

Field Mapping is the Future: A Tasking Manager Workflow Using ODK

Translations: [French](#) | [Spanish](#)

[Posters](#) (in English and French)

Field mapping by local people is key to the future of open mapping. However, the tools available for field mapping — despite many being of high quality — do not form a coherent ecosystem to unleash the potential of community field mapping. Something is missing! Could it be a Tasking Manager for Field Mapping?

Summary (TL:DR)

While we have pretty good field mapping applications, we don't have great tools to coordinate field mapping. However, we have most of the elements needed to create a field mapping-oriented version of the HOT Tasking Manager, which allows people to select specific areas and complete tasks in a coordinated, organized fashion.

It's already possible to implement a sort of Field Mapping Tasking Manager workflow using existing tools (mostly based on ODK, particularly the new 'select from map' functionality), but it's pretty labor-intensive and tricky. We're working on some automation to ease the pain points, which moves us closer to a fully-fledged Tasking Manager.

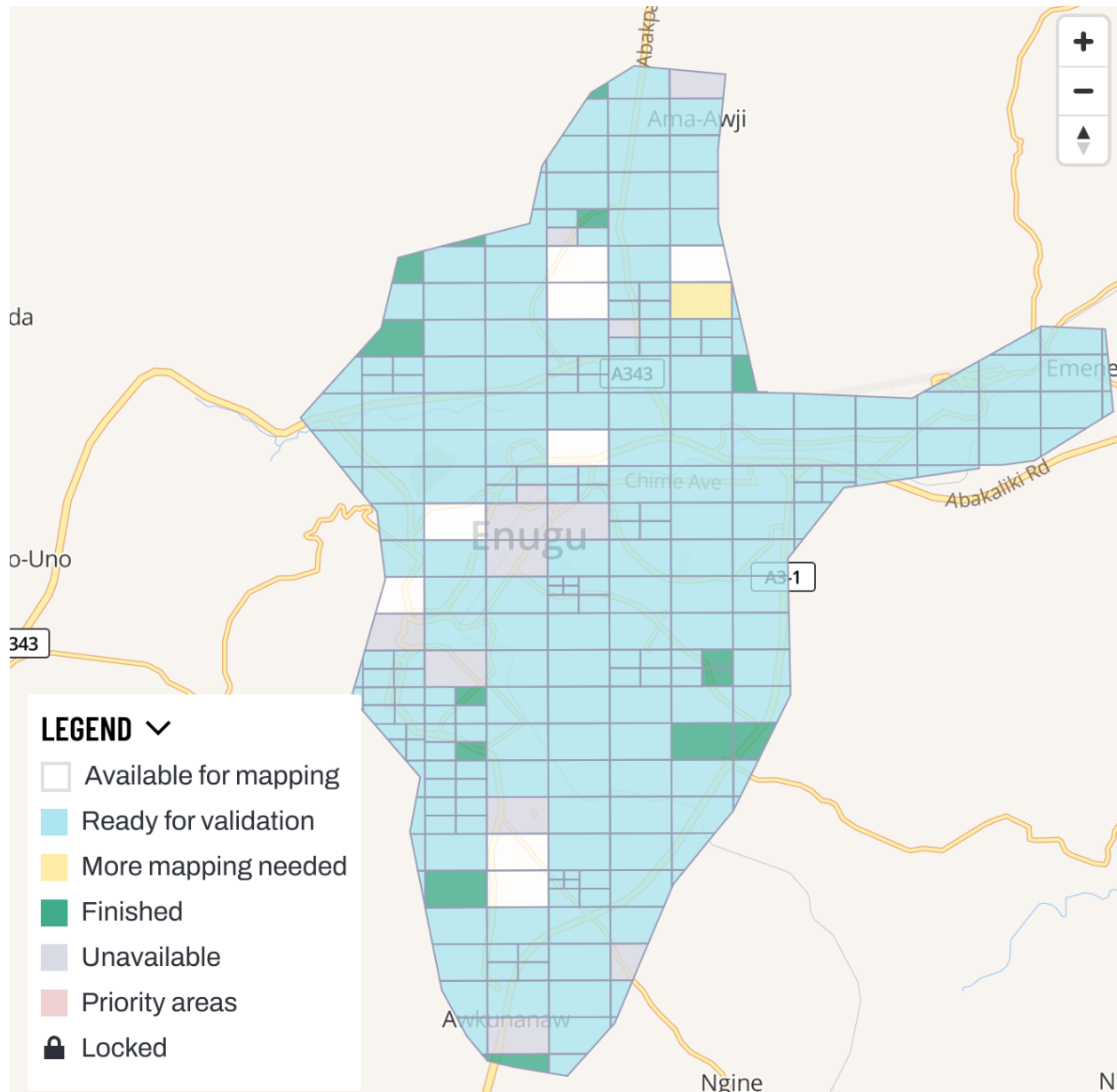
In collaboration with the Tech and Communities team, and the Community and Training Working Groups, the HOT Field Programs Team will be hosting a [skill share session on September 9th, 2022](#), during which people can gain an understanding and some experience with the idea; we'll be using the feedback from this session to gauge interest and participation to continue development. We encourage individuals and communities interested in field mapping coordination tools to attend!

