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Geodesy and geoinformatics for sustainable development in Jordan (GEO4D)

 POLITECNICO DI MILANO



OpenStreetMap applications

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Politecnico di Milano, Lecco Campus – June 20, 2018

- OpenStreetMap has evolved into a complex ecosystem:
 - datasets, software, services & applications
- How is OpenStreetMap used?
 - map visualization
 - software (editors, routing, etc.)
 - data download
 - humanitarian applications
 - quality assurance/quality control
 - games
 - (enrichment/update of governmental maps)
 - (education and research)

http://wiki.openstreetmap.org/wiki/List_of_OSM-based_services

Map visualization



Map visualization

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- OSM vector data can be visualized with customized styles:
 - standard visualization



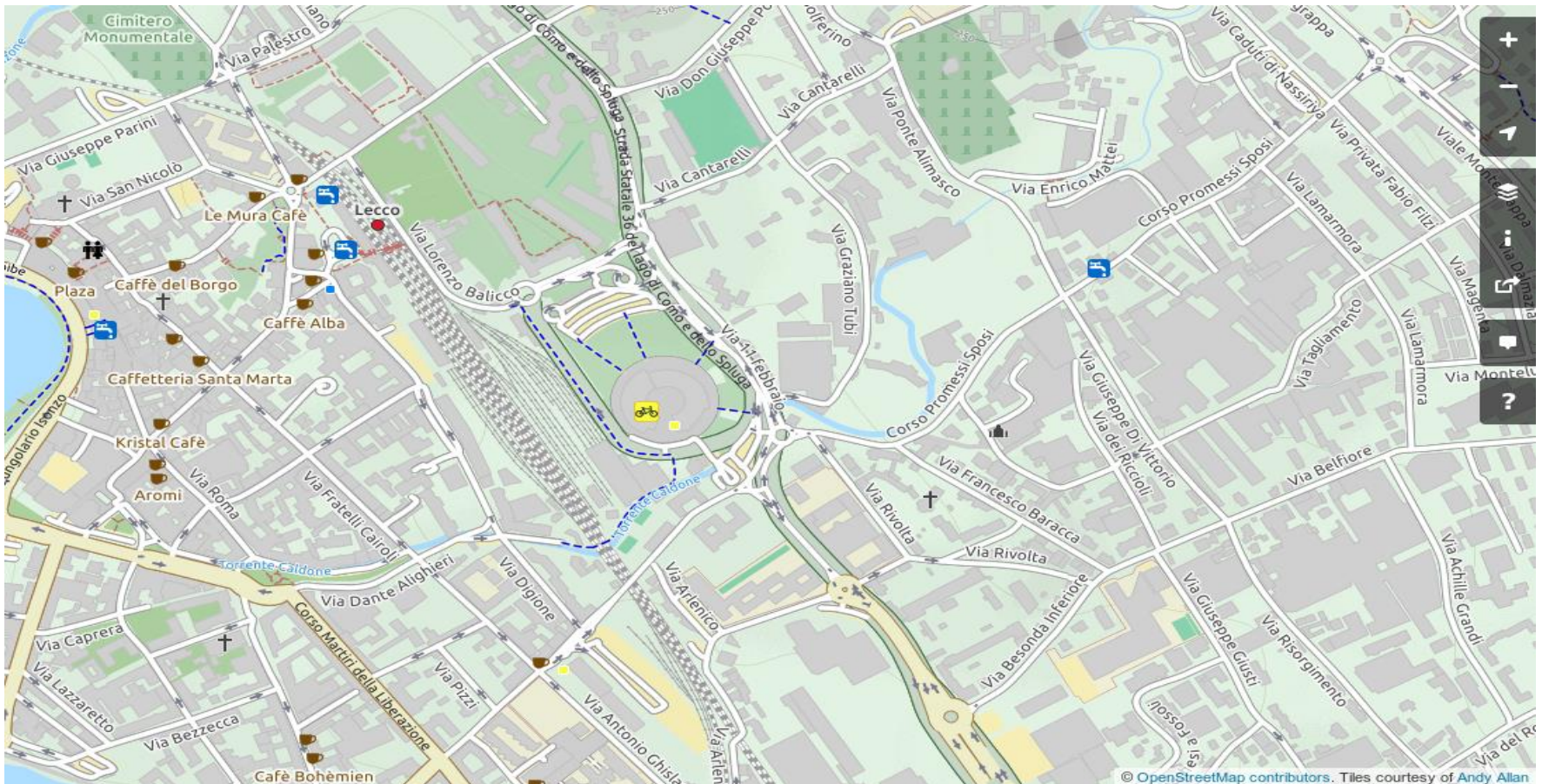
<http://www.openstreetmap.org>



Map visualization

5

- OSM vector data can be visualized with customized styles:
 - cycle map visualization



<http://www.openstreetmap.org>



Map visualization

6

- OSM vector data can be visualized with customized styles:
 - transport map visualization



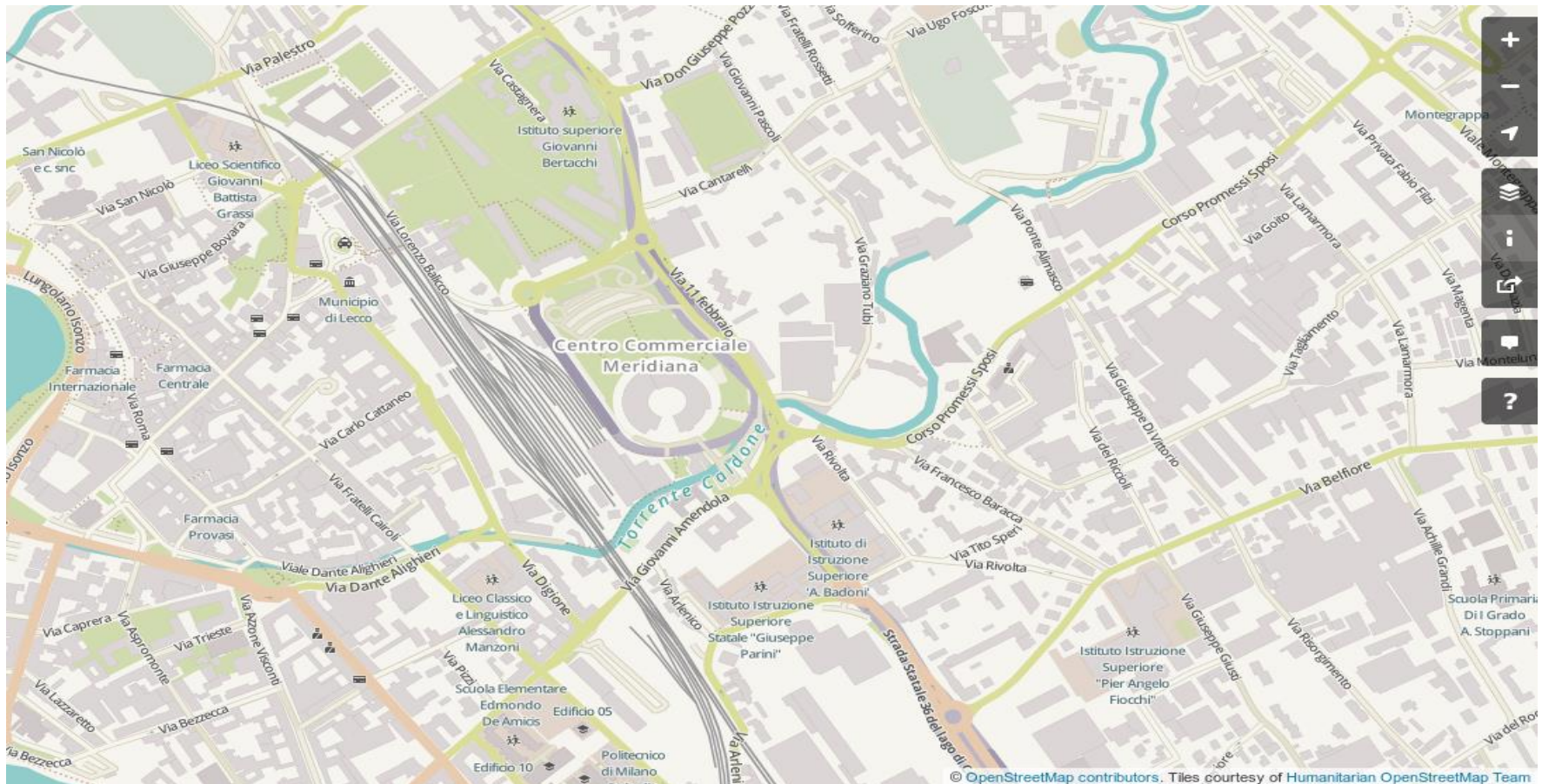
<http://www.openstreetmap.org>



Map visualization

7

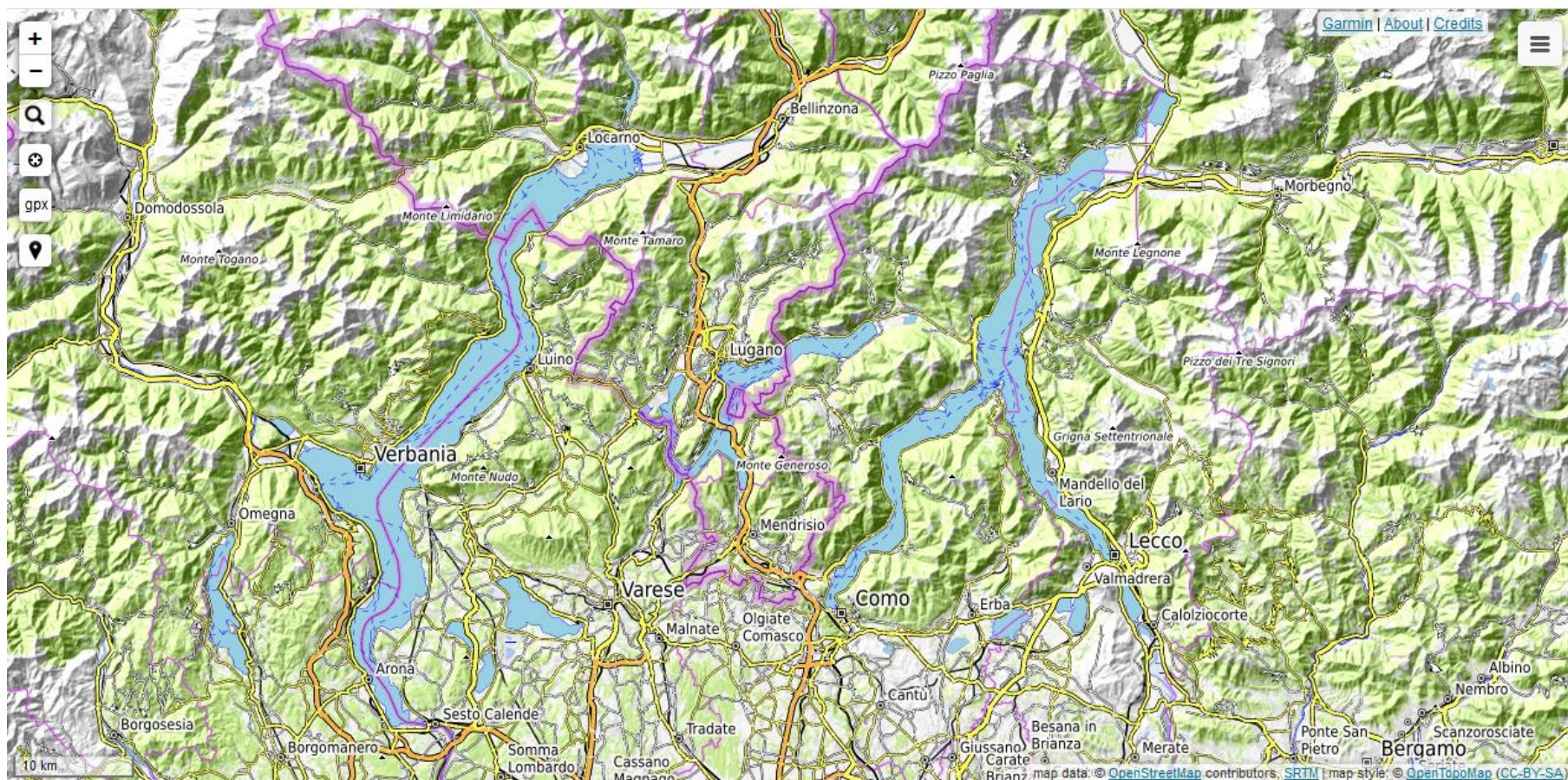
- OSM vector data can be visualized with customized styles:
 - humanitarian visualization



<http://www.openstreetmap.org>



- OSM vector data can be visualized with customized styles:
 - topographic visualization



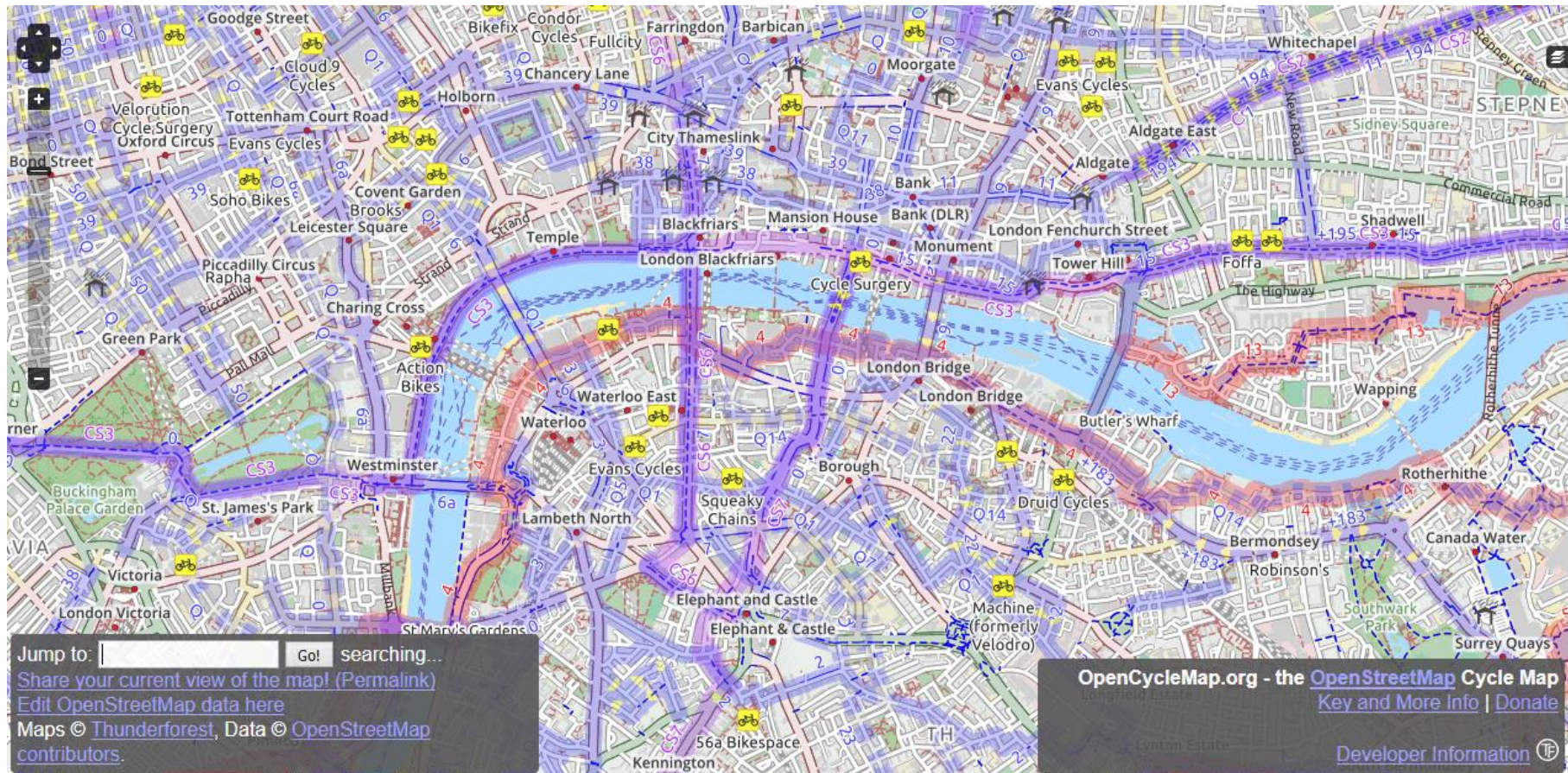
<https://opentopomap.org>



Map visualization

9

- OSM vector data can be visualized with customized styles:
 - cycle map visualization

