the team playing the role of the surveyees. Team members role playing as surveyees should take on various roles and attitudes that surveyors will encounter in the field including, resistant, reluctant, and even hostile surveyees. This process has many benefits: allows the team to find gaps and mistakes in the survey, prepares surveyors on what they might encounter in the field and how to handle the situation, and provides surveyors with the opportunity to understand how surveyees might feel to various approaches and questions.

1.3 Fostering a Collaborative Approach

The primary ingredient in the success of an open mapping project is the cultivation and care of a strong network of partners across the range of communities and institutions that have a stake in the

project. These partnerships are critical for the implementation, uptake, and sustainability of open mapping projects. They can lead to shared investment of resources and technical expertise, innovative use cases for open data, increased legitimacy for the project, and stability over time. Because the open mapping ecosystem is a global phenomenon, it's likely that, at the start of any project, there will be a pre-existing group of individuals and organizations already mapping in the target area. With proper outreach and engagement, these groups, as listed below, can be a powerful resource. Including them early in the planning and design phases of a project will help increase their sense of ownership and improve the likelihood of successful collaboration.

Government Agencies

Multiple governing bodies - areas as diverse as national statistics, urban planning, transportation, public health, environment and natural resource management, disaster response - have all benefited from working with open mapping

Such stakeholders can bring valuable resources, expertise, and authority to the development and implementation of a mapping project.

Universities and Colleges

Participation in a mapping project offers students and faculty an opportunity to learn about cutting-edge open-source methodologies, ideas, and software.

Mapping projects that involve academia may also evolve into a permanent part of the university's curriculum or even a course by itself.

Local scientific communities

Whether involved in university research or in civil society organizations, these are important groups to involve in the data modeling process. Civil engineers, planners, and others have experience with relevant data and analysis, so they may be able to provide suggestions as well as important local context.

Data quality assessment throughout the project, particularly at the end of the data collection period, is also critical, and these groups may be well placed to support it.

Open-source software communities

Freelance software developers,GIS specialists, and private software companies may be interested in providing software that assists the project as well as services for the community.

Often closely linked with OSM communities, these groups can also share its collective professional expertise when hosting a skills workshop, and service providers can rent office space or equipment.

Civil society organization or local NGO

Collaboration with these groups can enable a more in-depth understanding of local context and important issues, data-sharing and collection, youth outreach, and well-developed networks in the local community.

1.4 Identifying gaps and designing training content to ensure institutional needs are being met

Open mapping projects or activities should not be seen as a one size fits all. What works in one context may fail in another due to varying factors. By being intentional about identifying, addressing and integrating the specific needs of a community, partner organization, etc. into the project from the very start, it can be ensured that the right needs are being worked towards addressing.

An integral component of HOT's Global Partnerships for Sustainable Development Data (GPSDD) program in Uganda and Tanzania to train and capacitate partners meaningfully was engaging stakeholders in the early stages of planning the content and program to enhance the investment and accountability of partners alike in the execution and final outcome of the project. Consider the following action points to engage your specific group both adequately and appropriately from the project's start to enable long-term impact:

☐ Create and share a Needs/Gap Assessment Survey with beneficiaries to understand their baseline knowledge and perceived gaps before planning training content:

- ☐ Identify how the user understands and uses OSM, their application of specific tools, their perceived challenges and gaps in achieving success in their workflow, etc.
  - ☐ Sample survey can be found here.
- ☐ Meet with beneficiaries to discuss survey responses, co-identify potential training content and agree on a timeline:
  - ☐ Regular communication and engagement with the beneficiary helps to build rapport and trust that drives to build capacity within their institution
- ☐ Co-design the training agenda to ensure needs and learning goals are met
  - ☐ Based on the initial discussion around survey responses, create a draft training and share back with beneficiary for feedback
  - ☐ This is the point in collaboration where training content and agenda can and should be adjusted to ensure the final outcome satisfies the beneficiaries needs and addresses institutional gaps in knowledge and practice
- ☐ Encourage key focal points to participate in the final training engagement or program
  - ☐ Participation in the final training program by those who support the planning and implementation of the activity is key for long-term sustainability
  - ☐ Continuing to engage with and empowering an individual within the beneficiary's group (who helps to anchor the project) ensures their understanding of the value and use of the training and tools which makes it more likely that the training is useful to the larger group and lead to greater impact and sustainability during project implementation

1.5 Engaging with and capacitating local community members increases local buy-in, sustainability, and learning engagement

When individuals from the partner organization, government agency or local communities with whom you are working with participate in the development and implementation of your project, it can influence the level of buy-in and long-term investment other beneficiaries make in the initiative.

With many of the trainings HOT conducted under the GPSDD project, our mission was to ensure our team of trainers and supervisors were a mix of people coming from Kampala, where our country office in Uganda is based, and individuals from the communities that we have established relationships with. Bringing individuals from local communities onto your project not only provides the broader mission with local knowledge that is valuable to navigate places respectfully and safely, it also ensures the project is accepted and recognized as a community initiative rather than another exercise where people, like 'outside' surveyors, visit communities to roll out mapping activities in a neighbourhood that is not their own. Consider the following points when building your project team:

- Strive for diverse representation from different groups and communities in your project team to ease integration and enable greater buy-in in local communities
- Engage with leaders and those in positions of influence early in the project to determine their level of commitment and investment in the project; the more genuine interest there is from leaders to solve an innate problem in their institution, the more likely it is the project will continue after the initial phase of project implementation
- Learning (new) tools and skills from people who you either know personally or come from the same background, sector or community can increase the effectiveness of the training due to a shared common understanding of teaching cues, use of examples, etc.

From being able to understand the context in which you are working in and asking the right questions to knowing who to involve in the project when, the ability to exercise good judgement, critical thinking and empathy towards all those involved are key ingredients to ensuring the impact and long-term sustainability of your program. Defining at the start of the process what goals are most relevant to your program's mission and the specific profiles of people involved will help ensure your institution can design and implement the project in the ways most likely to achieve them.