Tasking enables better remote mapping

One of the most impactful elements of the open mapping ecosystem in the last ten years has been the [HOT Tasking Manager](#). [OpenStreetMap itself](#) created a massively scalable, open repository for geographical data, and tools like [ID Editor](#) and [the Java OpenStreetMap Editor \(JOSM\)](#) provided first-rate tools to add data to the map remotely. However, between the editing

tools and the repository, there was a gap: *how could people easily choose areas to map completely and with high quality?*

Something was needed: a way to allocate small, manageable tasks to individuals, keep track of their progress, quality-check and validate their work, and seamlessly integrate the new data into OpenStreetMap without damaging existing data. The HOT Tasking Manager served as the rug that tied the room together; a tool for the community to define data needs, and for individual mappers to contribute with ease and confidence.



What about tasking for field mapping?

There are a number of great field data collection tools!

The mighty [OpenDataKit](#) and the many platforms built from it such as [Kobo Toolbox](#) make it possible for anyone with an Android device to collect data using flexible, powerful forms designed in a spreadsheet.

1	type	name	label	hint	appearance	default	relevant	parameters
5	deviceid	deviceid						
6	phonenumber	phonenumber						
7	username	username						
8	email	email						
9	select_one_from_file	Buildings.geopoint		Please ensure your basemap is set to Mapbox (OSM may work if you do not require long-press selection for GeoPoints). The available points are centroids within the OSM building polygons they represent.	map			value=id, label=name
10	note	point_selected	Select one of the available points.					
11	geopoint	location	Great, you selected a building! Ok, you didn't choose anything from the available points. You can create a point for the building or amenity by long-pressing on the building on the map view here.	Make sure your basemap is set to MapBox! Otherwise the long press may not work. This may be used as the "name" tag in OpenStreetMap, so it's quite important to get it right. This will determine the list of choices you'll have to tag this feature.	Placement: map			\$(point_from_map)=""
12	text	name	What is the name of this place?					
13	select_one	building_or_amenity	Are you mapping a building or an amenity?					
14		building_type						
15	select_one	building_type	What kind of building is it?					\$(building_or_amenity)="building"
16	select_one	other_building_type	Ok, you said "other", so here's the full list of building keys from the OSM Wiki!	If you can't find it here, you probably shouldn't make one up. OSM validators hate that.				\$(building_type)="other" \$(building_or_amenity)="amenity"
17	select_one	amenity_type	What kind of amenity is it?					
18	select_one	other_amenity_type	Ok, you said "other", so here's the full list of amenity keys from the OSM Wiki!	Some of these are pretty weird. Don't look at me, I just copied them from the OSM wiki.				\$(amenity_type)="other"
19								
20	range	floors	How many floor levels are in the building? You set the number of floors to 50, which probably means there are more than 50 floors. How many are there?	Ground floor only = 1 (ground floor is level 1). The most floor levels allowed in this form is 50. If you choose the maximum, the next question will allow you to select as many floors as you like.				\$(building_or_amenity)="building" start=1 end=50 step=1
21	integer	floors_over_50						\$(floors)=50
22	note	burj_khalifa	You said that there are 163 floors. Congratulations, you are mapping the "Burj Khalifa", the tallest building in the world!	If you are mapping from the top of the building, please be careful. It's a long way down.				\$(floors_over_50)=163 \$(building_or_amenity)="building" selected=\$(building_materials), "other"
23	select_multiple	building_materials	What building materials are used in the construction of this building?					
24	text	building_materials_other	You said that "Other" building materials are used. What are they?					