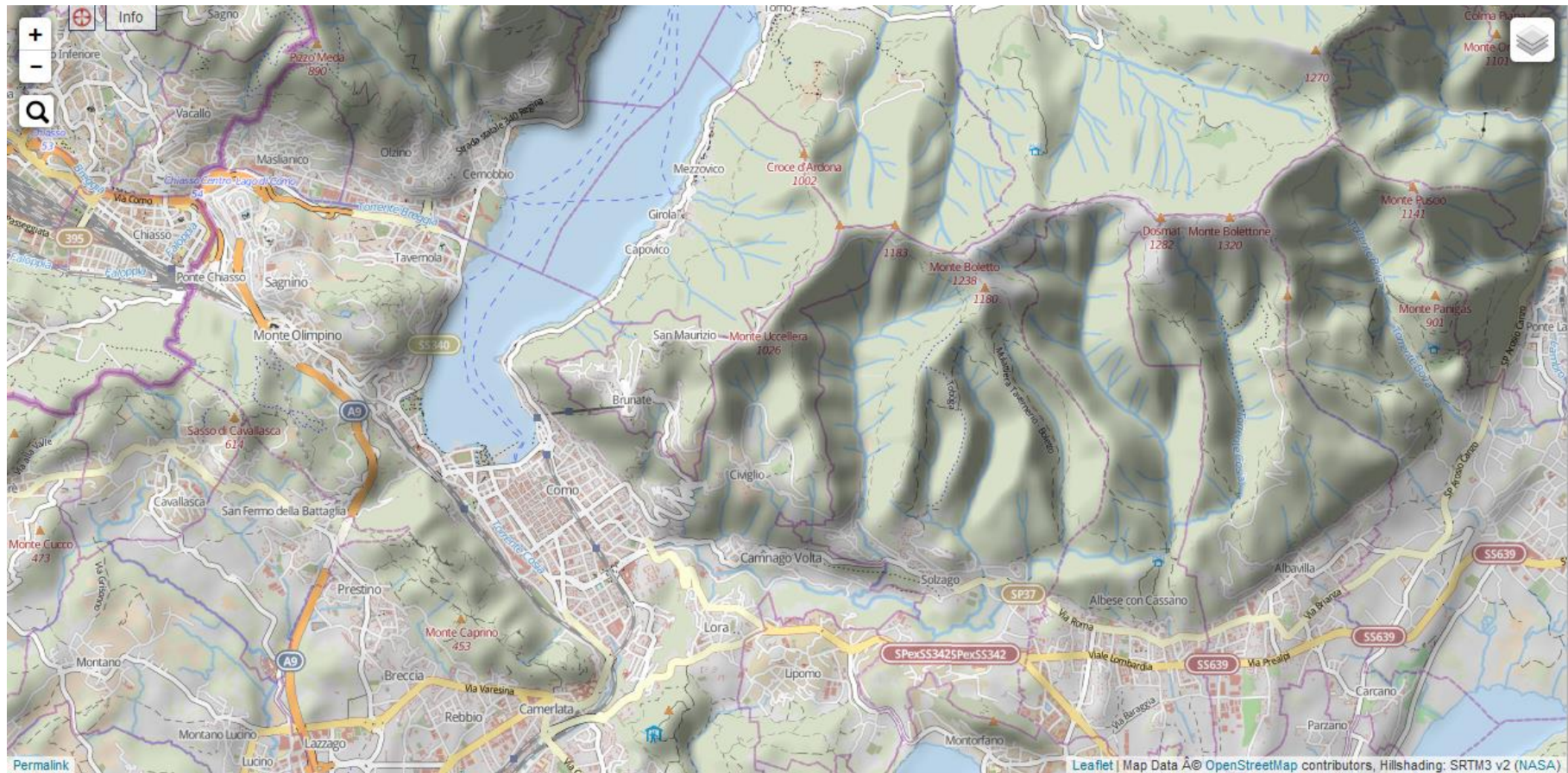


<https://www.opencyclemap.org>





- OSM vector data can be visualized with customized styles:
 - hiking/biking map visualization



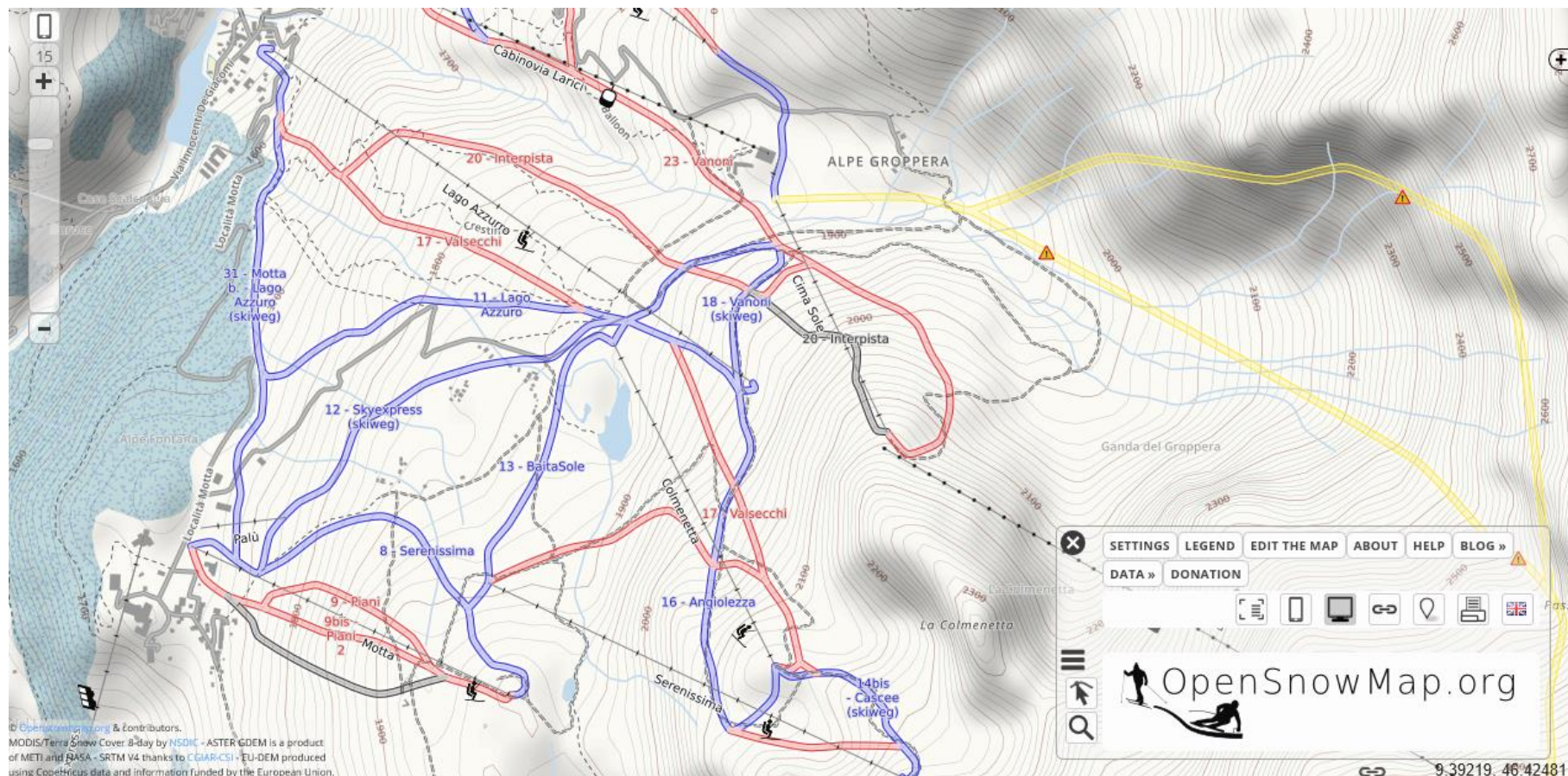
<http://hikebikemap.org>



Map visualization

11

- OSM vector data can be visualized with customized styles:
 - snow map visualization



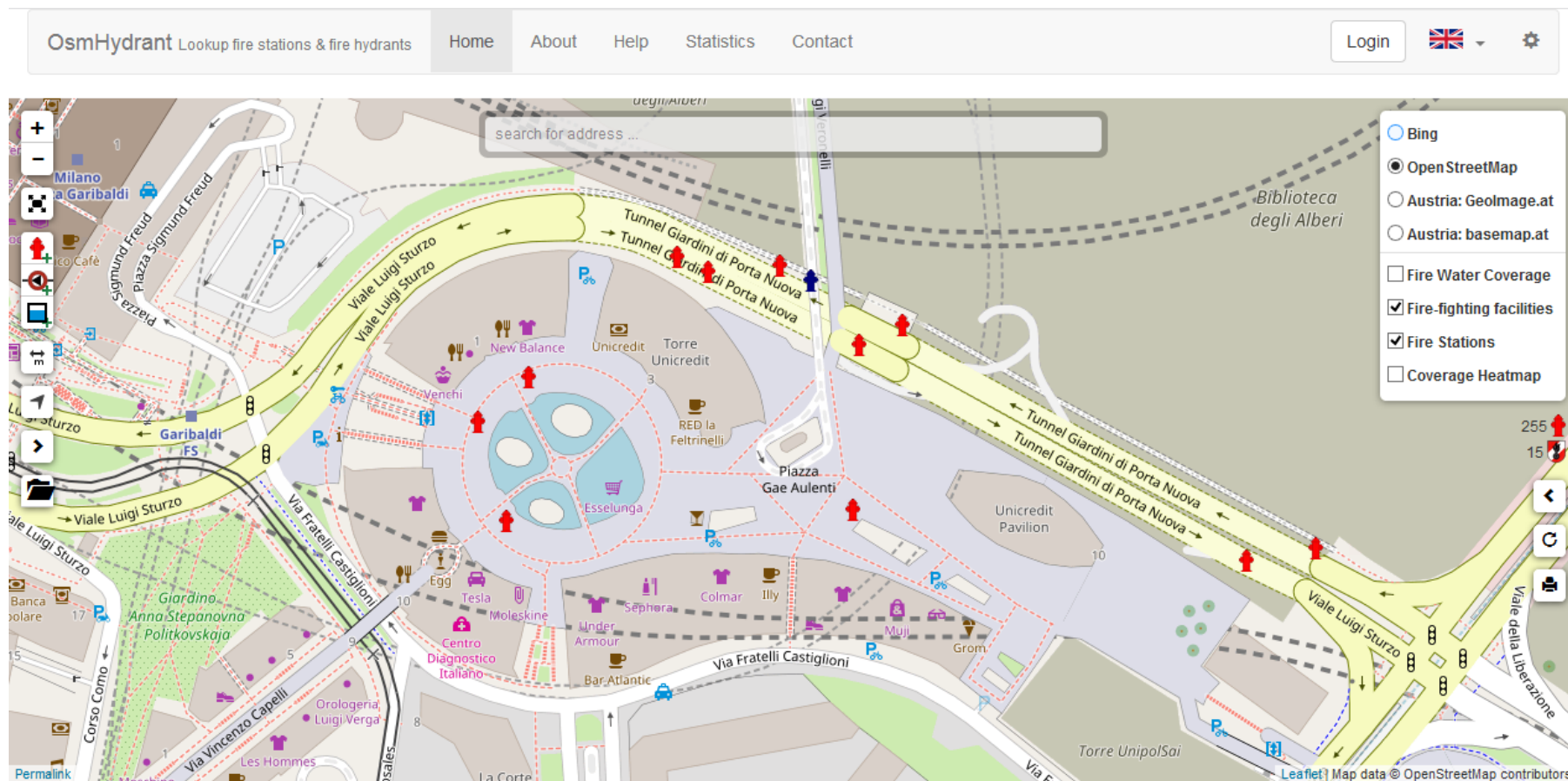
<http://www.opensnowmap.org>



Map visualization

12

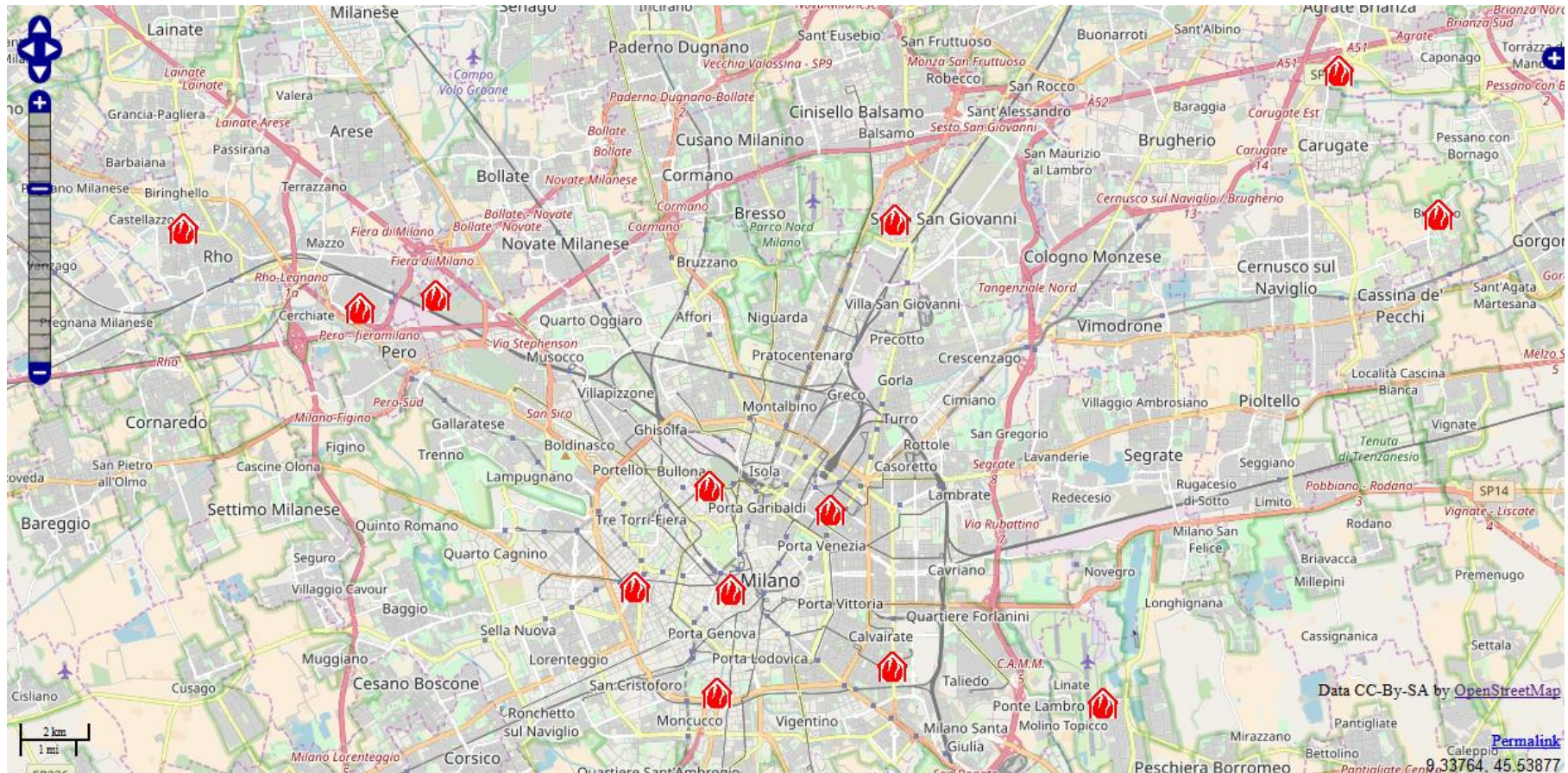
- OSM vector data can be visualized with customized styles:
 - fire fighting facilities visualization