2. Integrating workflow into existing projects

Many organizations want to incorporate open mapping into their operations but don't know where to start, believe that it requires rebuilding workflows from scratch, or that their operations will not be able to integrate open mapping. However, the open mapping workflow can be, and should be, integrated into existing workflows. The first step towards using open mapping is analyzing how existing projects and workflows can be altered and improved with integration.

2.1 Survey form conversion

Survey and data collection are often critical to operations. While paper surveys have been the standard for data collection, many disadvantages of paper surveys (i.e. data quality) have been resolved with the introduction of digital surveying. Converting from traditional paper surveys and data collection to digital surveying and mobile data collection can reduce costs, improve speed and efficiency, and increase overall data quality. Using digital methods also allows for more flexibility, customization, and enhanced management of fieldwork. As digital surveys allow for GPS point collection, converting existing surveys to a digital format improves the ability for survey data to be analyzed geospatially with higher accuracy.

Benefits of Converting Surveys to Digital Forms:

Cost Reduction

Eliminates need for double entry - reducing costs

Reduces printing costs

Eliminates need to carry extra questionnaires

Speed and Efficiency

Reduced interview length

Data is ready for analysis - no need for double entry

Automated analysis and visualization.

Skip logic saves interviewers time

Quality

Reduces possibility of data entry error to the point of collection

Can automate data cleaning

Filter logic eliminates confusion arising from questionnaire instructions

Allows for auto validation of data being entered (e.g. a question requiring only numeric is forced only to accept numeric answer)

Flexibility and Enhanced Management of fieldwork

Digital surveys can be updated to fix small issues in questionnaire design such as typos, badly phrased questions, or filter logic

Additional questions can be added quickly and with no cost implications

Effective supervision of enumerators through automatic metadata and timestamps, the GPS capability allows tracking the enumerator's route to further validate that the supervisor's directions were followed.

Customizability

Allows for multimedia collection: audio, graphics, photo, and video

Utilization of GPS technology to capture location and create a map of the survey sites.

Steps Necessary to Convert Surveys to Digital Forms:

1. Determine with digital survey tool is right for your organization. See Section [x] to learn more about various data collection applications and their differences.

2. Determine what hardware you need or if hardware available to you is appropriate for the digital survey tool.
3. For building and converting forms for ODK, training materials can be found here: https://docs.google.com/presentation/d/1Ngkz5pmcWr5z-15gfLVNqau8klxJRu9OgRrrXBHEaKk/edit#slide=id.g5559eccd29_0_34
4. For building and converting forms for KoboCollect, training materials can be found here: https://docs.google.com/presentation/d/1aQzOfgZtDzx3YYhw6qP99bKSzMmq6s-8bZ5HiJYUTsw/edit#slide=id.g55c75f85bc_0_380

Guidelines for Surveying:

2.2 Upload existing data to OSM (and other open data platforms)

From school facility data to WaSH points, many organizations already possess geospatial (and non-geospatial) data that is critical to areas such as operations, and monitoring and evaluation. Existing data can be imported into OpenStreetMap, but should be handled carefully. Importing data needs to be planned and executed following specific guidelines and methodology, as this data could have significant impact on existing data in OSM.

For each dataset imported, the OSM Import Guidelines created by the OSM community must be strictly followed and integrated into your organizations import methodology. The OSM Import guidelines include:

1. Prerequisites
2. Community Buy-in
3. License Approval
4. Documentation
5. Import Review
6. Uploading

For the full OSM Import Guidelines visit wiki.openstreetmap.org/wiki/Import/Guidelines

In addition to following the Import Guidelines, it is critical that any personally identifiable information is removed from datasets prior to upload to OSM.

Training materials:

2.3 Downloading data from OSM & benefits

OpenStreetMap (OSM) is a great source to explore the data available in a given place when initiating a new project because it offers vast, detailed datasets from all over the world. Because OSM data is free to use and it is accessible and downloadable by anyone, the platform contains data that is more rich and detailed than found in other free map sources. The ability for NGOs, partners and local government to be able to download OSM data to support their work is especially beneficial for the following reasons:

- Location of features, services or amenities can quickly be searched, interpreted and displayed for stock-taking (what is and isn't available) and downloaded for further use
- Availability and quality of data can guide your organization in designing and implementing its open mapping project to complement ongoing mapping efforts
- You can contribute your organization's own data to the OSM platform to expand the reach of the data's usability and impact by other partners or local government authorities working on similar issues

How do you download data from OSM?

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

HOT Export Tool

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

Humanitarian Data Exchange (HDX)

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

Training Materials

Data Export Tools Presentation - English

HOT Export Tool Worksheet - English

3. Designing an Open Mapping Project

Designing and implementing an open mapping project can be complex, especially if there are ambitious mapping goals or a large group of partners involved. Several resources exist that provide further detail on navigating the mapping process:

- **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

Here we provide a brief overview of some of the most important steps.

3.1 Deciding what to map

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

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

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

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

3.2 Planning and Preparation

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

Political Climate:

- **Government support** - If a non-governmental organization, does local, regional, and national government support humanitarian activities in the area? Governments may either support or oppose humanitarian organizations within their country.

- **Hostile activity** - Is the area experiencing violence or hostile events? Is this activity involve groups similar to your own? Is this a secure environment to conduct your work? A hostile climate can make it extremely difficult to carry out operations.

Communication

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

Literacy

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

Accessibility

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

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

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

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

3.4 Building a Mapping Team

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

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

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

1. **Community** – Active participation by the affected population is essential to providing assistance that best meets their needs. The first criteria for participant selection is being from the local community. Non-governmental organizations should also consider integrating local and/or national gov-

ernment staff to increase buy-in and data use. Government organizations conducting mapping and survey activities should consider incorporating staff typically outside of geospatial activities as well as staff from non-governmental partner organizations. Regardless, participation from the affected population should be of the highest priority.

2. **Motivation** – Participants should have strong reasons for working. Motivations vary, but one of the strongest factors is being emotionally invested in a project. Feeling like you are making progress in meaningful work is a powerful motivator.