1:17 84% 85%

HOT_Advanced_Mappi...

Opening days and hours > Opening hours by day

Opening hours

Enter the opening hours for each open day. Use dashes to separate opening and closing hours, and commas to separate multiple opening periods; for example, if it opens from 9:00 until 12:00, closes from 12:00 to 14:00, and opens again from 14:00 to 18:00, enter 09:00-12:00,14:00-1800.

Monday opening hours

09:00-17:00

Tuesday opening hours

09:00-17:00

Wednesday opening hours

09:00-17:00

Thursday opening hours

09:00-17:00

Friday opening hours

09:00-17:00

< BACK

NEXT >

12:30 84% 88%

Select one of the available points.

Select

building: residential

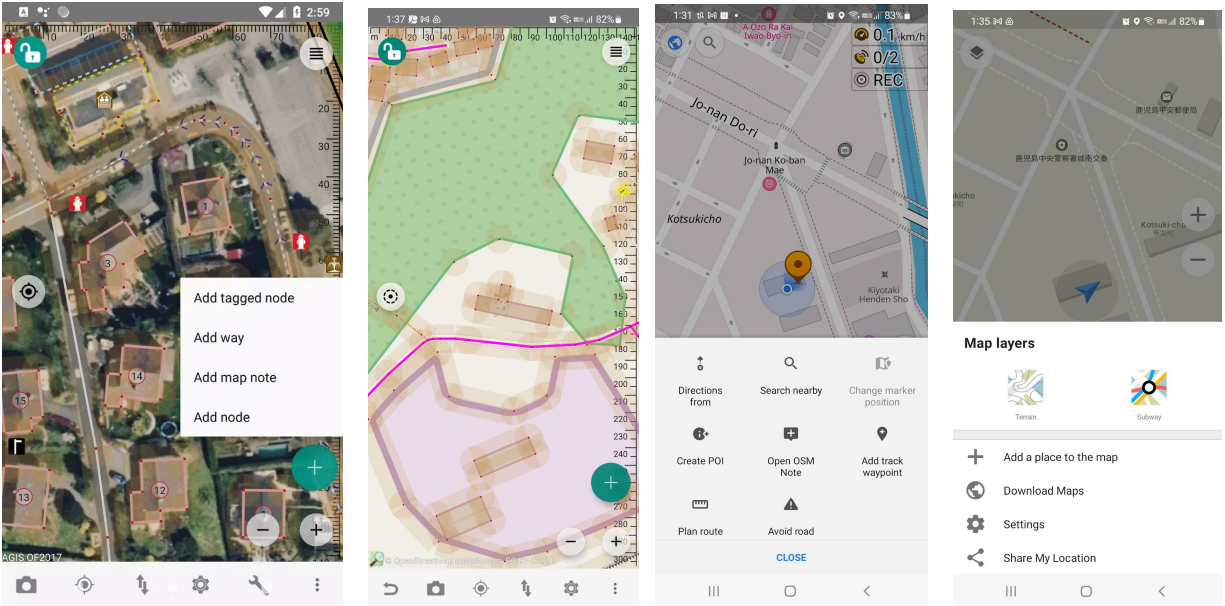
building.levels: 1

building.material: cement_block

damane: minor

The spreadsheet on the left creates the questionnaire and “Select From Map” activity on the phone.

[Vespucci](#) brings much of the power of JOSM to a mobile editor. [EveryDoor](#) gives both Android and iPhone users a simple platform to edit OSM data, and StreetComplete does the same for Android users. [OSMAND](#) and [Organic Maps](#) allow navigation and offline map viewing with OSM data, as well as some basic capacity to add or edit features to contribute back to OSM.