<https://www.osmhydrant.org>



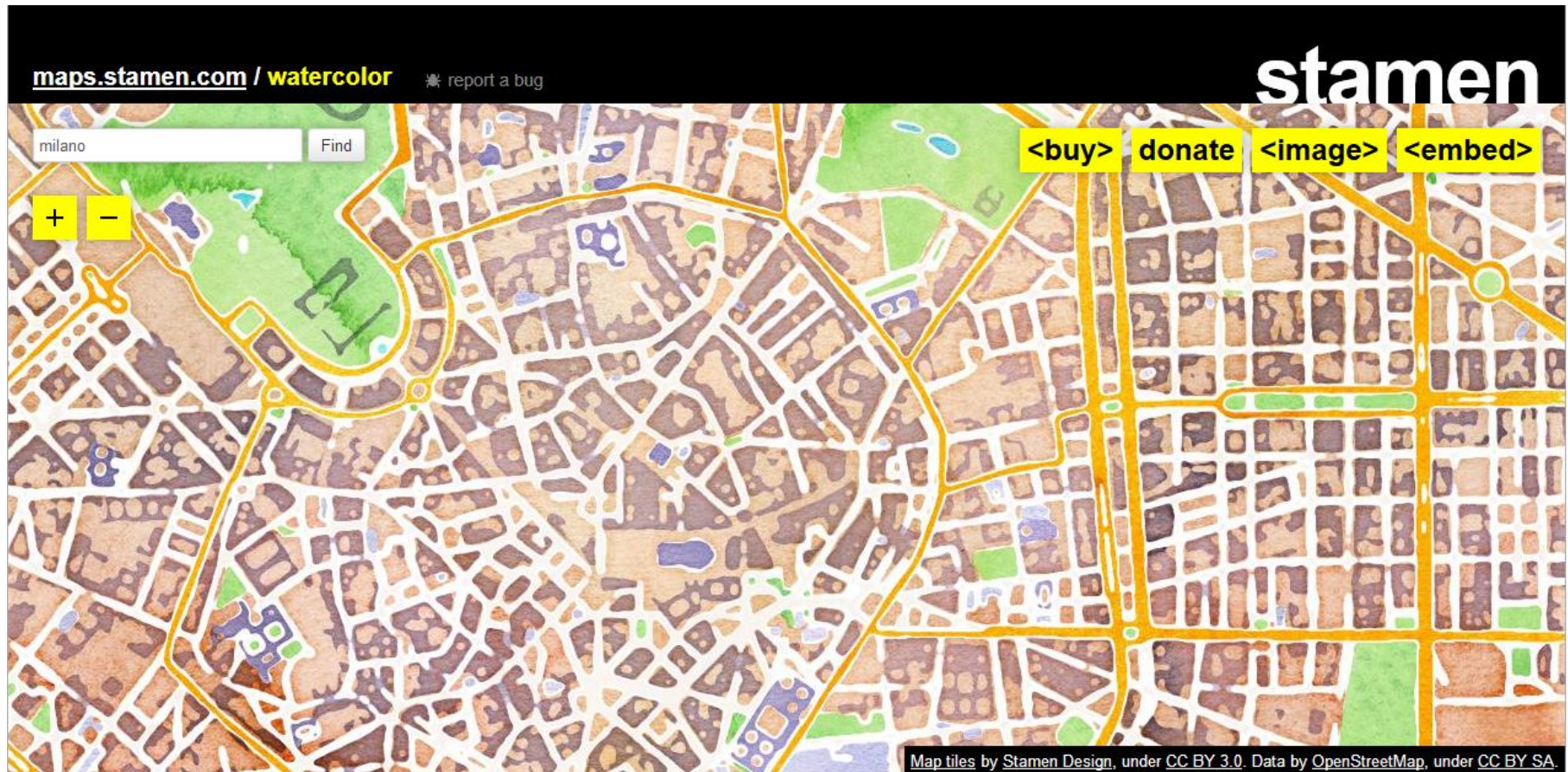
- OSM vector data can be visualized with customized styles:
 - fire stations visualization



<http://openfiremap.org>



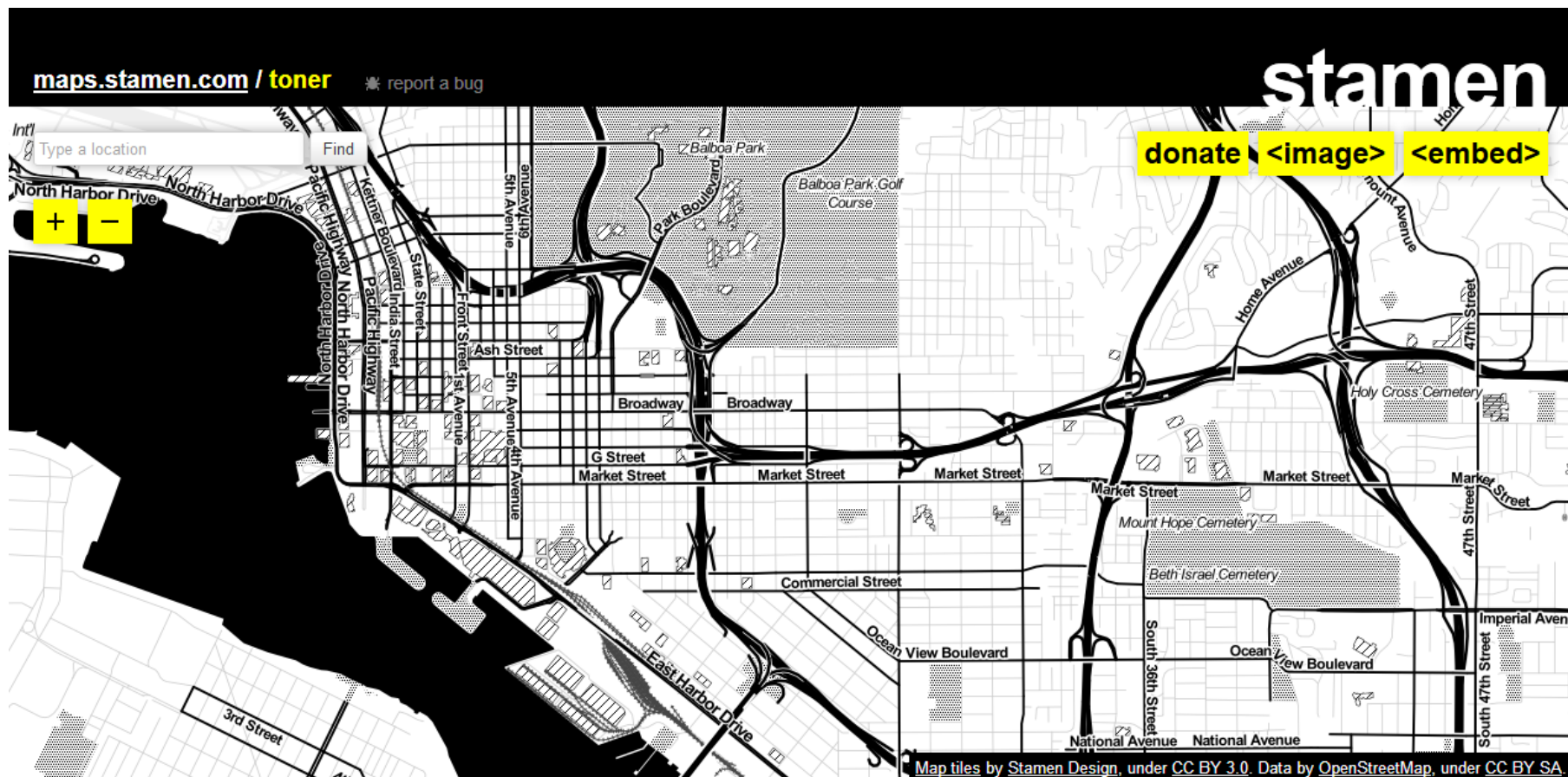
- OSM vector data can be visualized with customized styles:
 - watercolor visualization



<http://maps.stamen.com/watercolor>



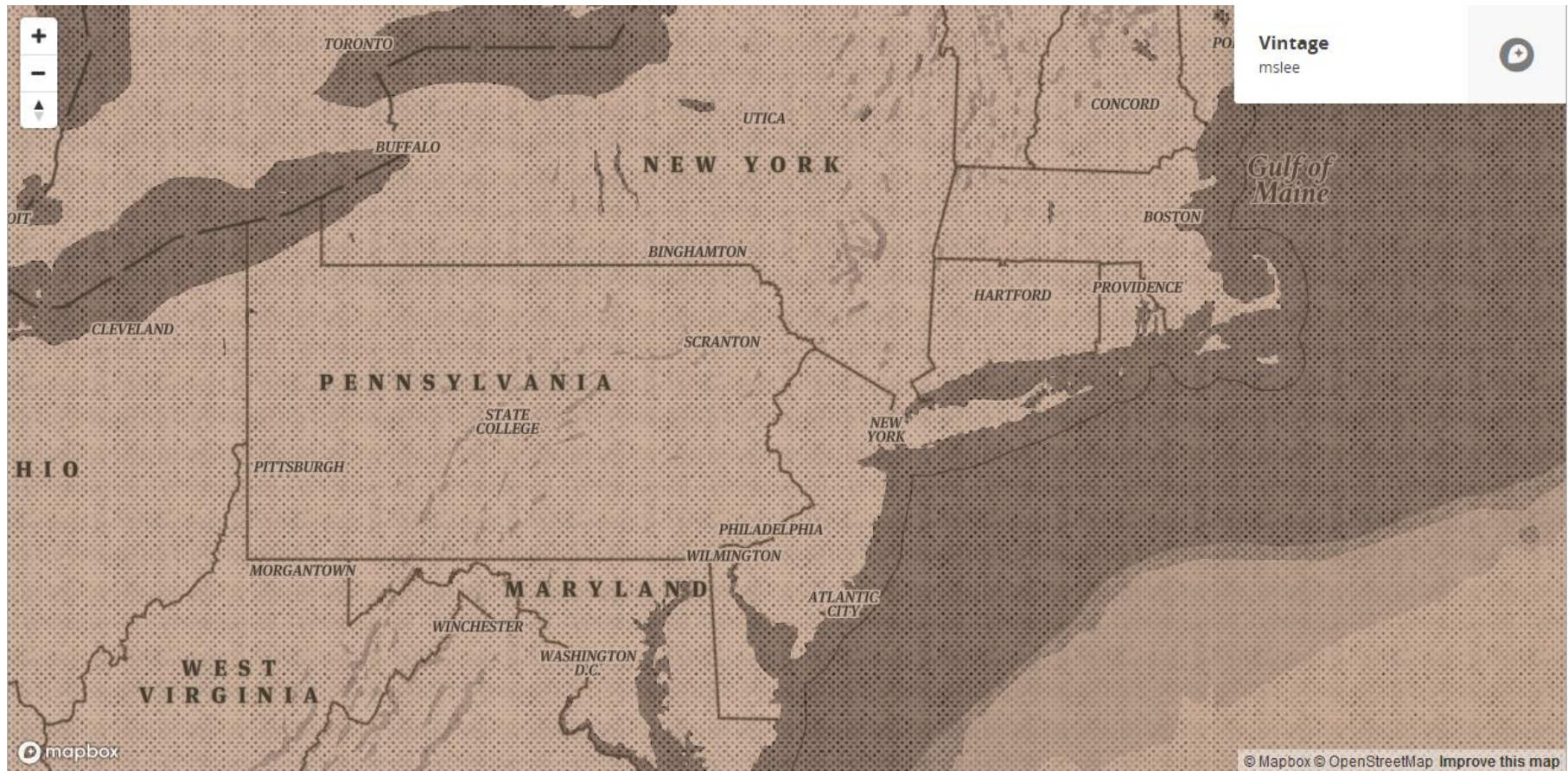
- OSM vector data can be visualized with customized styles:
 - toner visualization



<http://maps.stamen.com/toner>



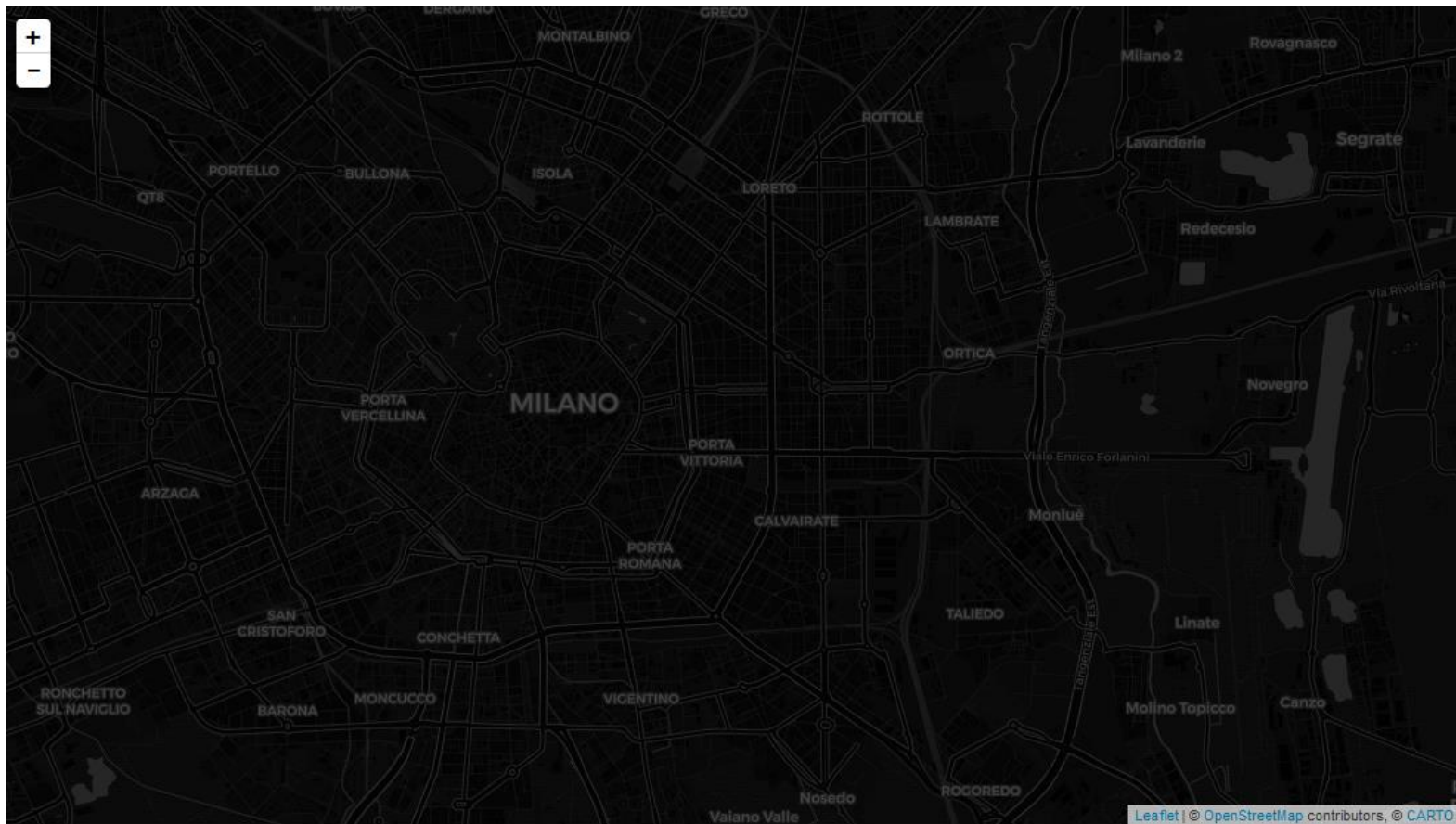
- OSM vector data can be visualized with customized styles:
 - vintage visualization



<https://tinyurl.com/yasqcqp4>



- OSM vector data can be visualized with customized styles:
 - dark visualization



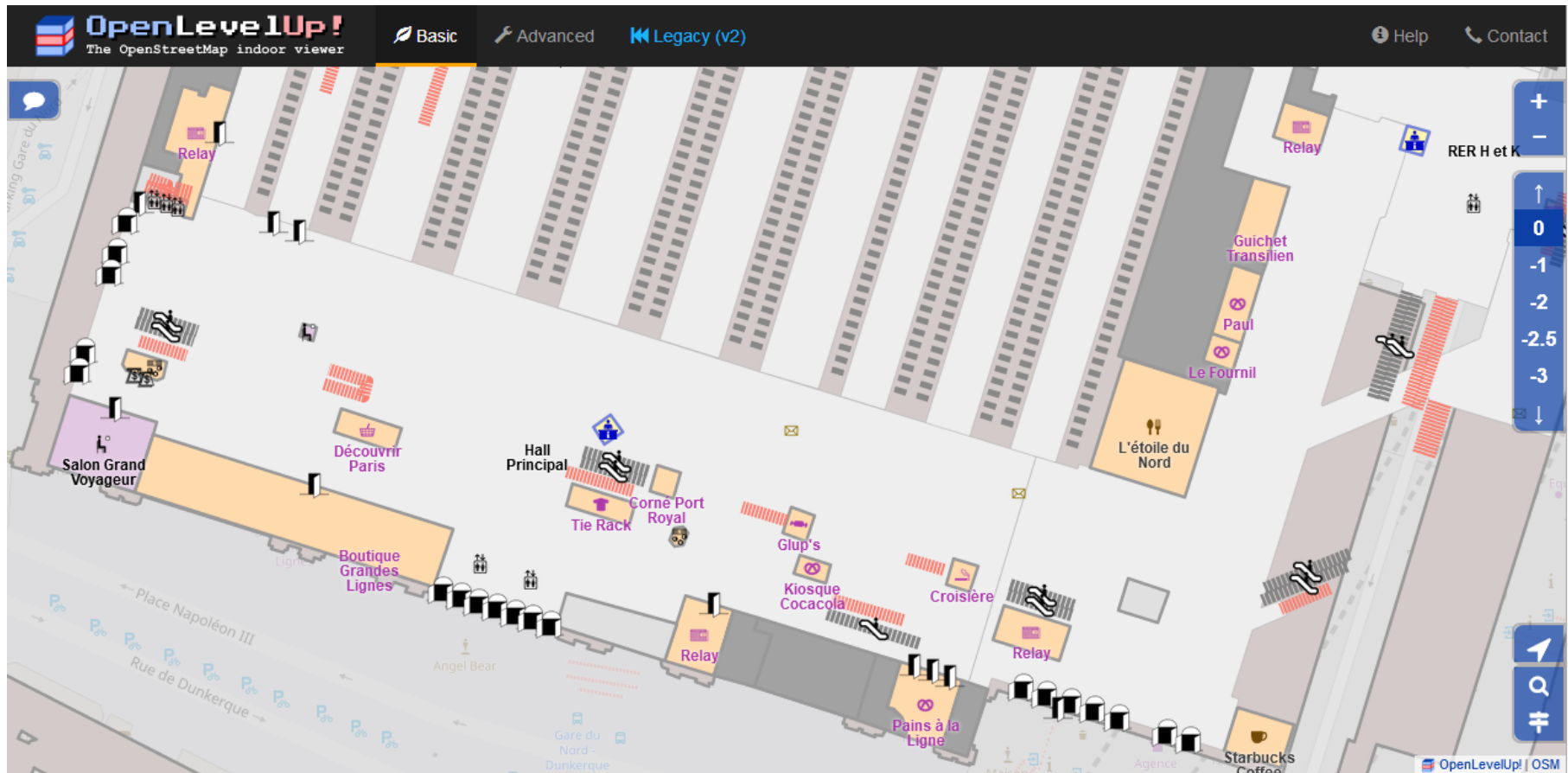
<https://carto.com/location-data-services/basemaps>