3. **Non-Discrimination** – no one should be discriminated against on any grounds of status, including age, gender, race, color, ethnicity, sexual orientation, language, religion, disability, health status, political or other opinion, national or social origin. None of these should be criteria in determining participants. Take into consideration pre-existing social, cultural and political dynamics or practices that may marginalize or exploit certain groups

4. **Payment** – As a general rule it is good practice to cover costs of active participants. For example, if volunteers join your team as field mappers they should be paid per diems to cover transportation and food. Projects rely on the data these volunteers collect, so it is an integral part of the work and should not be treated lightly. Of course unpaid volunteers can and should also be active participants, but organizations must judge when the line is crossed into work to avoid exploitation. Lastly, be mindful that even seemingly small payments can affect power dynamics in refugee communities and households.

5. **Gender** – Organizations should be sensitive to gender but avoid using it as criteria to determine participants, aligned with the non-discrimination principle. Within families, paying one member but not another can have unintended consequences - either positive or negative.

6. **Training Your Team** - Questions to consider when training your team:
    - **What is the technical literacy of team members?** Certain groups will require longer lengths of time to learn an application or tool than others.
    - **What tools will you be using?** The tools you use will determine the length of time and skill level demanded of your team. Additionally, the number of tools you plan to train team members in impacts the length of training and time necessary to master a skill or tool.
    - **Will you be able to have hands-on and field training?** Training teams in tools using hands-on approaches, including conducting trial fieldwork greatly increases the success rate of mastery and improves data quality. All trainings should incorporate a practical session if possible.
    - **Will you have consistent access to internet and electricity?** Some tools require internet and computer use for training.

3.5 Logistics

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

Workspace / Meeting space

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

Equipment

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

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

Transportation

- How will mappers move around in the field?
- Is the scope of work/area of interest large enough that mappers will need transportation beyond walking?
- What types of transportation are available?
- What types of transportation are safe for the context and circumstances?
- Will this type of transportation have associated costs? (i.e. driver fees, rental, fuel)

Safety & Security

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

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

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

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

3.6 Community Entry

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

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

In the context of working with refugees, for example, who are used to seeing new projects with skepticism, it is especially important that your approach to engage with and inform these groups of the upcoming work is prioritized over activity implementation and achieving results. Many organizations and individuals use humanitarian crises as opportunities to exploit people – whether deliberately or through incompetence. It is crucial to build **trust** and **respect** between the organization and community. Though protected under international law, refugees in host countries are subject to municipal and national authorities. The

presence of refugees can put pressure on host communities, which often fuels prejudice. Therefore, the final aspect of successful community entry is taking into account the host community's concerns.

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

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

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

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

4. Data Creation & Collection: Quick Start Guide

Creating data for OpenStreetMap typically takes two forms: remote mapping and field data collection. Remote mapping is the process of tracing infrastructure such as buildings and roads into OpenStreetMap using aerial or satellite imagery. This process allows for volunteers and team members to create basemaps anywhere in the world with only a computer and internet connection.

Collecting data on the ground is an integral part of editing OSM. This data is typically richer in detail and more accurate than map data that is generated solely by remote tracing. Mappers can choose from a number of free and open tools that facilitate on-the-ground data collection in both online and offline settings.

4.1 Remote Mapping: Mapathons & Learning How to Map

Open mapping techniques, particularly editing OSM, are easy to learn and present a low barrier to entry for new contributors. Volunteer mappers can learn through in-person trainings, while attending a mapathon, and/or from a variety of online tutorials and videos. The OSM community has created a wide variety of online tools to learn how to map, including:

- LearnOSM, which includes instructions for learning how to map in 17 languages;
- HOT Toolbox;
- HOT's Learn to Map! Youtube playlist;
- MapGive, which offers extensive video tutorials on mapping for humanitarian efforts;
- Missing Map's Beginner's Guide;
- Mapbox's visual guide to editing OSM; and
- The OSM Wiki page to find out more about the communities in your area.

Humanitarian and development organizations and governments host virtual and in-person mapathon events to engage volunteers in contributing to crowdsourced mapping projects. The typical objective of a mapathon is to provide humanitarian and development efforts with improved access to data in OSM. A typical mapathon asks participants to edit OSM for a target area, provides training for new mappers, and may feature remarks or a presentation on the purpose and goals of the mapping project.

Mapathon planning resources include:

- MapGive in a Box
- Missing Maps' Event Hosting guide
- HOT's How to Host a Mapathon video.

Remote mapping is also typically the first step in the field data collection workflow. Prior to going into the field, teams are encouraged to check OSM for completeness and temporal validity. If data for an area of interest is out of date or incomplete, teams should conduct remote mapping to complete an up-to-date basemap for field activities.

Tasking Manager

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

For more information and resources on the Tasking Manager, visit: https://github.com/hotosm/toolbox/wiki/3.1-Working-with-the-HOT-Tasking-Manager

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

iD Editor

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

- Simple edits

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

Java OpenStreetMap Editor (JOSM)

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

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

For more information and resources on iD Editor and JOSM, visit https://github.com/hotosm/toolbox/wiki/3.3-Editing-with-iD-and-JOSM

4.2 Tools for Field Data Collection

Several mobile applications exist to assist with field data collection. The following are Data Collection Tools commonly used in the HOT workflow. A detailed overview of these and other data collection tools can be found at [insert link]. Choosing an application to use depends on mobile device capability, varying set-up requirements, and survey needs. It is also important to note that some tools require others (i.e. OMK requires use of ODK), and others can be complementary (i.e. OSMTracker or Mapillary can be used to supplement data collection with ODK, Kobo, and OMK).

I want to collect…

ODK

Kobo

OMK

Maps.

me

OSM

Tracker

Mapillary

Qualitative survey data

☒

☒

☒

X

X

X

Quantitative survey data

☒

☒

☒

X

X

X

GPS Points

☒

☒

☒

☒

☒

X

Photos attached to GPS Points

☒

☒

X

X

☒

X

GPX Tracks

X

X

X

X

☒

☒

Streetview imagery

X

X

X

X

X

☒

Data attached to OSM points of interest

X

X

☒

☒

X

X

Data attached to OSM polygons (i.e. buildings)

X

X

☒

☒

X

X

Data attached to OSM ways (i.e. roads)

X

X

X

☒

X

X

OpenDataKit (ODK)

ODK is a free an open-source set of tools which help organizations author, field, and manage mobile data collection solutions. ODK Collect is part of ODK and is an Android app that replaces paper forms used in survey-based data gathering.