EveryDoor, Vespucci, OSMAnd, and Organic Maps screenshots

Just as with remote mapping, we have an excellent data repository (OSM) and great editing and/or data collection tools, but *there is no coordination platform to facilitate large-scale, high-quality field mapping for OpenStreetMap.*

We propose a Field Mapping Tasking Manager to fill this need.

The components of a field mapping Tasking Manager are mostly already built!

If we were starting from scratch, this would be a daunting proposition. However, thanks to the incredible work of [Nafundi](#), the lead developers of OpenDataKit (ODK), and some related work happening within HOT and the wider open mapping community, the pieces are mostly already in place.

What is needed for a field mapping Tasking Manager?

What's needed to implement a Field Mapping Tasking Manager? We need a way to:

- Define an Area of Interest and divide it into smaller tasks
- Allocate tasks to individuals such that there is neither duplication nor gaps
- Monitor progress of field mapping tasks
- Convert the field mapping results (submissions) into an appropriate format for validation

- Validate the work and provide feedback to the mappers if needed (including asking them to revisit or correct errors)
- Integrate the new data into OSM or other platforms
 - Ideally with specific attribution to the field mapper for the data they created, a long-standing request from the OSM community who value individual responsibility for edits over aggregated data imports

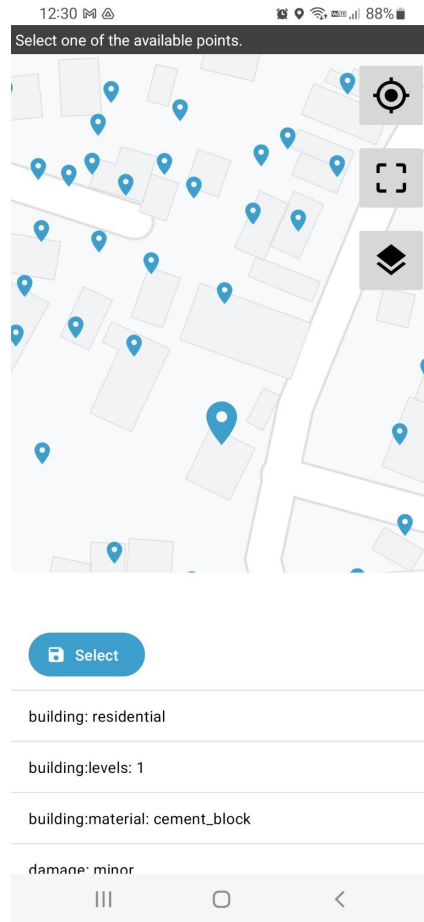
What do we already have?

As of mid-2022, we have tools that can accomplish all of the above requirements. A Tasking Manager-like functionality can already be achieved with (a great deal of) manual work. With a bit of simple automation, we can already make this much smoother, and eventually create a highly accessible and functional Field Mapping Tasking Manager workflow.

New ODK “select from map” functionality and individual form allocation

As of mid-2022, ODK incorporates a new functionality, [select from map](#), that allows field mappers to select an object from a map, view the existing attributes, and fill out a form adding new information and attributes to that object. For example, a mapper can approach a building, select that building from a map view within ODK on their mobile phone, and add the opening hours, number of floors, construction material, or any number of useful attributes in a well-structured questionnaire format.¹

¹ This mostly replicates the functionality of the much-lamented [OpenMapKit](#), a very useful fork of ODK created by the American Red Cross with support from HOT and other agencies, which allowed users to launch forms from a map view and select buildings/features to add attributes to. Unfortunately ODK is no longer maintained and can't be reliably used.



Additionally, the new [ODK Central](#) web server application contains very granular tools to allocate forms to individual users. It is possible, in fact, to create individual questionnaires for an arbitrary number of small areas (such as neighborhoods), each with their own set of features (such as buildings). These forms can then be allocated to specific “app users,” with access to

specific forms (and therefore neighborhoods/areas) defined by a QR code

Form	State 	App Users	HOTTIE	Tri	Samson	Nirab	Leen	Kennedy	Johanes	Emanuel	Dewi	Claudio	Celine	Can	Anjar
anjar	Open 	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒
can	Open 	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐
celine	Open 	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐
claudio	Open 	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐
dewi	Open 	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐
emanuel	Open 	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐
johanes	Open 	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐
kennedy	Open 	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
leen	Open 	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
nirab	Open 	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
osm_buildings_odk_field_mapping	Open 	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
samson	Open 	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
tri	Open 	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