Map visualization

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- OSM vector data can be visualized with customized styles:
 - indoor level-based visualization

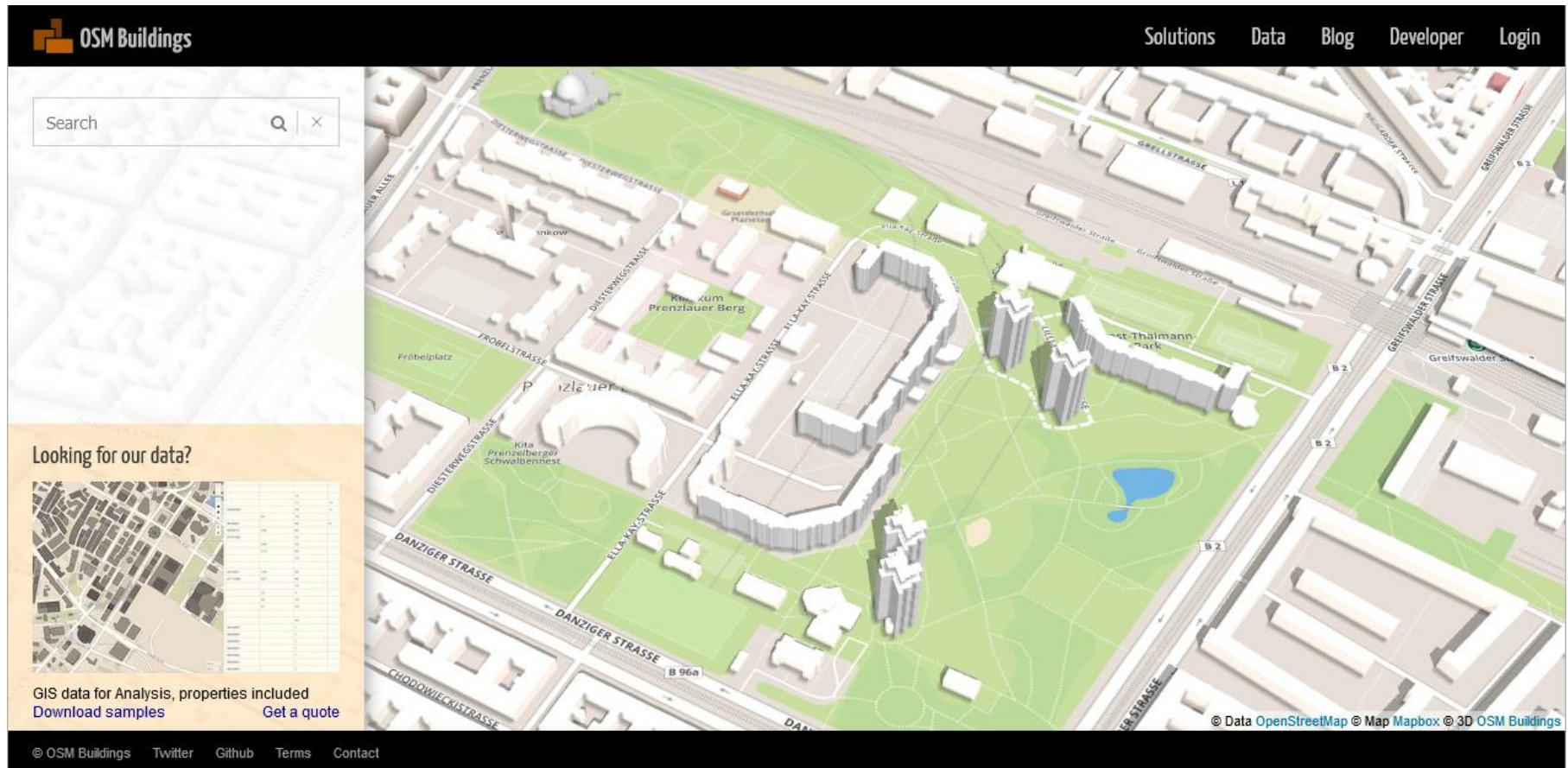


<https://openlevelup.net>





- OSM vector data can be visualized with customized styles:
 - 3D building visualization



<https://osmbuildings.org>



- OSM vector data can be visualized with customized styles:
 - 3D building visualization



<http://osm.eoapps.eu/application>



- OSM vector data can be visualized with customized styles:
 - 3D building visualization



<http://demo.f4map.com>

Software – Editors



- There are three main ways to contribute data to OSM:
 - **Outdoor mapping**: it implies to know the area to be mapped through a personal field survey; data is uploaded using specific software.
 - **Armchair mapping**: it consists in digitizing objects (buildings, roads, etc.) in remote areas without a personal field survey. Information is typically derived from openly-licensed aerial/satellite imagery and is uploaded using specific software.
 - **Bulk import**: it consists in the direct upload of datasets available under an open license compatible with ODbL. Bulk import is a delicate operation, which must be discussed and authorized by the OSM community and is reserved for expert users.
- Regardless of the way chosen to map, data upload in OSM requires to use an **editor**.

https://wiki.openstreetmap.org/wiki/Mapping_techniques

<http://wiki.openstreetmap.org/wiki/Import/Catalogue>

<http://wiki.openstreetmap.org/wiki/Editors>



How to add/edit OpenStreetMap data?

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- OSM editors include:
 - **iD editor**: web-based editor, suitable for beginners

The screenshot shows the OpenStreetMap iD editor interface. On the left, the 'Modifica elemento' (Edit element) panel is open, showing the details for a park named 'Parco di Villa Olmo'. The panel includes a 'Nome' (Name) field with the value 'Parco di Villa Olmo', an 'Aggiungi campo' (Add field) dropdown, and a table of tags (4) with values: 'access' (public), 'leisure' (park), 'name' (Parco di Villa Olmo), and 'opening_hours' (Mo-Su 07:00-23:00). The main map area shows an aerial view of the park with various features like paths, buildings, and water. The top navigation bar includes links for 'Tracciati GPS', 'Diari degli utenti', 'Copyright', 'Aiuto', and 'Informazioni'. The bottom status bar shows the map scale (50 metri) and the number of modifications (Modifiche di Darklash, Taurus77, mingo23, e 28 altri).

OpenStreetMap

Modifica Cronologia Esporta

Tracciati GPS Diari degli utenti Copyright Aiuto Informazioni mingo23

Modifica elemento

Parco

Tutti i campi

Nome

Parco di Villa Olmo

Aggiungi campo: Indirizzo, Descrizione, Altitudine...

Tutti i tag (4)

access	public		i
leisure	park		i
name	Parco di Villa Olmo		i
opening_hours	Mo-Su 07:00-23:00		i

Vedi su openstreetmap.org

50 metri

Modifiche di Darklash, Taurus77, mingo23, e 28 altri

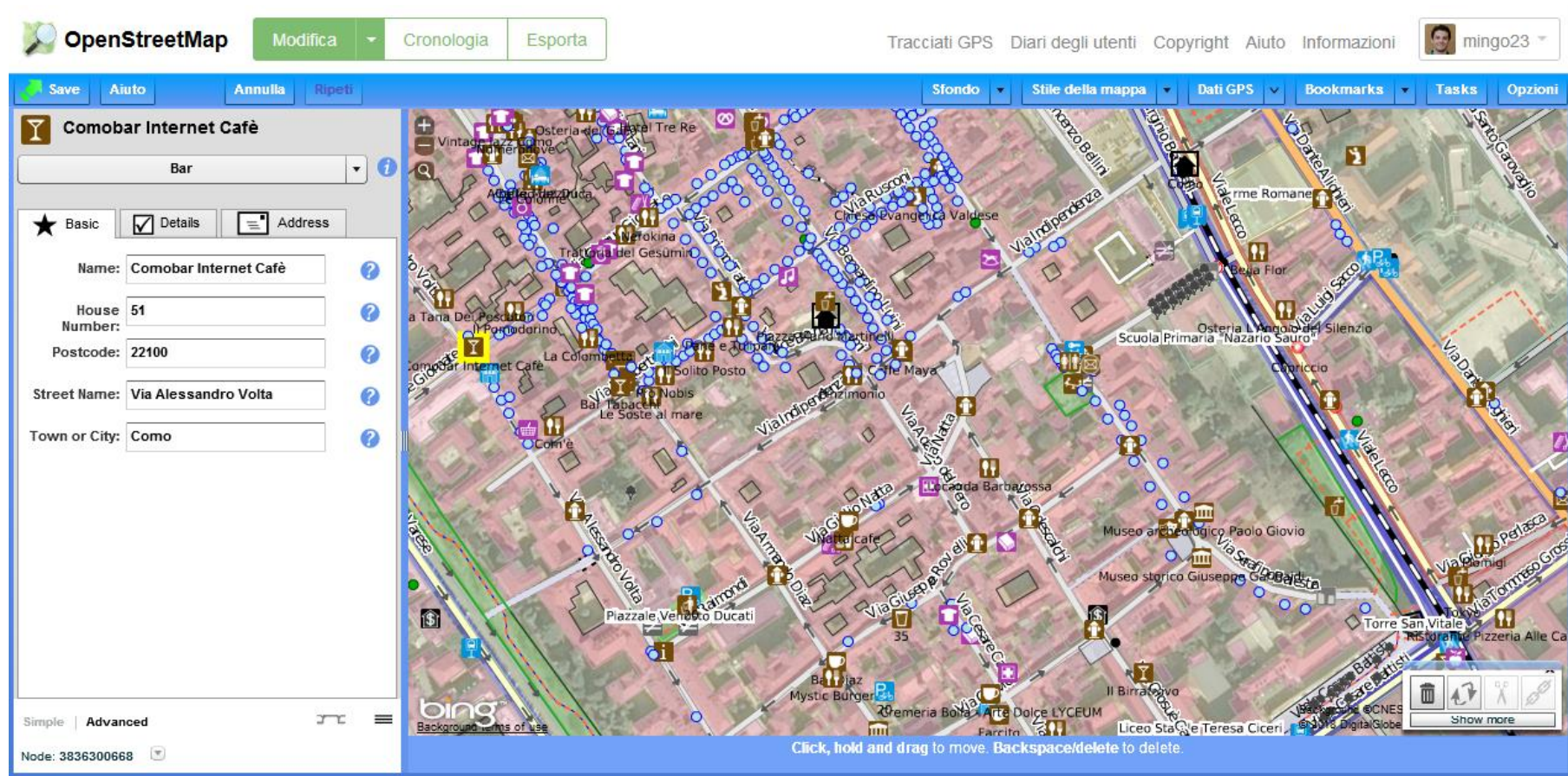
<https://wiki.openstreetmap.org/wiki/iD>



How to add/edit OpenStreetMap data?

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- OSM editors include:
 - Potlatch 2: web-based editor, suitable for more advanced users



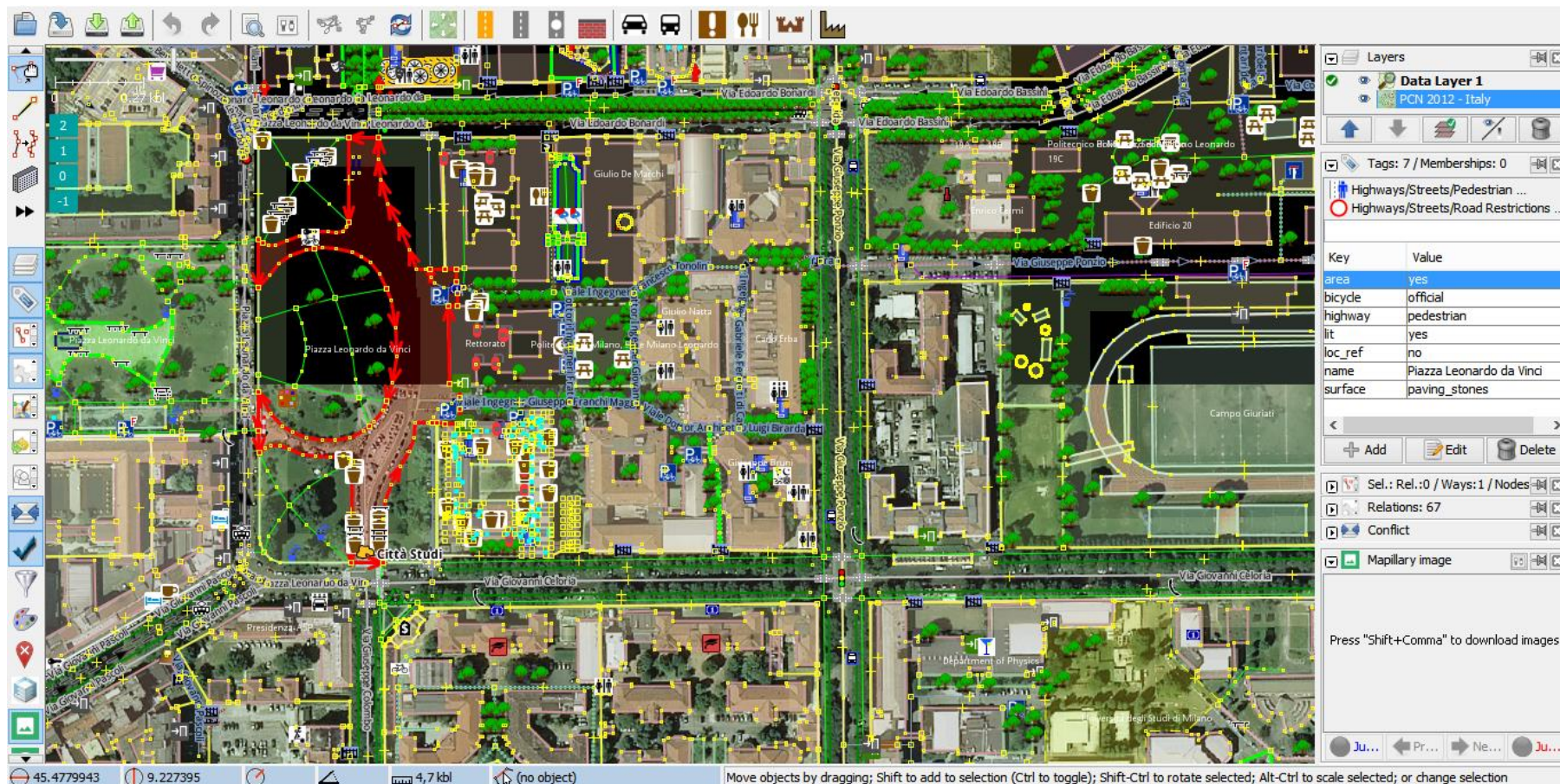
https://wiki.openstreetmap.org/wiki/Potlatch_2



How to add/edit OpenStreetMap data?