Use OpenDataKit (ODK) if:

- You have access to mobile devices but they have limited RAM & storage
- You do not need to collect data for buildings in OSM OR you are able to manually transfer data collected as points to OSM polygons after data collection.
- Someone on your team is comfortable developing or learning to develop ODK forms using spread-sheet software.

OpenMapKit (OMK)

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

Use OpenMapKit (OMK) if:

- You have access to mobile devices with sufficient RAM & storage
- You need to collect data for buildings in OSM
- You have the capacity for more intensive set-up prior to data collection

KoboCollect

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

Use KoboCollect if:

- You have access to mobile devices with sufficient RAM & storage
- You would like to use a form builder to build your survey (as opposed to building forms in spread-sheet software, as with ODK)
- You do not need to collect data for buildings in OSM OR you are able to manually transfer data collected as points to OSM polygons after data collection.

OSMTracker

OSM Tracker is "an offline GPS tracker designed for collecting points of interest (POI) to be added to the map and for recording GPX tracks." OSM Tracker is free and open-source. Several projects have used OSMTracker to complement ODK/OMK/Kobo survey collection.

Use OSMTracker if:

- You need to collect waypoints and GPX tracks.
- You need to collect photos with waypoints.

- You need to map points of interest.
- You do not need to conduct a survey.

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.

Use Maps.me if:

- You need to map points of interest.
- You want to upload points to OSM without data cleaning or additional processing.

- You need an application for navigation.

Mapillary

Mapillary is an open-source street view imagery capture application that integrates with OpenStreetMap. Several projects have used OSMTracker to complement ODK/OMK/Kobo survey collection.

Use Mapillary if:

- You need to collect street view imagery.

For more information and resources (including skills and tools necessary) on data collection applications, visit https://github.com/hotosm/toolbox/wiki/4.2-Data-collection-application

Data Collection Servers

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

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

- **POSM** - a physical server that contains a set of OpenStreetMap tools, including OpenMapKit server. POSMs allow multiple users to connect and upload data from data collection devices to a central location without the need for internet access. This data can then be aggregated using the OMK Server and synced with OSM directly or downloaded for analysis and processing.
- **OpenMapKit Server** - OpenMapKit Server is a cloud based storage system for specially designed to store and compile OpenMapKit data. Data collected through OpenDataKit can also be uploaded to an OpenMapKit Server.
- **Kobo Toolbox** - An online application that allows users to build Kobo/ODK surveys as well as store, aggregate, and perform analysis of Kobo/ODK data.
- **ODK Aggregate** - ODK Aggregate is an online application (local options possible) that stores, aggregates, and allows users to perform basic analysis on ODK data.

More information and resources on servers can be found at:

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. For more information about a server-less data management workflow, visit https://github.com/hotosm/toolbox/wiki/5.1.2-Serverless-Data

5. Quality control/assurance

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

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

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

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

Phase 1

Defining Needs & Requirements

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

What data are we collecting?

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

What is the geographic scope of our data?

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

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

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

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

Phase 2

Defining Data Collection Methodology

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

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

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

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

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

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

Phase 3

Collecting Data & Producing Datasets

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

Is data quality being monitored during field data collection?

Is field data being safely secured on a daily basis?

Phase 4

Cleaning and Validating Datasets

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

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

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

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

Phase 5

Ensuring Sustainability & Providing Documentation

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

Has the availability of data been communicated to relevant stakeholders?

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

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

For a full version of HOT's Data Quality Framework, visit:

5.1 Overview of Tools used in QC/QA

While quality assurance can be and should be performed at all stages of a mapping campaign, several tools exist to assist with quality assurance during the data cleaning and upload process as well as monitoring data after uploading.

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

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

MapCampaigner

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

OSMCha

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

Osmose

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

JOSM Tools

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

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

Quality Assurance Tools Wiki: wiki.openstreetmap.org/wiki/Quality_assurance MapCampaigner: campaigns.hotosm.org/ OSMCha: osmcha.mapbox.com Osmose: osmose.openstreetmap.fr

6. Using Open Data & Maps for Analysis, Display and Decision-Making

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

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

   Level: Beginner

   umap.openstreetmap.fr

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

   Level: Beginner/Intermediate

   overpass-turbo.eu

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

   Level: Beginner/Intermediate

   openheatmap.com

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

   Level: Intermediate

   datawrapper.de

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

   Level: Advanced

   qgis.org

Part I - Introduction

Who Is This Guide For?

This guide is for national and sub-national governments, international organizations, and their partners who are setting policy and plans and/or designing implementation programs, for data needs in meeting and monitoring the SDGs. It gives policy-makers insight on the strategic benefit of open mapping, and program and technical implementers pointers to in-depth guidance and access to an expert community for realizing open mapping projects.

What is Open Mapping? Why use OpenStreetMap and Open Source tools?

Open mapping is a global movement to create free and open geographic data. Beyond open data, it is a broad community partnership to collaboratively create a critical data resource for monitoring and meeting the Sustainable Development Goals (SDGs) by making available fundamental, detailed, and timely information on where things are in our world.

Centered on the OpenStreetMap (OSM) project, open mapping is transforming how governments and citizens can work together by allowing them to co-create and support critical government functions with geographic maps and data. Anyone with geographic knowledge, whether an individual enthusiast or a professional from a public or private sector institution, is invited to contribute map data in an open community. The community openly designs schemas for mapping features as they are encountered in the world, develops new workflows and applications to contribute as technology advances, applies spatial data for an ever-growing array of uses, and supports and advocates for a growing, open collaboration across sectors.

The open mapping community is one that cares deeply about quality and use of geographic data and includes people from all parts of society and across the globe, from experts in geographic technologies to those in their own neighborhoods. It is hugely powerful for people from around the globe to work in the same database. To date, more than 5 million people have registered, and approximately 40,000–50,000 make contributions - in the form of edits - during a given month . This collaborative approach has been phenomenally successful at creating maps in under-mapped and under-served places, addressing critical needs, as seen in responses ranging from the Nepal earthquake and flooding in Bangladesh to mapping local schools and health care services in informal settlements. Through excellence in data, many OpenStreetMap participants have gone on to become more fully engaged citizens.