ODK Central supports allocation of individual forms—and corresponding features like buildings—to individual users

How does this “app user” system facilitate a Tasking Manager? We’re so glad you asked! By creating a QR code for each neighborhood (or “task”), and allocating them one-by-one to individuals, we can:

- Assign specific areas to specific people (either by allocating them directly, or by providing a selection of areas and letting people choose)
- Keep track of which areas have been allocated, and completed (and, with a bit more work, validated) Keep track of who mapped which area
- Allocate new areas to people who have finished theirs
- Keep track of which areas still require mapping (or completion/correction after validation)

At the moment, this is a lot of manual work. However, ODK Central has a [powerful and well-documented API](#), and the creation of individual tasks/areas, allocation to specific users, tracking of incoming results and freezing of forms that are already allocated, can be automated!

While we can already allocate tasks manually, the obvious next step is a web map² allowing field mappers to select an area easily. The [OpenMapDevelopment Tanzania](#) (OMDTZ) team has pioneered [interactive web maps that integrate with ODK Central](#), demonstrating a promising way forward.

[GRAPHIC: WEB MAP ON MOBILE WITH SELECTABLE NEIGHBORHOODS]

Conversion of ODK submissions to OSM XML for validation and upload

The HOT Tech Team has already created a set of scripts that convert submission from ODK forms into OSM XML, the native data format of OpenStreetMap. This allows the submissions from field mapping to easily enter the traditional data pipeline of validation in JOSM, followed by upload to OSM attributed to the OSM ID of the field mapper.³

The existence of these scripts facilitates more Tasking Manager-like functionality, as the conversion of submissions into datasets ready for validation is straightforward and easily automated. The scripts are particularly easy to adapt when they target good-quality standardized ODK forms, a key benefit of this entire system.

What do we need to build?

In principle, we can already implement a Field Mapping Tasking Manager workflow, but it requires a lot of tricky manual work. Our plan is to do so, and incrementally automate away the pain points! The most likely path probably looks like:

1. Create a mobile-friendly web map (not a mobile app, just a web app) that:
 - a. Displays all of the individual tasks in a project, color-coded by allocation/completion status
 - b. Allows mappers to click on a task near their physical location and have it allocated to them (either with a QR code or a direct launch of ODK Collect with the relevant configuration)
 - c. Allows mappers, validators, and managers to see progress and select tasks for further mapping or validation
2. Create a web map for computer screens that facilitates the creation of projects and individual tasks
 - a. Ideally uses road and waterway networks to divide tasks sensibly for field mapping rather than arbitrary squares

² Similar to and possibly based on the HOT Tasking Manager UI, though optimized for mobile; people using the Tasking Manager are by definition using a computer screen, while field mappers are by definition using a mobile device.

³ Most field mapping data is currently uploaded to OSM as bulk imports attributed to the organization, project, or validator. This is a source of frustration to the OSM community, who greatly value individual responsibility for individual edits added to the map.

- b. Automates the process of downloading OSM data (likely buildings as the first priority) for the area covered by each task and converting it into selectable features in an ODK form for each task area
3. Refine and expand the form(s) available to cover the most critical field mapping data needs of communities
4. Streamline the data validation and import process
5. And so on...

Next steps

In collaboration with the Tech and Communities team, and the Community and Training Working Groups, the HOT Field Programs Team will be hosting a skill share on September 9th, 2022, where we'll demonstrate the use of a rudimentary Field Mapping Tasking Manager workflow. All are welcome!

French and English sessions will be held in several time zones, and additional sessions may be added if there is interest from additional time zones and languages (we can probably manage a Spanish-language session if the participants are prepared to hear the language of Cervantes mercilessly butchered).

If, following the skill share session, there is substantial community interest in using this workflow, we will continue building it in collaboration with those users. So if you think this is something you might want or need, make sure you sign up for the skill share at tinyurl.com/field-mapping-tools1.