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- OSM editors include:
 - **JOSM**: Java-based desktop editor, suitable for advanced users



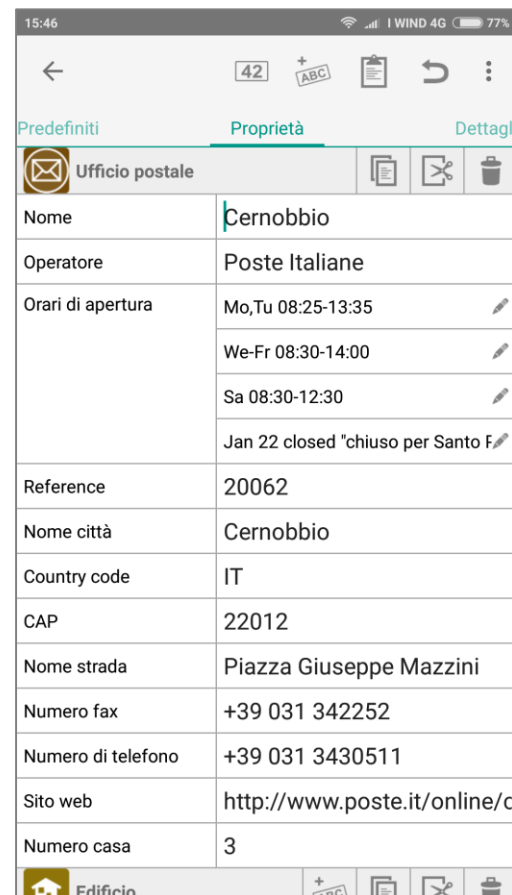
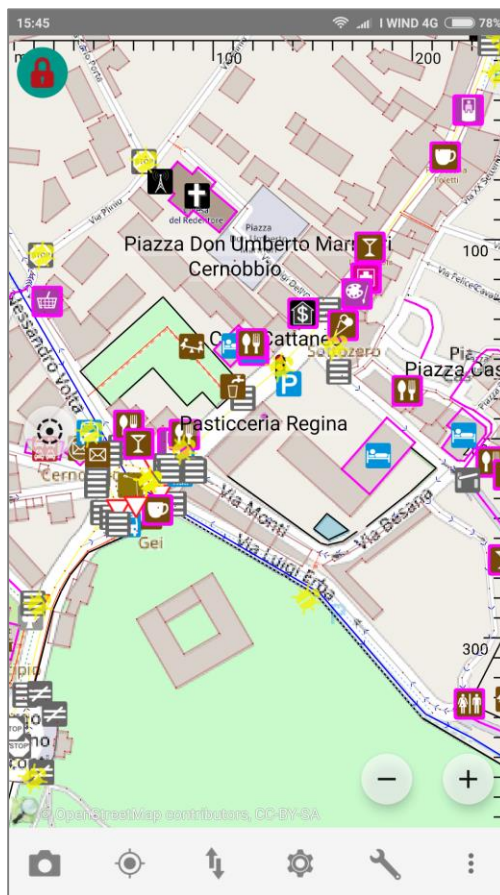
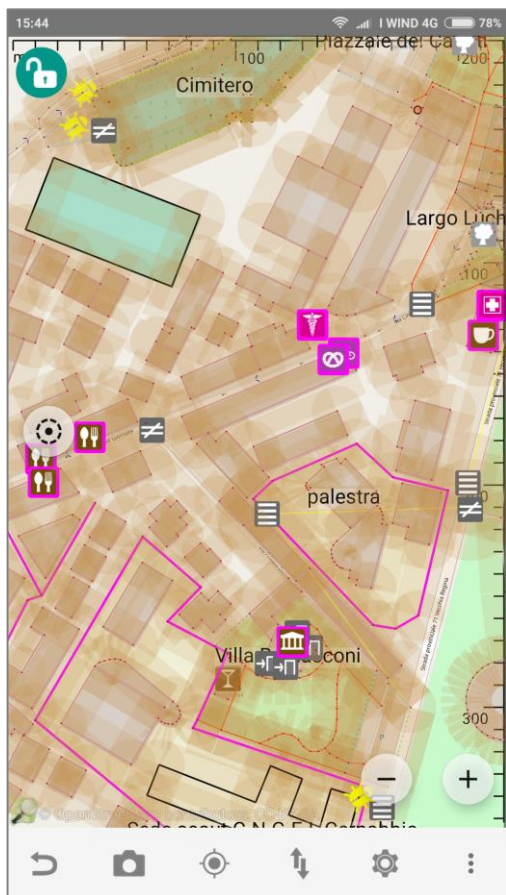
<https://josm.openstreetmap.de>



How to add/edit OpenStreetMap data?

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- OSM editors include:
 - Vespucci: Android app to download, edit & upload OSM data



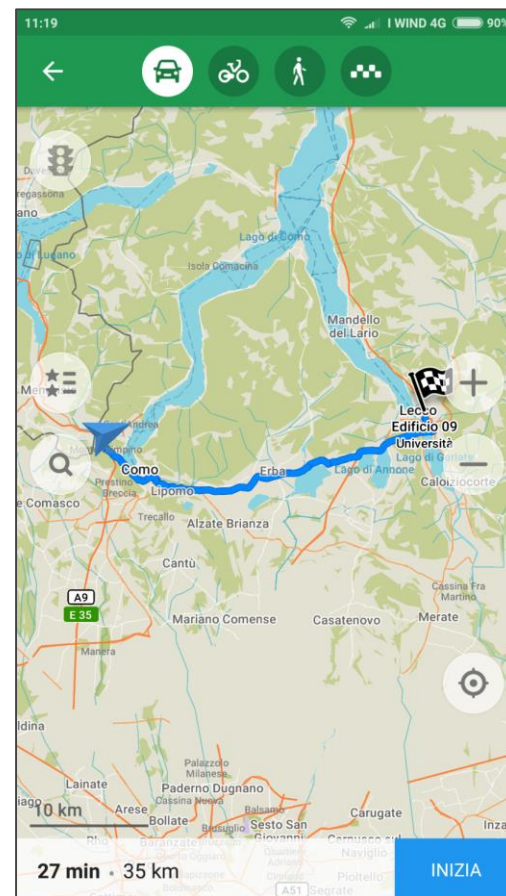
<https://wiki.openstreetmap.org/wiki/Vespucci>



How to add/edit OpenStreetMap data?

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- OSM editors include:
 - **MAPS.ME**: Android/iOS app to add OSM nodes and navigate



<https://wiki.openstreetmap.org/wiki/MAPS.ME>



How to add/edit OpenStreetMap data?

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- OSM editors include:
 - StreetComplete: Android app to add street-related tags



<https://wiki.openstreetmap.org/wiki/StreetComplete/Quests>



How to add/edit OpenStreetMap data?

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- There are many useful tools to support OSM mapping:
 - GPS receivers: crucial to add map data not visible from imagery

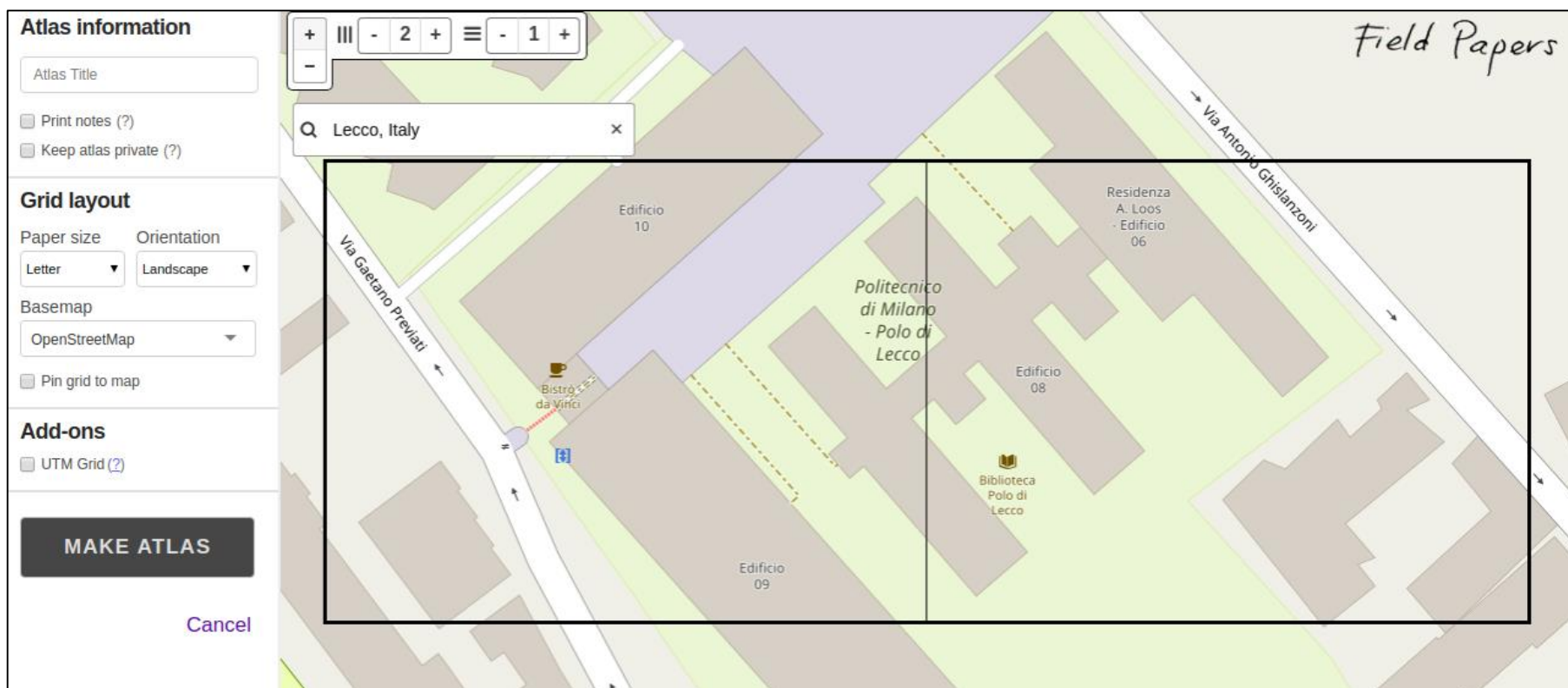
The screenshot shows the OpenStreetMap web interface. At the top, there's a search bar with the text "Cerca" and a "Vai" button. Below the search bar, the map displays a forested area with various trails and landmarks. The map is overlaid with several colored lines representing different types of trails or boundaries. On the right side, there's a sidebar with a "Livelli mappa" (Map layers) section. It includes a "Standard" map style, a "Mappa ciclabile" (Bicycle map), a "Mappa dei trasporti" (Transport map), and an "Umanitario" (Humanitarian) map. Below the map layers, there's a section for "Abilita sovrapposizioni per la risoluzione dei problemi della mappa" (Enable overlays for map problem resolution), which includes checkboxes for "Note sulla mappa" (Map notes), "Dati della mappa" (Map data), and "Tracciati GPS pubblici" (Public GPS tracks). The bottom of the map shows a scale bar (50 m, 200 ft) and a copyright notice: "© OpenStreetMap contributors".



How to add/edit OpenStreetMap data?

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- There are many useful tools to support OSM mapping:
 - **Field Papers:** a service to generate & print the OSM map of any area to be used to take notes during field survey



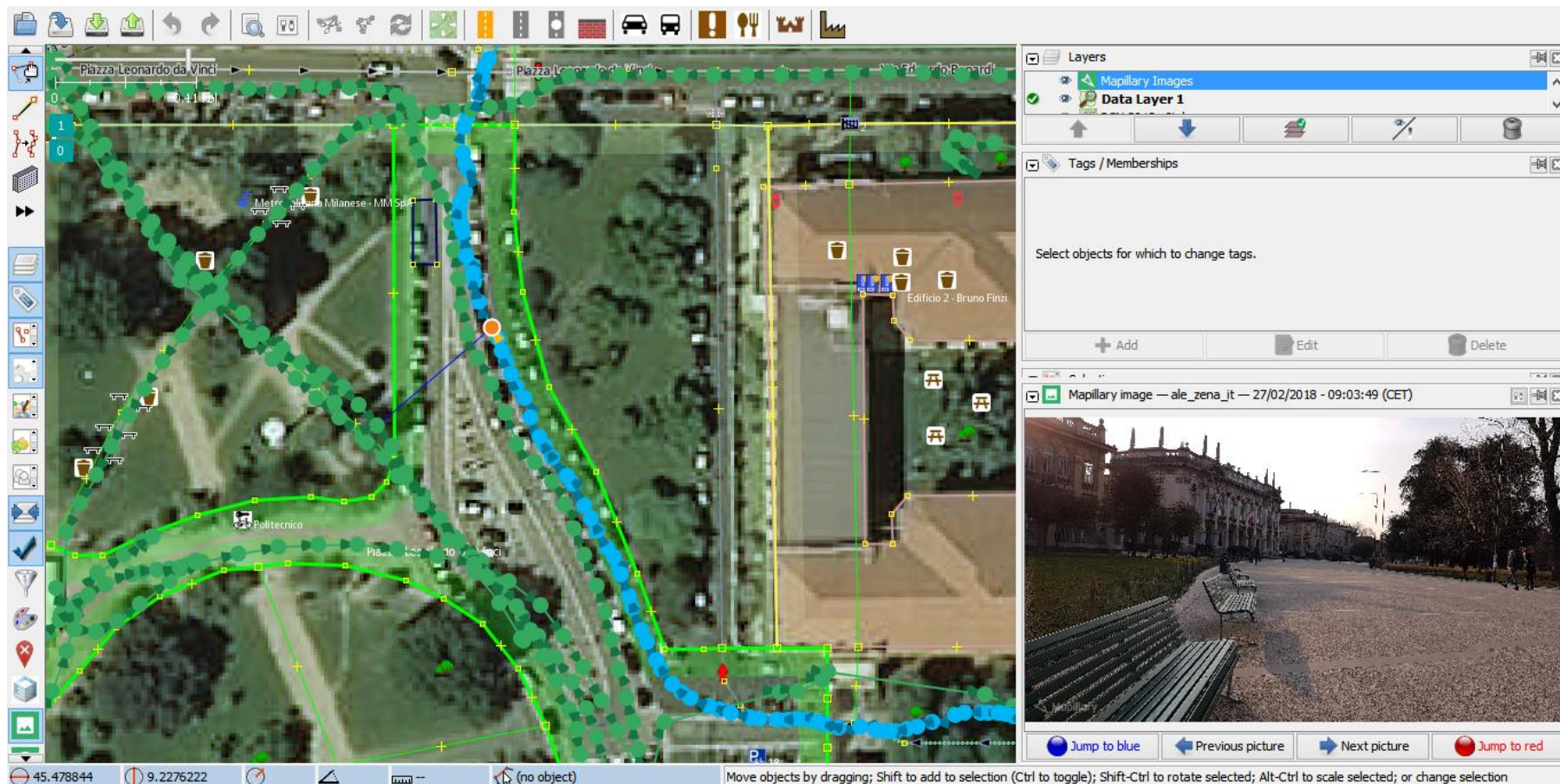
<http://fieldpapers.org>



How to add/edit OpenStreetMap data?

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- There are many useful tools to support OSM mapping:
 - **Mapillary**: an open collection of street-level imagery



<https://www.mapillary.com>

Software – Routing



How to compute routes using OSM roads?³⁴

- There are many OSM-based routing services:
 - Open Source Routing Machine (OSRM): OSM C++ routing library

86, Via Bellinzona, Folcino Superiore, Monte Olimpino

Comunità Montana Triangolo Lariano, Via Partigiana,

18.8 km, 36 min

Via Nino Bixio, Via Partigiana

- Head southwest 20 m
- Turn left onto Via Bellinzona 15 m
- Enter the roundabout and take the 1st exit onto Via Luigi Camozzi 10 m
- Turn right onto Via Luigi Camozzi 150 m
- Enter the roundabout and take the 2nd exit onto Via Nino Bixio 30 m
- Make a slight right onto Via Nino Bixio 1.5 km
- Turn right onto Via Borgovico 450 m
- Make a slight right onto Viale Innocenzo XI 800 m

Mapbox Streets
Mapbox Outdoors
Mapbox Streets Satellite
openstreetmap.org
openstreetmap.de.org

Small Components

English

1 km
3000 ft

SP36

SP639

Golf Villa D'Este

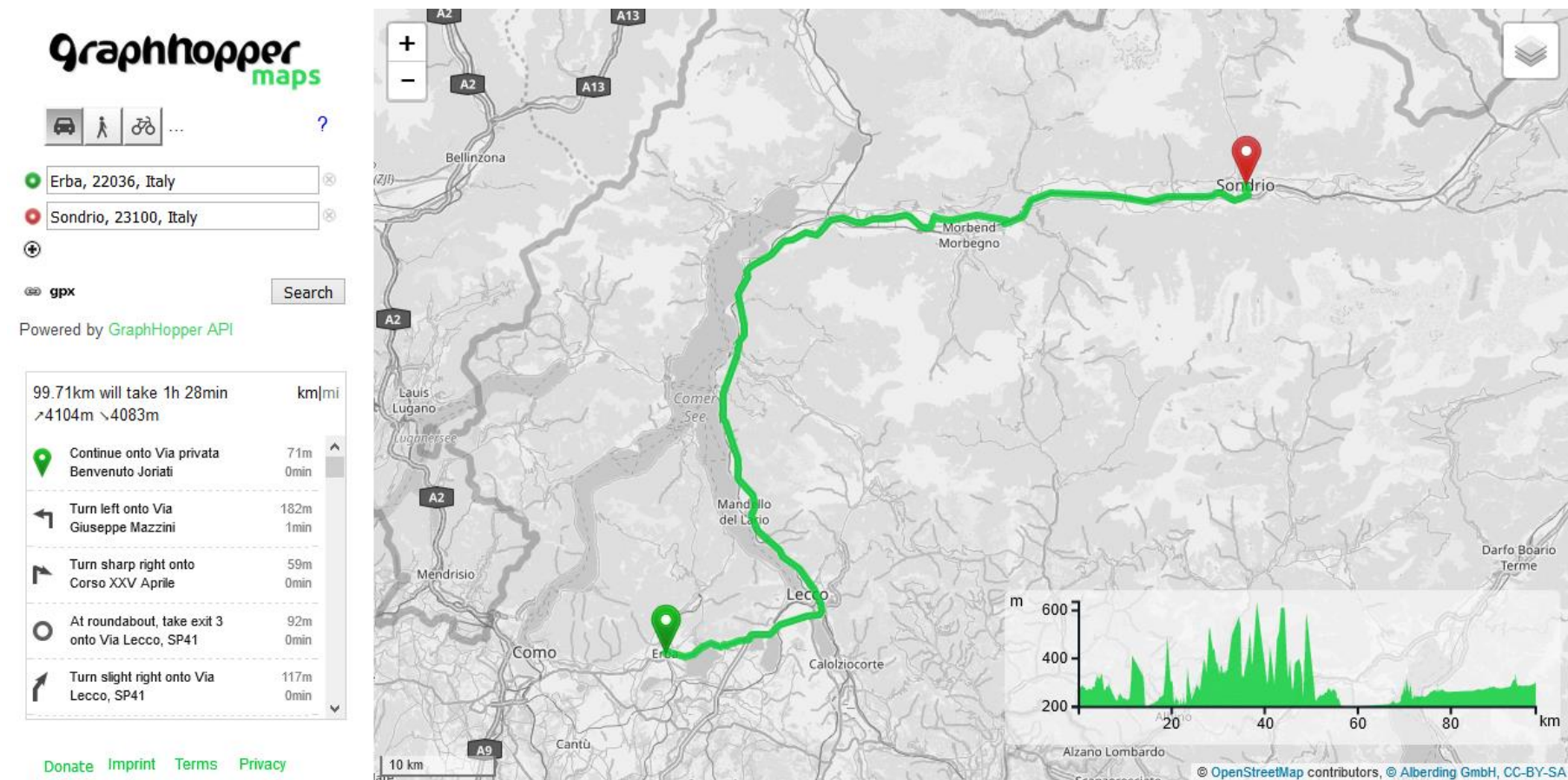
Leaflet | © Mapbox © OpenStreetMap | Improve this map