Countries around the world have joined the open mapping revolution - and possibilities have proven to be endless. Kenya's Map Kibera project collects citizen-generated data and other kinds of relevant open data in one of the region's biggest slums-turned-informal-city to enhance citizen accountability, development planning and government use. DATA Uruguay is a non-profit using its platform to increase citizen access to open government health data through interactive visualizations. In Russia, Green Patrol uses an open platform to advocate for environmental protection through regional investigations to ensure environmental violators are held accountable for their disobedience. In Indonesia, the National Disaster Management Agency (BNPB in Indonesian) has worked in cooperation with OSM Indonesia to crowdsource and utilize citizen-generated map data for contingency planning, risk reduction, and decision-making during flooding events in Jakarta. As seen in these examples, the adoption of free and open-source software and tools by institutions provide them with better control over information technology and enable greater usage, impact and accessibility of data by the general public, leading individuals to be better informed and empowered to take action on specific issues.

How Government Agencies Work with the Open Mapping Ecosystem

There are countless examples of government agencies who are choosing to work with the open mapping ecosystem for a range of purposes, including:

- The need for high quality, spatial data that is updated at a pace consistent with rapidly changing urban areas;
- Shortage of expertise and resources needed to maintain comprehensive maps in many government agencies;
- As part of wider commitments to local, national, and global open data efforts;
- Through initiatives aimed at supporting science and innovation across government and civil society; and
- To increase public engagement with local government.

While data quality is frequently raised as a concern in discussion of open mapping projects, research has repeatedly demonstrated that OSM data is as, and in some cases more, accurate than authoritative datasets produced by official entities. In fact, the dynamic nature of the OSM database can in some cases make it easier to keep map data up to date. This is particularly true in areas with active local mapping communities, pointing to the need for governments to support and engage with these communities. Some of the most commonly found challenges in open mapping projects stem from the failure to build strong relationships between government and local mapping communities, short-term program designs that don't consider project sustainability, and lack of clear goals from the outset of a project. There are, however, a handful of examples that highlight how government agencies have successfully implemented open mapping projects in collaboration with local communities already embedded in the open mapping ecosystem.

The Global Facility for Disaster Risk and Recovery (GFDRR)'s Open Cities Africa initiative was carried out in 11 cities in sub-saharan Africa to engage local government, civil society and the private sector to develop the information infrastructures necessary to meet 21st century urban resilience challenges. After assessing available data and its openness, relevance and value, local governments alongside technical specialists and mentors were tasked with initiating open mapping activities in collaboration with the local OpenStreetMap communities in each of these regions. Through trainings, mapping parties and community town halls, local government and civil society organizations worked in close collaboration with local NGOs, universities and open data enthusiasts to develop final tools and products that aimed to build more resilient and sustainable cities through the use of open data.

Similarly, the Humanitarian OpenStreetMap Team (HOT) in collaboration with Botswana's Ministry of Health and Wellness and the Clinton Health Access Initiative (CHAI) worked to enhance and expand the available data in the country to support more effective malaria eradication interventions. Prior to launching this initiative, interventions such as Indoor Residual Spraying (IRS) and bednet distribution were sporadic as accurate data for where people live and sleep was not available. Because spraying teams did not have a full overview of the buildings needed to be covered, these interventions were not guided or systematic in reaching places that had high concentrations of malaria infections. HOT's intervention focused on expanding available data in six malaria endemic areas in Botswana on the type/use of buildings as well as building and roofing materials. Surveyors from local communities were recruited to implement data collection processes across these districts. Ultimately, working directly with the Ministry of Health and Wellness staff, including National Malaria Programme and District Health Management Team staff, enabled this data to be used directly to inform a more effective response and interventions.

OpenStreetMap: openstreetmap.org Nepal Earthquake Response: hotosm.org/projects/nepal_2015_earthquake_respor Bangladesh & South Asia Floods: hotosm.org/projects/disaster-response-south-asian-floods-2017 Map Kibera: hotosm.org/projects/map-kibera-slum-mapping DATA Uruguay: datauy.org OSM Indonesia: openstreetmap.id Open Cities Africa: opencitiesproject.org HOT Malaria Elimination in Botswana: hotosm.org/projects/botswana_field_data_collection_to_support_the_national_malaria_programme

Goal 1 - No Poverty

End poverty in all its forms everywhere

"Extreme poverty rates have fallen by more than half since 1990. While this is a remarkable achievement, one-in-five people in developing regions still live on less than $1.90 a day. Millions more make little more than this daily amount and are at risk of slipping back into extreme poverty."

Poverty elimination projects to map low income (often slum) areas can support humanitarian and development programming. Particularly, mapping access to financial services and monitoring areas with low employment rates is fundamental to enabling those living in poverty to become more economically stable and to improve employability and education initiatives.

Additionally, while property boundaries are not imported into OpenStreetMap directly, putting villages and household footprints on a map is often the first step in giving communities a voice in land rights. "Geospatial information is critical in helping people claim their property rights. OSM allows for a flexible database schema and detailed historical information on how and when data originated. Both of these traits are particularly helpful in property rights, which are essentially a social contract between people about their land (versus solely between a person and the land they inhabit without accounting for their neighbors, community, society, etc.)."[1]

What has been done?

Mapping Financial Inclusion in Uganda: In order to increase digital financial inclusion, HOT mapped access to financial services in Uganda, allowing providers to analyze gaps in coverage. Access to digital financial services is fundamental to enabling struggling people to become more economically stable, prosperous, and resilient. These services – payments, credit, savings and insurance offered through mobile phones or other technology – are reaching millions of people around the world who had not previously been included in the financial system.

Map Kibera: The World Bank has partnered with Map Kibera to aid regional counties to engage citizens in an ongoing participatory budgeting process for development initiatives. The main purpose of this project is to use citizen-generated data to ensure that development projects within the counties meet the needs of the people.