<http://project-osrm.org>



How to compute routes using OSM roads? ³⁵

- There are many OSM-based routing services:
 - **GraphHopper**: OSM-based API for route planning/optimization

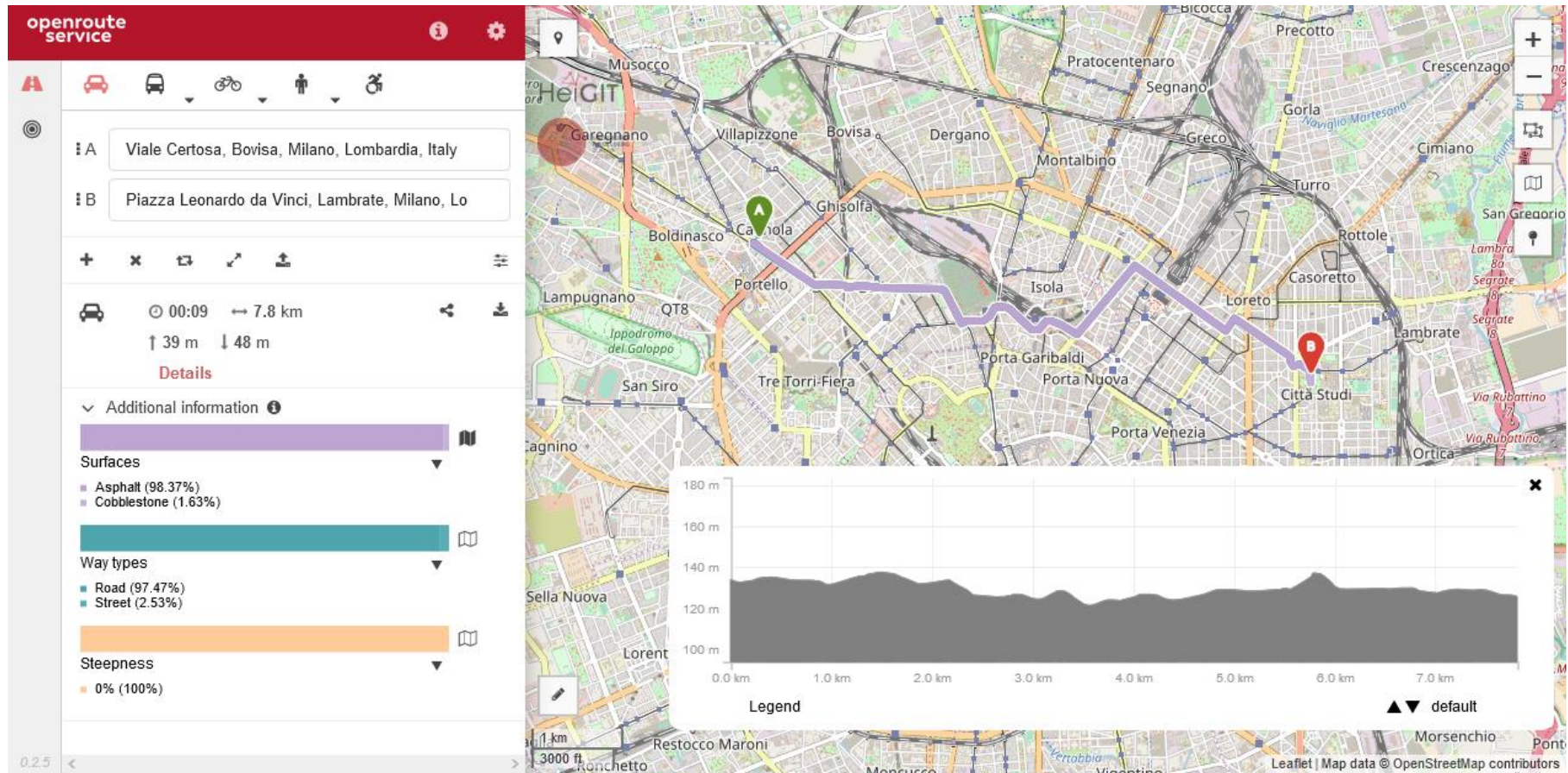


<https://www.graphhopper.com>



How to compute routes using OSM roads?³⁶

- There are many OSM-based routing services:
 - OpenRouteService: variety and richness of routing settings/outputs

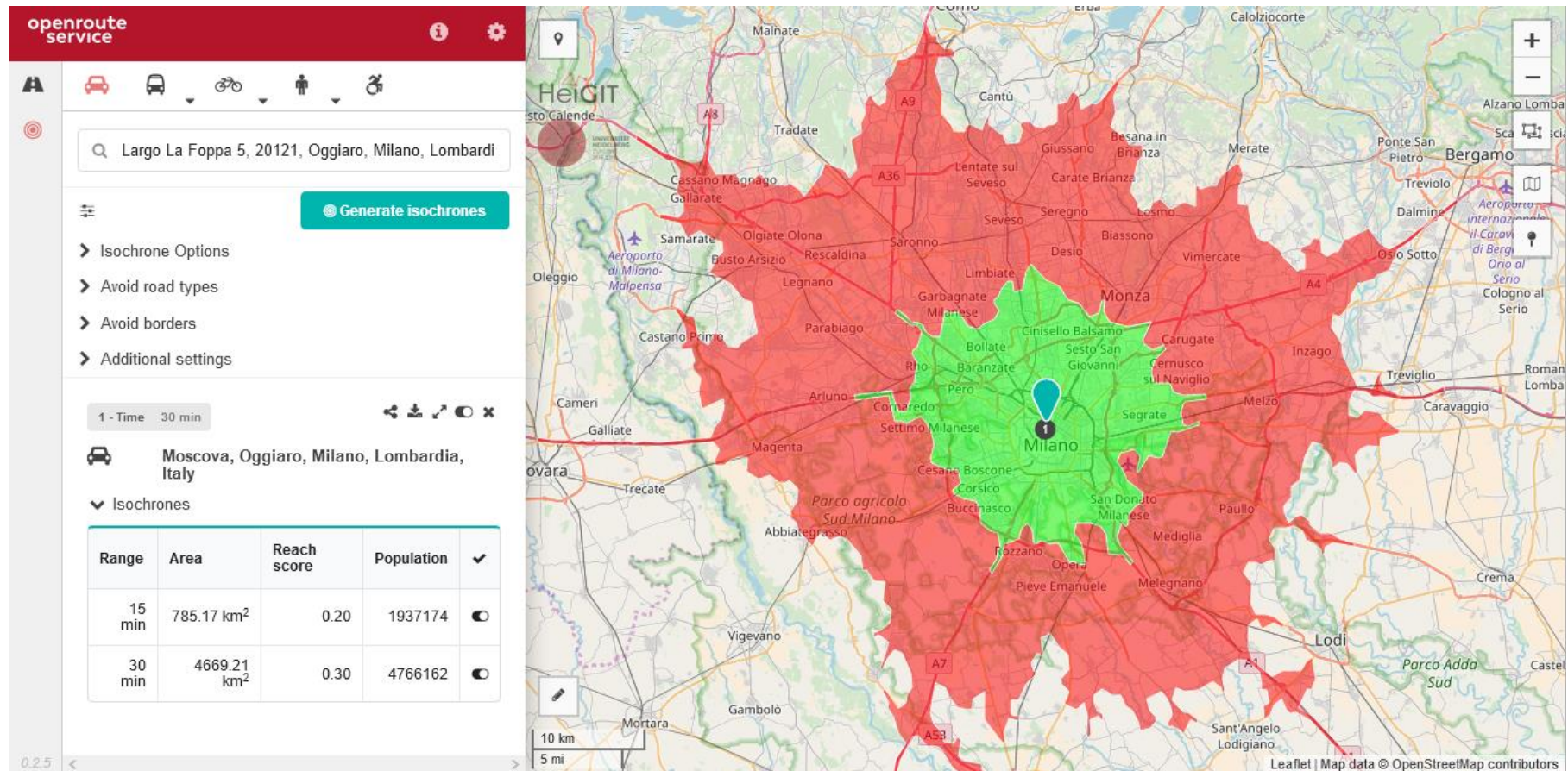


<https://maps.openrouteservice.org>



How to compute routes using OSM roads?³⁷

- There are many OSM-based routing services:
 - OpenRouteService: variety and richness of routing settings/outputs



<https://maps.openrouteservice.org>



How to compute routes using OSM roads?³⁸

- There are many OSM-based routing services:
 - **Kurviger**: routing service for motorcyclists

Kurviger.de

Route Planning

Round Trips

Valmadrera, 23868, Lo

Albino, Lombardy, Italy

Search

Import

Export

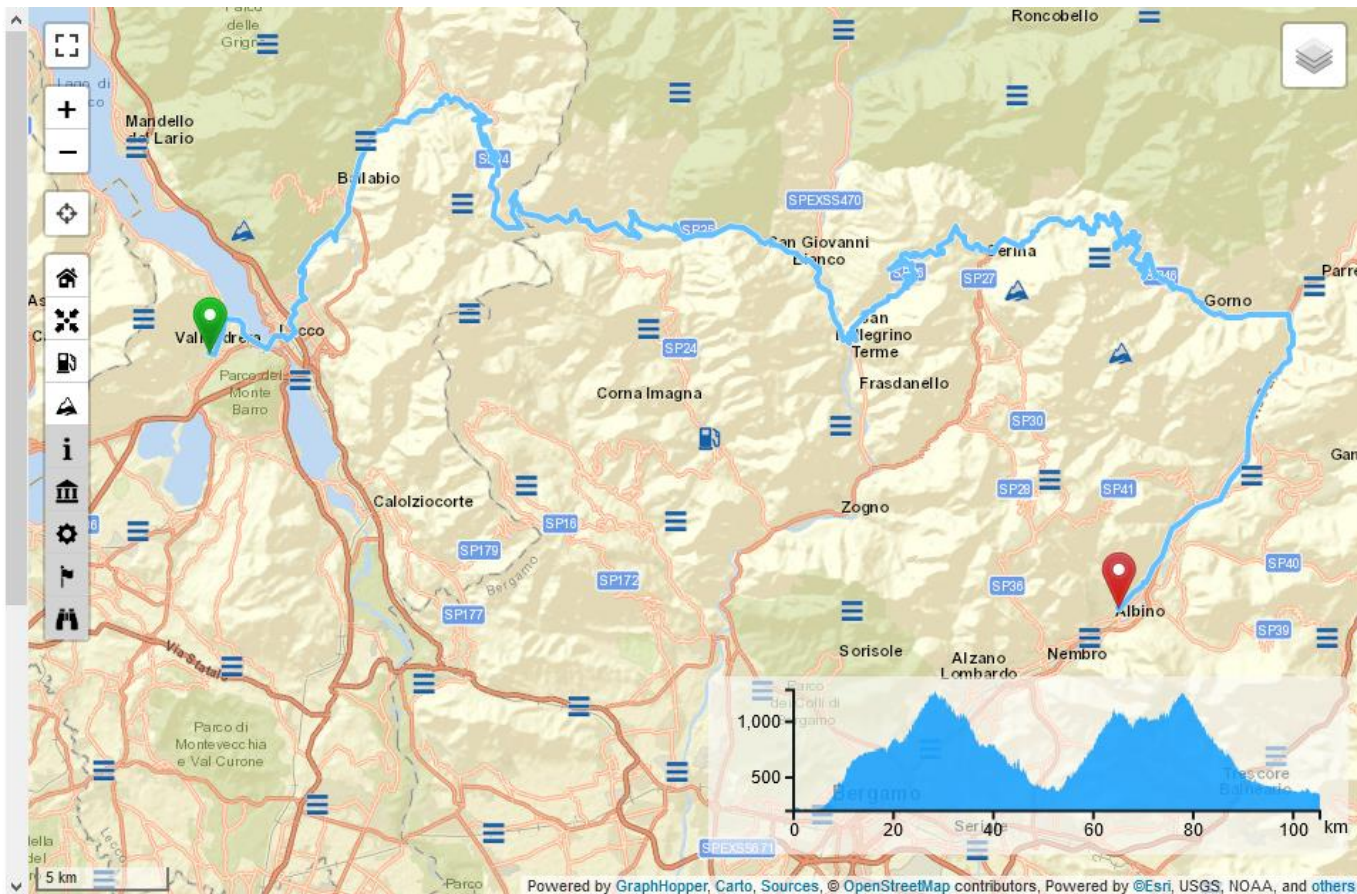
Tourcode

Turn instructions

Advanced Options

Distance: 112km
Estimated duration: 1h 57min
Altitude: ~9361m ~9252m

Deutsch Français
Español Nederlands

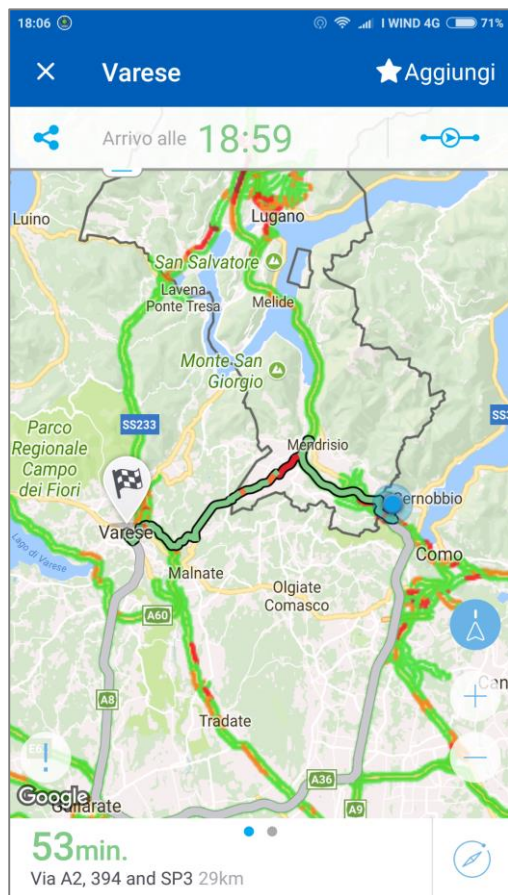


<https://kurviger.de/en>



How to compute routes using OSM roads?³⁹

- There are many OSM-based routing services:
 - **INRIX Traffic**: Android/iOS app for routing, learns user's driving habit

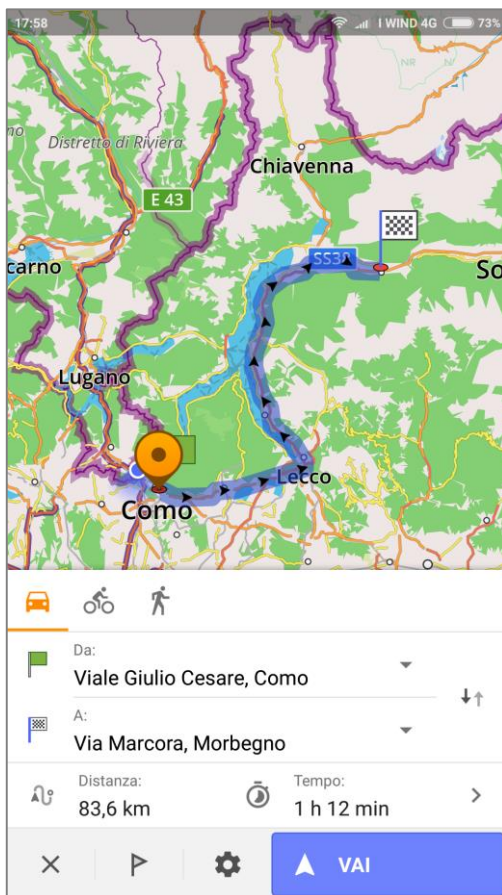


<http://inrix.com/mobile-apps>



How to compute routes using OSM roads?⁴⁰

- There are many OSM-based routing services:
 - OsmAnd: Android app for offline maps & routing/navigation



<http://osmand.net>

Data download

How to download OSM data?

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- OSM data can be downloaded in many ways:
 - **OSM website**: download based on a selected area on the map

The screenshot displays the OpenStreetMap website interface. On the left, the 'Esporta' (Export) panel is visible, showing a search bar with 'Cerca', a 'Vai' button, and a map selection area with coordinates: 45.81318, 9.07955, 9.08337, and 45.81146. Below this, there is a 'Licenza' (License) section stating that data is released under the 'Open Data Commons Open Database (ODbL)' license, with an 'Esporta' button. Further down, there are links for 'Overpass API' and 'Pianeta OSM'. The main map area shows a detailed view of a city street grid, including landmarks like 'Piazza Cavour', 'Piazza Volta', and 'Piazza Duomo'. The map includes various icons for points of interest, buildings, and roads. The bottom of the map shows a scale bar (30m, 100ft) and a copyright notice for 'OpenStreetMap contributors'.

<https://www.openstreetmap.org>

- OSM data can be downloaded in many ways:
 - Planet OSM: the complete OSM database (including history)



Planet OSM

The files found here are regularly-updated, complete copies of the OpenStreetMap.org database, and those published before the 12 September 2012 are distributed under a Creative Commons Attribution-ShareAlike 2.0 license, those published after are Open Data Commons Open Database License 1.0 licensed. For more information,

[see the project wiki.](#)

Complete OSM Data

[Latest Weekly Planet XML File](#)

67 GB, created 4 days ago.

md5: d400366fce481fe8f382a91e8a258371.

[Latest Weekly Changesets](#)

2.2 GB, created 4 days ago.

md5: ec71103454974c6b37b936f6ab0c191e.

[Latest Weekly Planet PBF File](#)

40 GB, created 4 days ago.

md5: 8462bc48226db9eb06982dad630e426e.

<https://planet.openstreetmap.org>



Planet OSM

The files found here are complete copies of the OpenStreetMap.org database, including editing history. These are published under an Open Data Commons Open Database License 1.0 licensed. For more information, [see the project wiki.](#)

Complete OSM Data History

[Latest Full History Planet XML File](#)

102 GB, created 4 days ago.

md5: 8c6858682fe1fc54e348cad60dff9073.

[Latest Full History Planet PBF File](#)

66 GB, created 4 days ago.

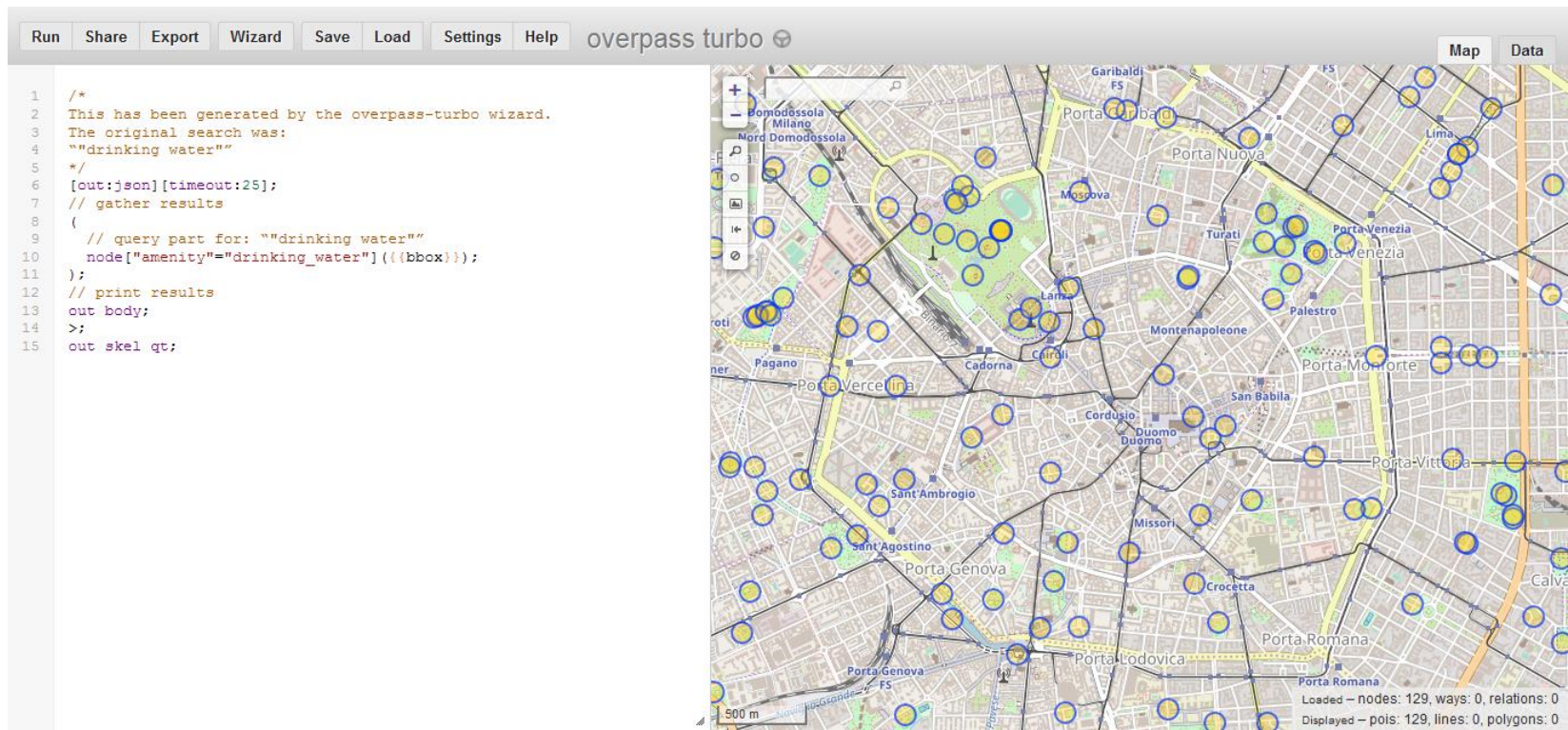
md5: 10b5ae5c89c9938e844c1f03d58c4d3e.

<https://planet.openstreetmap.org/planet/full-history>

How to download OSM data?

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- OSM data can be downloaded in many ways:
 - **OSM API**: read/write access to the OSM database
 - **Overpass API**: read-only API – a powerful frontend is **Overpass Turbo**



<https://wiki.openstreetmap.org/wiki/API>

https://wiki.openstreetmap.org/wiki/Overpass_API | <http://overpass-turbo.eu>

How to download OSM data?

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- Overpass Turbo is a frontend to the Overpass API:
 - example 1: extraction of the cafes in Lecco

The screenshot shows the Overpass Turbo web interface. At the top, there is a navigation bar with buttons: Run (highlighted with a red box), Share, Export, Wizard, Save, Load, Settings, and Help. The text 'overpass turbo' is displayed next to these buttons. On the right side of the navigation bar, there are two tabs: 'Map' (highlighted with a red box) and 'Data'. Below the navigation bar, on the left, is a code editor with line numbers 1 to 10. It contains the following text:

```
1 /*  
2 This is an example Overpass query.  
3 Try it out by pressing the Run button above!  
4 You can find more examples with the Load  
5 tool.  
6 */  
7 node  
8 [amenity=cafe]  
9 ({bbox});  
10 out;
```

To the right of the code editor is a map of Lecco, Italy. The map shows the city's layout, including the lake, roads, and buildings. Numerous blue circles are overlaid on the map, indicating the locations of cafes. A scale bar at the bottom left of the map indicates 300 meters. At the bottom right of the map, there is a status bar with the following information:

Loaded — nodes: 33, ways: 0, relations: 0
Displayed — pois: 33, lines: 0, polygons: 0

<http://overpass-turbo.eu>



How to download OSM data?

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- Overpass Turbo is a frontend to the Overpass API:
 - example 1: extraction of the cafes in Lecco

The screenshot shows the Overpass Turbo web interface. The top navigation bar includes buttons for 'Run', 'Share', 'Export', 'Wizard', 'Save', 'Load', 'Settings', and 'Help'. The 'Run' button is highlighted with a red box. To the right of the navigation bar is the text 'overpass turbo' and a globe icon. On the far right, there are two tabs: 'Map' and 'Data', with 'Data' highlighted by a red box.

The main area is split into two panels. The left panel contains a query editor with the following text:

```
1 /*
2 This is an example Overpass query.
3 Try it out by pressing the Run button above!
4 You can find more examples with the Load
5 tool.
6 */
7 node
8   [amenity=cafe]
9   {{{bbox}}};
10 out;
```

Below the query editor, the text 'node [amenity=cafe] {{{bbox}}}; out;' is displayed in a larger font.

The right panel shows the XML result of the query, which is a list of three cafes in Lecco:

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <osm version="0.6" generator="Overpass API 0.7.55.3 9da5e7ae">
3 <note>The data included in this document is from www.openstreetmap.org. The data is made available under ODbL.</n
4 <meta osm_base="2018-06-18T15:24:02Z"/>
5
6 <node id="1832587336" lat="45.8555311" lon="9.3930378">
7   <tag k="addr:city" v="Lecco"/>
8   <tag k="addr:country" v="IT"/>
9   <tag k="addr:housenumber" v="2"/>
10  <tag k="addr:postcode" v="23900"/>
11  <tag k="addr:street" v="Piazza Armando Diaz"/>
12  <tag k="amenity" v="cafe"/>
13  <tag k="name" v="Caffè Diaz"/>
14 </node>
15 <node id="1859370799" lat="45.8556955" lon="9.3927506">
16   <tag k="amenity" v="cafe"/>
17   <tag k="description" v="Wine Bar Paninoteca"/>
18   <tag k="name" v="Bar Cavour"/>
19 </node>
20 <node id="1859854067" lat="45.8569941" lon="9.3925509">
21   <tag k="addr:city" v="Lecco"/>
22   <tag k="addr:country" v="IT"/>
23   <tag k="addr:housenumber" v="1"/>
24   <tag k="addr:postcode" v="23900"/>
25   <tag k="addr:street" v="Largo Monte Nero"/>
26   <tag k="amenity" v="cafe"/>
27   <tag k="name" v="Caffè del Vallo"/>
28 </node>
29 <node id="1967871852" lat="45.8567692" lon="9.3918964">
30   <tag k="addr:city" v="Lecco"/>
31   <tag k="addr:country" v="IT"/>
32   <tag k="addr:housenumber" v="18"/>
33   <tag k="addr:postcode" v="23900"/>
34   <tag k="addr:street" v="Via Giuseppe Resinelli"/>
35   <tag k="amenity" v="cafe"/>
36   <tag k="name" v="Le Mura Caffè"/>
37 </node>
```

<http://overpass-turbo.eu>

How to download OSM data?

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- Overpass Turbo is a frontend to the Overpass API:
 - example 2: extraction of the restaurants serving pizza in Milan

```
1 node
2 [amenity=restaurant]
3 [cuisine=pizza]
4 ({{bbox}});
5 out;
6
```

node
[amenity=restaurant]
[cuisine=pizza]
({{bbox}});
out;

Loaded - nodes: 162, ways: 0, relations: 0
Displayed - pois: 162, lines: 0, polygons: 0

<http://overpass-turbo.eu>

How to download OSM data?

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- Overpass Turbo is a frontend to the [Overpass API](#):
 - example 2: extraction of the restaurants serving pizza in Milan

Run Share **Export** Wizard Save Load Settings Help overpass turbo