What else could be mapped?

- Mapping basic services including education, water points, sanitation, and electricity. See Goals 4, 6, and 7 respectively, for examples and data models.
- Work with communities and governments to add collectively agreed upon administrative boundaries to the map.
- Work with rural communities to map underrepresented villages.
- Map commercial activity to understand economic needs and opportunities.
- Survey households for land ownership status.

OSM Data Model

Type

Category

Key

Value

Description/notes

Commercial activity

All commercial points of interest

name

<Business name; name of the agent location (one can own multiple)>

noname

if no name

opening_hours

Example: "Mo-Su 08:00-22:00", "24/7", "Mo-Fr 08:30-20:00; Sa,Su 08:00-15:00"

Financial Services / Mobile Money

amenity

mobile_money_agent, bank, banking_agent, atm, credit_institution, microfinance_bank, microfinance, sacco, bureau_de_change, money_transfer

network

Airtel Money, Africell Money, MTN Mobile Money, UTL M-Sente, SMART Mobile Money, Vodacom M-Pesa, Safaricom M-Pesa

Businesses

amenity

shop

alcohol, art, bakery, beauty, beverages, bicycle, books, butcher, car, car_parts, car_repair,charcoal, chemist, clothes, convenience, copyshop, cosmetics, electronics, food, furniture, greengrocer, hairdresser, houseware, jewelry, kiosk, mobile_phone, pastry, shoes, stationary, supermarket, tailor, yes

Markets

amenity

marketplace

marketplace:type

<agricultural, clothes,mixed>

Boundaries and places

Administrative boundaries

boundary

administrative

Designates an area as an administrative area

admin_level

<1 to 10>

Indicates the level of an administrative boundary according to country specific guides

addr:*

addr: to be followed by the administrative designation (i.e. addr:district, addr:village)

name

Official or most commonly used name of administrative area

Places (Villages, towns, cities)

place

city, suburb, town, village, hamlet,

Place type, generally based on population size

name

Official or most commonly used name of the place

alt_name

Unofficial or secondary name of the place

population

Official or estimated population size

---

[1] Omidyar Network: https://www.omidyar.com/blog/how-map-can-change-world-state-map-us-2015-conference-emphasizes-role-geospatial-data-property

Goal 15 - Life on Land

Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss

"Forests cover 30 percent of the Earth's surface and in addition to providing food security and shelter, forests are key to combating climate change, protecting biodiversity and the homes of the indigenous population. Thirteen million hectares of forests are being lost every year while the persistent degradation of drylands has led to the desertification of 3.6 billion hectares."

Environmental mapping projects help monitor change in environmental features such as coastal erosion, wetlands, and local biodiversity to tackle issues such as climate change, flooding and sustainable livelihoods. Understanding land use and change through mapping can help local communities and organizations develop and maintain sustainable practices.

What has been done?

The Gambia YMCA's Computer Training Centre and Digital Studio is working with the Gambia Tourism Board and the National Environmental Agency to identify ecotourism areas and capture the current state of vegetation and wildlife to stimulate The Gambia's tourism industry and assist in planning efforts focused on environmental conservation and preservation.

YouthMappers and COASTMAP-URABÁ: Last year, mapping groups in Universidad de Antioquia (Medellín, Colombia) recently joined efforts with an aim to provide an open-source map of the coastal zone of Turbo municipality. The main goal was to put on the map the fishing communities scattered along the coastline. An area of particular interest is El Uno Bay, a peri-urban fishing village severely affected by La Niña 2010-2011. In addition, the group aimed to map mangroves and freshwater wetlands within the area because they are important ecosystems for subsistence of coastal livelihoods. The ultimate objective of COASTMAP-URABÁ is to highlight that coastal wetlands are fundamental elements for the resilience of both fishing livelihoods and the entire coastal zone.

What else can be mapped?

- Adding boundaries of designated protected areas to OpenStreetMap
- Mapping buildings and infrastructure in and around designated protected areas to understand and monitor encroachment
- Mapping wetlands and coastlines to understand erosion and impacts of climate change.
- Mapping land use areas to understand change and development

OSM Data Model

Category

Key

Value

Description/notes

Protected Area Boundaries

boundary

protected_area

Designates boundary for protected area

protect_class

Protection level as defined by country https://wiki.openstreetmap.org/wiki/Tag:boundary%3Dprotected_area#Protect_cla

protection_title

Title or type of protection, not the name of the protected area

name

Name of the protected area

Landuse

landuse

allotments, farmland, forest, meadow, orchard, plant_nursery, vineyard, basin, brownfield, commercial, construction, depot, residential, industrial, railway, retail, salt_pond, landfill, quarry, reservoir

man_made

wastewater_plant, reservoir_covered,

leisure

nature_preserve, park

natural

water, grassland, wetland, glacier, beach, reef, wood, scrub, heath

Used to describe natural physical land features

wetland

wet_meadow, bog, fen, marsh, swamp, tidal flat

name

Used to describe natural area subject to inundation or with waterlogged ground

Waterways

waterway

river, riverbank, stream, canal, drain, ditch, dam

name

intermittent

yes

Indicates that the waterway is usually dry, even during the wet season.

seasonal

yes, spring, summer, autumn, winter, wet_season, dry_season

Indicates that the waterway has a seasonal flow

destination

name of body of water the feature flows into

Monitoring

man_made

monitoring_station

Goal 3 - Good Health and Wellbeing

Ensure healthy lives and promote well-being for all at all ages

"Significant strides have been made in increasing life expectancy and reducing some of the common killers responsible for child and maternal mortality. Major progress has also been made on increasing access to clean water and sanitation, reducing malaria, tuberculosis, polio and the spread of HIV/AIDS. However, many more efforts are needed to control a wide range of diseases and address many different persistent and emerging health issues."

Public health data collection projects provide local governments and organizations with the information to improve their response to health-related issues, such as malaria prevention, and cholera and Ebola outbreaks. Adding health facilities and their capacities to OpenStreetMap can help governments and partners understand gaps in services, help local communities locate nearest services, and assist first responders when disease outbreaks occur. Understanding household information and distribution can also assist with improving access to health care and monitoring behavior that impacts health outcomes.

What has been done?

Data Zetu: In Tanzania, HOT used mapping data they had collected on wards, sub-wards and districts in Dar es Salaam – corroborated by local communities on the ground – to provide Amana Hospital with information to better pinpoint patients' geographic origin. With this information, the hospital can identify locations that are at risk of diseases, enabling them to prevent infection and even fight infant malnutrition. After updating the hospital's electronic systems, HOT also trained 40 staff at the hospital on how to use the data.

Malaria Elimination: In 2018, HOT supported malaria elimination projects on the ground in Guatemala and Botswana by providing geographical data and training to national governments. These projects worked to improve the usefulness of the OSM data in malaria elimination interventions, including support for the logistics and indoor residual spraying campaigns, better data for further types of interventions such as bed net distribution, and improved monitoring and evaluation to measure intervention impacts.

What else could be mapped?
- Map areas affected by disease outbreaks to more effectively track new cases and transmission on the ground, aimed at ending the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases.
- Map incidence of households displaying healthy behaviors; for example, sleeping under a long-lasting insecticide-treated bednet in malarious countries or seeking timely care when ill.
- Map barriers to healthcare services, such as the distance people must travel for healthcare and the cost of transportation.
- Map spaces that are accessible or inaccessible to people with disabilities.

OSM Data Model

Category

Key

Value

Description/notes

Health facilities

amenity

clinic, doctors, hospital, dentist, pharmacy

For describing useful and important facilities for visitors and residents

healthcare

doctor, pharmacy, hospital, clinic, dentist, physiotherapist, alternative, laboratory, optometrist, rehabilitation, blood_donation, birthing_center

A key to tag all places that provide healthcare (are part of the healthcare sector)

healthcare:speciality

- these values are options available when the healthcare=laboratory tag is applied to a health facility (biology, blood_check, clinical_pathology, diagnostic_radiology, medical_physics, medical_engineering, radiology)
  A key to detail the special services provided by a healthcare facility.   To be used in conjuction with the 'healthcare=*' tag.   For example 'healthcare=laboratory', and 'healthcare:speciality=blood_check'
  name
  The primary tag used for naming an element
  operator
  The operator tag is used to name a company, corporation, person or any other entity who is directly in charge of the current operation of a map object
  operator:type
  public, private, community, religious, government, ngo, combination
  This tag is used to give more information about the type of operator for a feature
  addr:full
  Used for a full-text, often multi-line, address for buildings and facilities
  contact:phone
  The contact tag is the prefix for several contact:* keys to describe contacts
  operational_status
  operational, non_operational, unknown
  Used to document an observation of the current functional status of a mapped feature
  opening_hours
  Describes when something is open or closed. There is a specific standard format for this data https://wiki.openstreetmap.org/wiki/Key:opening_hours/specification
  beds
  Indicates the number of beds in a hotel or hospital
  staff_count:doctors
  Indicates the number of doctors in a hospital
  staff_count:nurses
  Indicates the number of nurses in a hospital
  health_amenity:type
  ultrasound, mri, x_ray, dialysis, operating_theater, laboratory, imaging_equipment, intensive_care_unit, emergency_department
  Indicates what type of speciality medical equipment is available at the healthsite
  dispensing
  yes, no
  Whether a pharmacy dispenses prescription drugs or not. Used to add information to something that is already tagged as amenity=pharmacy
  wheelchair
  yes, no
  Used to mark places or ways that are suitable to be used with a wheelchair and a person with a disability who uses another mobility device (like a walker)
  emergency
  yes, no
  This key describes various emergency services
  insurance:health
  no, public, private, unknown
  This key describes the type of health insurance accepted at the healthsite
  water_source
  well, water_works, manual_pump, powered_pump, groundwater, rain
  Used to indicate the source of the water for features that provide or use water

electricity

grid, generator, solar, other, none

Used to indicate the source of the power generated

Building Assessments

building

residential, commerical, school, hospital, kitcen, toilets, church,

Indicates the useage(s) of the building.

building:levels

Number of levels in the building

building:material

brick, cement_block, concrete, glass, loam, metal, plaster, reed, wood, mud, canvas, grass,

Material(s) used in wall construction

building:roof

thatch, wood, asphalt, tile, metal, plastic, cement,

Material(s) used in roof construction

wall

yes, no

Indicates whether or not a structure can be considered fully walled (i.e. four walls) or if a stucture is open (i.e. three walls or fewer).

Goal 4 - Quality Education

Ensure inclusive and quality education for all and promote lifelong learning

"Basic literacy skills across the world have improved tremendously, yet bolder efforts are needed to achieve universal education goals for all. For example, the world has achieved equality in primary education between girls and boys, but few countries have achieved that target at all levels of education."

Open mapping provides a two-fold benefit towards reaching the SDG for education: assisting partners, governments, and local communities understand gaps in services and distribution of educational facilities, as well as providing an opportunity for individuals in these groups to gain technical and vocational skills such as GIS and surveying.

What has been done?

GAL (Peru): HOT local partner GAL School Peru is training local high school students in Cusco to identify under-represented social issues, and then investigate, map and share them. To date, groups of school girls in Cusco have created campaigns that use maps of sexist publicity and behaviour, presenting them as part of an international festival and to local government representatives, as well as peers and the broader school community.

Crowdsourcing Non-Camp Refugee Data Through OpenStreetMap: In northern Uganda, refugees and host community members were trained and provided with the tools to map vulnerabilities and assets in their communities, including educational facilities. This educational data, combined with other features mapped, allowed for analysis and map creation showing patterns such as distance refugees and host community members need to walk to school and the distance between educational facilities and the closest safe drinking water points. Through this project, HOT also provided training to secondary school students and teachers in the refugee-hosting district of Arua covering subjects such as how to use OpenStreetMap to navigate, how to read a map, and how teachers can use OSM during geography lessons.

What else can be done?

- Provide vocational training in the latest open source GIS tools to substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs, and entrepreneurship.
- Map barriers to education, such as the distance students must travel to school and unsafe or vulnerable areas en route to or near schools.
- Create detailed maps of schools in a given community, along with information about school size, number of teachers, number of bathrooms available, etc., to empower parents when they choose a school for their children.
- Engage students in on-the-ground geographic data collection to improve map literacy and spatial awareness, as well as empower students to have a say in how their community is represented on the world map.

OSM Data Model

Educational Facilities

Key

Value

Description/notes

amenity

school, kindergarten, college, university

Type of school

name

Name of school

operator

Name of operator, often the local education authority

operator:type

public, private, religious, ngo

Type of operator

addr:full

Full address

and/or addr:city, addr:district, addr:street, etc.

capacity

yes, no,

Total number of students the school can accept (not current

grades

fee

yes, no

religion

christian, muslim, buddhist,

If applicable, add denomination=*

min_age

max_age

wheelchair

yes, no

Wheelchair accessibility

temporary

yes

toilets

yes, no

toilets:access

public, staff only

staff_count:teachers

Number of teachers

generator:source

oil, gas, coal, biomass,

Power supply (if any) for the school

water_supply

water_well, pipeline, pump, borehole,

Related Facilities and Amenities

Category	Key	Value
Child friendly space	amenity	social_facility
	social_facility	outreach
Recreation	landuse	recreation
	leisure	pitch, playground, park
Community centre	amenity	community_centre

Goal 5 - Gender Equality

Achieve gender equality and empower all women and girls

"Gender equality is not only a fundamental human right, but a necessary foundation for a peaceful, prosperous and sustainable world. Providing women and girls with equal access to education, health care, decent work, and representation in political and economic decision-making processes will fuel sustainable economies and benefit societies and humanity at large."

Open mapping projects can support gender equality by creating data about gendered problems that affect women and girls, and working to prioritize the involvement of all members of society in decision-making processes. This means empowering female mappers, supporting projects which promote equal rights, and providing local communities with the resources and training to encourage equal participation in their initiatives. Creating spaces where women are explicitly included in each phase of the mapping process, with support from male advocates and leaders, can help achieve this goal.

What has been done?

Tanzania Development Trust (Tanzania): Since 2015, Crowd2Map has been adding schools, hospitals, roads, buildings and villages to OpenStreetMap, with the help of over 7500 volunteers worldwide and 600 on the ground in Tanzania. Our mission is to map all of rural Tanzania, particularly to enable better planning for delivery of the SDGs in rural areas and to empower disadvantaged communities to put themselves on the map. These maps are used by community activists to locate and protect girls at risk of FGM, as well as providing local officials data needed to plan for the development of services. Despite the illegality of the practice, FGM is still prevalent across many areas of rural Tanzania.

GeoChicas (Mexico): Following the 2017 Mexico earthquakes, the GeoChicas team have started a pilot project researching informal shelters and their relation to women's security after a disaster. The project is based in the Oaxaca region which suffered two major earthquakes in 2017. Collaborating with disaster response experts, the aim is to create a database of informal provisional shelters and designated shelters to overlay with the geographical locations of reports of sexual harassment and gender violence. The maps produced will help inform and improve women's safety in the area and during future disaster management.

What else can be done?

- Engage girls and women in mapping areas of their community that are unsafe or pose serious risks and empower them to advocate for change by working with community leaders, local government, police, and civil society.
- Create asset maps of services and resources, such as women's health clinics and women's vocational training centers.
- Provide opportunities to young women through hiring practices and training opportunities to enhance information and communications technology skillsets to promote the empowerment of women.

Goal 7 - Affordable and Clean Energy

Ensure access to affordable, reliable, sustainable and modern energy for all

"Energy is central to nearly every major challenge and opportunity the world faces today. Be it for jobs, security, climate change, food production or increasing incomes, access to energy for all is essential. Transitioning the global economy towards clean and sustainable sources of energy is one of our greatest challenges in the coming decades. Sustainable energy is an opportunity – it transforms lives, economies and the planet."

OpenStreetMap serves as a key database for understanding global electrification rates on a wide scale through storing information from power grid networks and infrastructure down to information needed to understand individual household and commercial access to electricity. Open mapping of electricity access can help partners and organizations share resources and understanding of where people are accessing electricity, and more importantly, where people do not have access.

What has been done?

Mini Grids (Tanzania): In Tanzania, 80% of the population live in rural areas and only 16% of people have access to electricity. Due to the remote nature of these unelectrified villages, the government of Tanzania aims to target the best areas to build off-grid electrification. To support this goal, HOT completed a large-scale digitization of rural Tanzania using mapping and household surveys, including over four million buildings and 1,300 villages. By collecting this highly detailed data of the settlements, HOT enabled the government and private electricity and renewable energy providers to predict demand and determine where grid and off-grid connections can be made.

What else can be mapped?

- Add infrastructure such as power lines and plants to the map and make it accessible, allowing for accurate assessments of the proportion of population that is connected to the grid.
- Survey households and commercial properties for access to and source of electricity
- Survey structures for roof attributes to determine solar compatibility

OSM Data Model

Category

Key

Value

Description/notes

Structural

electricity

yes, no, grid, generator, solar, wind

Used to indicate the source of the power generated

roof:material

metal, thatch, roof_tiles, wood, concrete, grass

Material(s) of roof

roof:shape

flat, skillion, gabled, hipped, pyramidal, round

Shape of roof

Power grid/network

power

line, minor_line

A way following the path of (overground) power cables. For minor power lines with poles and not towers, use power=minor_line.

power

pole, tower, plant, generator

Power grid features

generator:source

biomass, coal, gas, oil, diesel, waste, wind, solar, hydro

Source of the energy generated by a power=generator device

generator:method

wind_turbine, water-storage, water-pumped-storage, thermal, photovoltaic, combustion, gasification

Method by which the energy is generated by a power=generator device

generator:output

electricity, heat, biogas

Used in conjunction with power=generator

operator

Name of operator

operator:type

public, private

Type of operator

Example

This is a documentation site example file. Write your content in markdown. You can edit directly in Github or take your content into a Markdown editor like Dillinger and you can see how your content looks while you edit.

Happy Editing!