```
1 node
2 [amenity=restaurant]
3 [cuisine=pizza]
4 ({{bbox}});
5 out;
```

node
[amenity=restaurant]
[cuisine=pizza]
({{bbox}});
out;

Export

- ▼ Data
 - [download/copy](#) as GeoJSON
 - [download/copy](#) as GPX
 - [download/copy](#) as KML
 - [download/copy](#) as raw OSM data
 - raw data directly from [Overpass API](#)
 - load data into an OSM editor: [JOSM](#), [Level0](#)
 - save GeoJSON to [gist](#)
- Map
- Query

done

Loaded — nodes: 162, ways: 0, relations: 0
Displayed — pois: 162, lines: 0, polygons: 0

<http://overpass-turbo.eu>

- Some predefined extracts of OSM are also made available:
 - Geofabrik: country-level data extracts

Download OpenStreetMap data for this region:

Europe

[\[one level up\]](#)

Commonly Used Formats

- [europe-latest.osm.pbf](#), suitable for Osmium, Osmosis, imposm, osm2pgsql, mkgmap, and others. This file was last modified 10 hours ago and contains all OSM data up to 2018-04-13T20:43:02Z. File size: 20.4 GB; MD5 sum: [2c819686408d677b16d1b62494c4c544](#).
- [europe-latest-free.shp.zip](#) is not available for this region; try one of the sub-regions.

Other Formats and Auxiliary Files

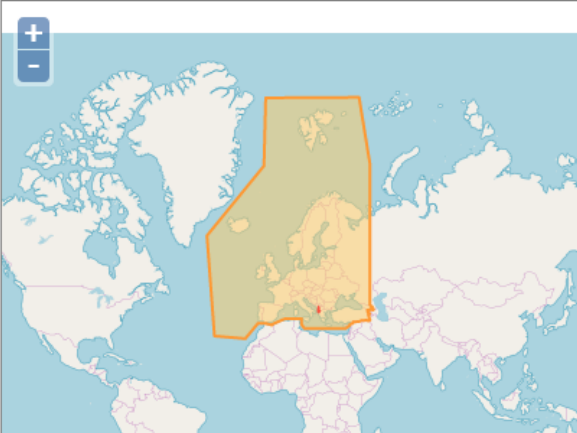
- [europe-latest.osm.bz2](#), yields OSM XML when decompressed; use for programs that cannot process the .pbf format. This file was last modified 1 day ago. File size: 32.2 GB; MD5 sum: [6e06ceb99c8dcf814adb229c661cf66f](#).
- [europe.osh.pbf](#), a file that contains the full OSM history for this region for processing with e.g. osmium. This file was last modified 2 days ago. File size: 33.5 GB; MD5 sum: [26feb46113339304715839206355c0f5](#).
- [.poly file](#) that describes the extent of this region.
- [.osc.gz files](#) that contain all changes in this region, suitable e.g. for Osmosis updates
- [raw directory index](#) allowing you to see and download older files

Sub Regions

Click on the region name to see the overview page for that region, or select one of the file extension links for quick access.

Sub Region	Quick Links		
	.osm.pbf	.shp.zip	.osm.bz2
Albania	[.osm.pbf] (26.5 MB)	[.shp.zip]	[.osm.bz2]
Andorra	[.osm.pbf] (1.5 MB)	[.shp.zip]	[.osm.bz2]

GEOFABRIK downloads



Not what you were looking for? Geofabrik is a consulting and software development firm based in Karlsruhe, Germany specializing in OpenStreetMap services. We're happy to help you with data preparation, processing, server setup and the like. [Check out our web site](#) and contact us if we can be of service.

<http://download.geofabrik.de>

How to download OSM data?

50

- Some predefined extracts of OSM are also made available:
 - **OSMaxx**: predefined and customized data extracts

OSMaxx / Existing excerpt export

To delete your own non-public excerpts go to [excerpt management](#).

Export options

GIS export formats

- ☐ Esri File Geodatabase (~7 GB)
- ☐ Esri Shapefile (~37 GB)
- ☐ GeoPackage (~18 GB)
- ☒ SpatiaLite (~17 GB)
- ☐ Garmin navigation & map data (~423 MB)
- ☐ OSM Protocolbuffer Binary Format (~472 MB)

Export (will take around 30 minutes)

GIS options (ignored for Garmin and PBF)

Coordinate system

UTM Zone 32, northern hemisphere

Detail level

Full detail

© 2015-2017 HSR Hochschule für Technik Rapperswil

<https://osmaxx.hsr.ch>

How to download OSM data?

51

- Some predefined extracts of OSM are also made available:
 - **HOT Export Tool**: customized data extracts created in near real-time

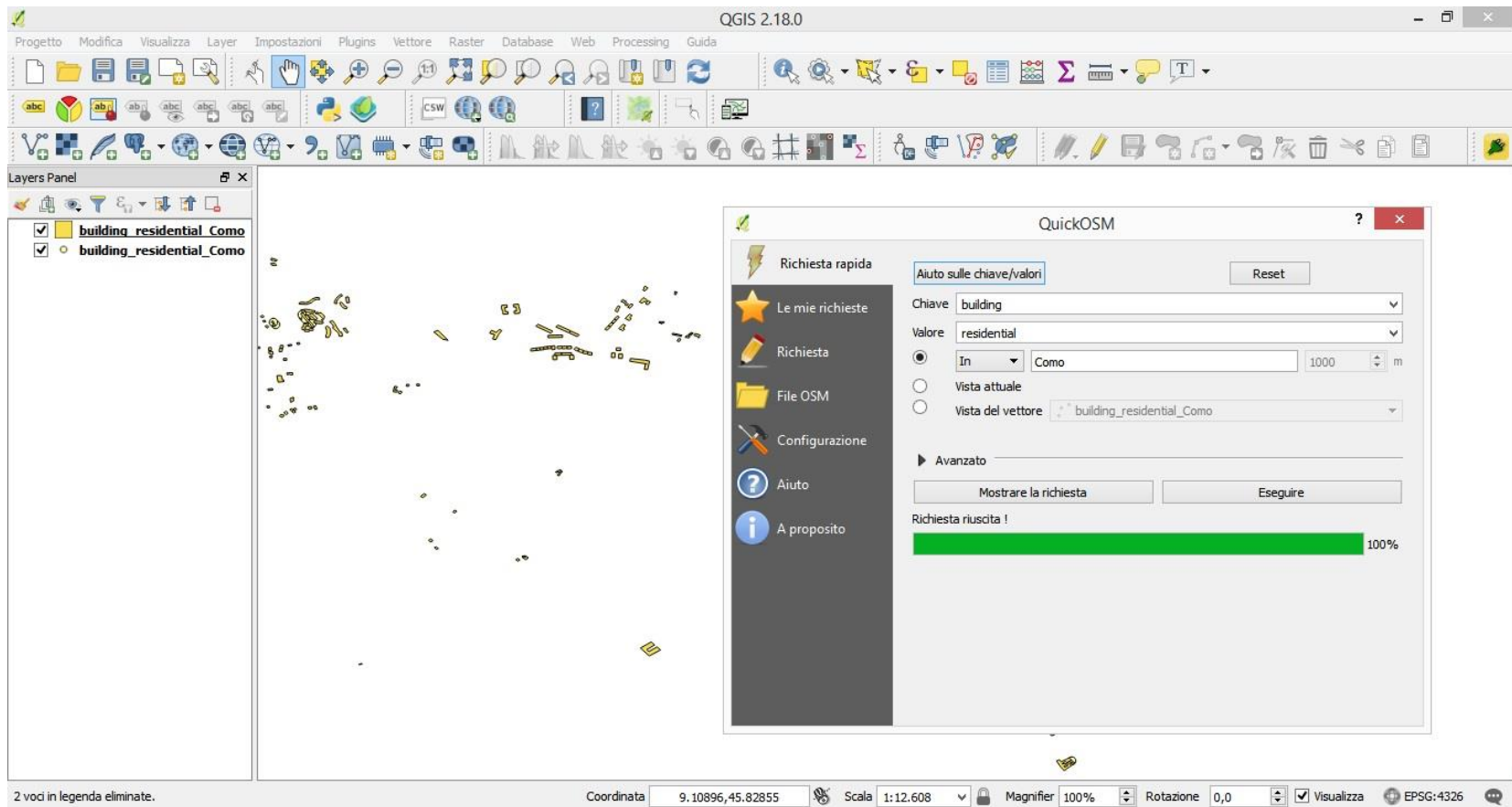
The screenshot displays the HOT Export Tool web interface. On the left, the 'EXPORT TOOL' header is visible. Below it, a navigation bar shows four steps: '1 Describe', '2 Formats', '3 Data', and '4 Summary'. The '2 Formats' step is active. Under 'File Formats', a list of export options is shown with checkboxes and file extensions: Shapefile (.shp), GeoPackage (.gpkg), Garmin (.img), Google Earth (.kml), OSM (.xml), OSM (.pbf), MAPS.ME (.mwm), OsmAnd (.obf), and MBTiles (.mbtiles). A 'Next' button is located at the bottom right of this section. Below the list, a status bar indicates 'OpenStreetMap database last updated 2 minutes ago'. On the right, a map of Puerto Rico is displayed with a blue dashed outline representing the 'Area Of Interest (AOI)'. The map includes labels for various cities and regions. A search bar at the top right of the map contains the text 'puerto rico'. A 'Tools' sidebar on the far right offers options like 'BOX', 'DRAW', 'THIS VIEW', and 'IMPORT'. At the bottom of the map, there is a 'ZOOM TO SELECTION' button and a scale bar indicating 50 km. The footer of the map area credits 'OpenStreetMap contributors' and 'Mapbox'.

<https://export.hotosm.org/en/v3/exports>

How to download OSM data?

52

- Plugins to download OSM data are available for desktop GIS software:
 - **QuickOSM**: QGIS plugin to extract customized OSM data



<https://plugins.qgis.org/plugins/QuickOSM>

Quality assurance/ Quality control



How to check the quality of OSM data?

54

- Many tools are available to check for mistake/inconsistencies in OSM data:
 - **KeepRight**: highlights errors in tags and geometry/topology

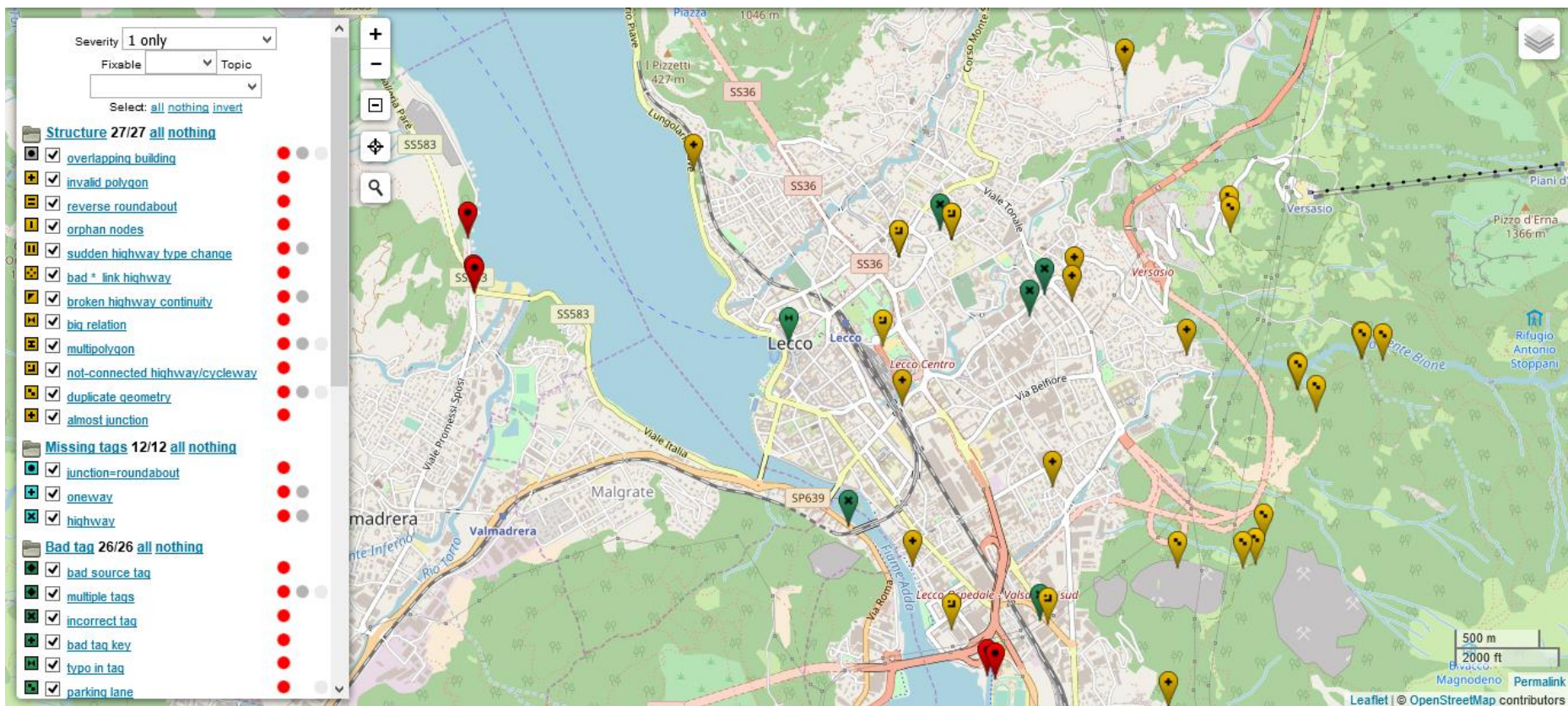
http://keepright.ipax.at/report_map.php



How to check the quality of OSM data?

55

- Many tools are available to check for mistake/inconsistencies in OSM data:
 - **Osmose**: highlights errors in tags and geometry/topology



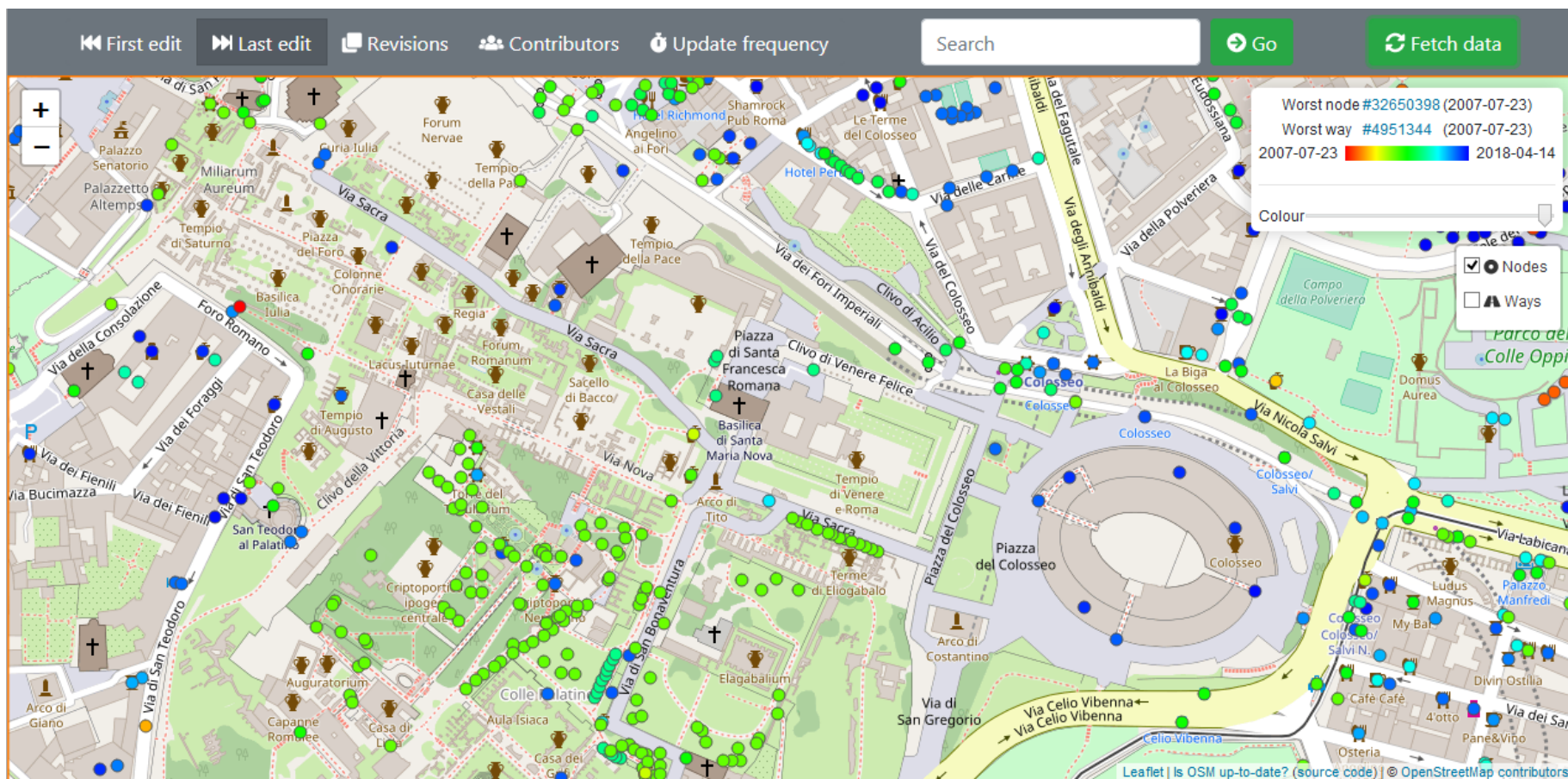
<http://osmose.openstreetmap.fr/en/map>



How to check the quality of OSM data?

56

- Many tools are available to check for mistake/inconsistencies in OSM data:
 - is OSM up-to-date: qualitative visualizations of OSM temporal history



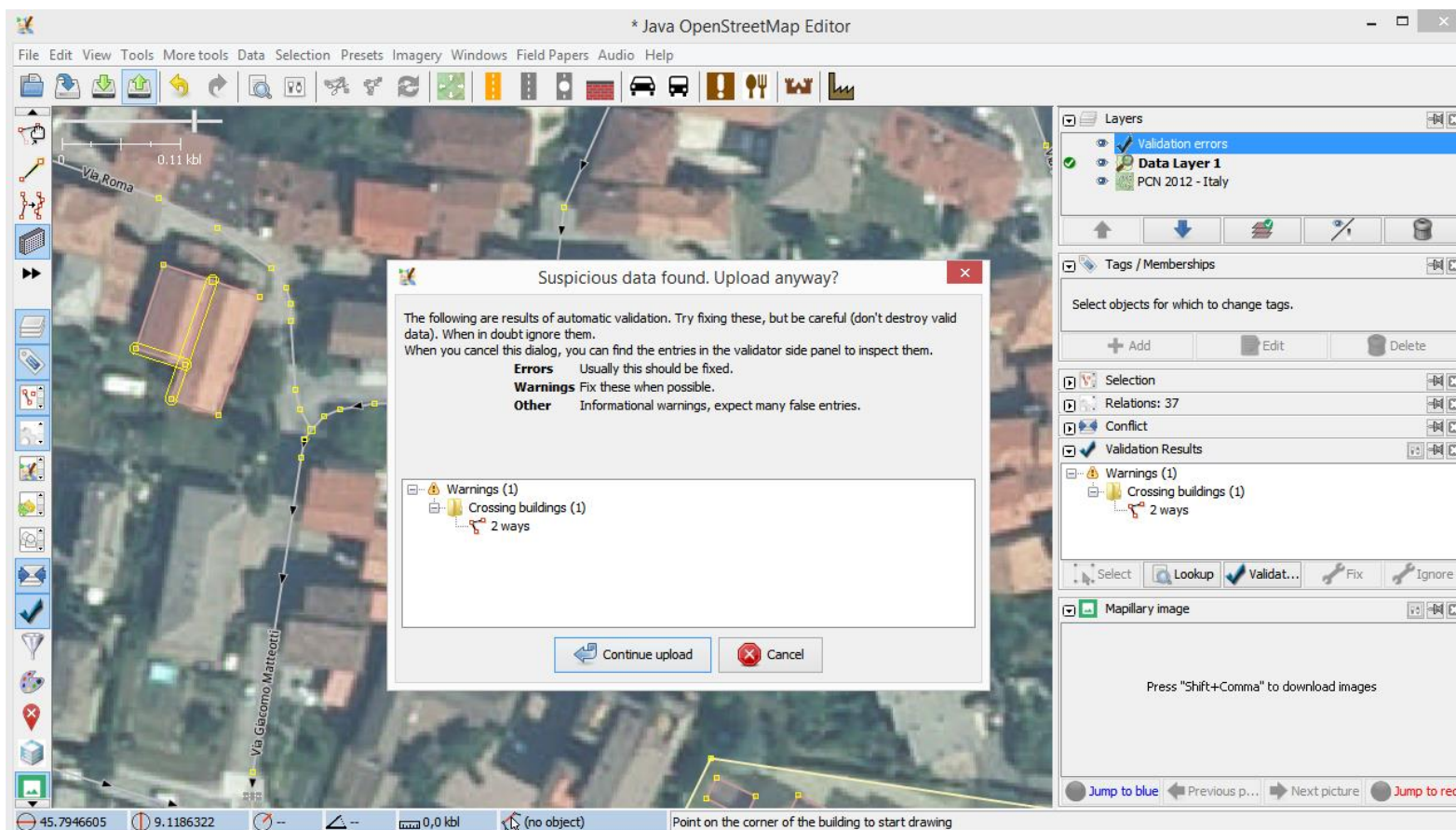
<https://is-osm-uptodate.frafra.eu>



How to check the quality of OSM data?

57

- Many tools are available to check for mistake/inconsistencies in OSM data:
 - **JOSM Validator**: highlights errors in JOSM before data upload



<https://wiki.openstreetmap.org/wiki/JOSM/Validator>



How to check the quality of OSM data?

58

- Many tools are available to check for mistake/inconsistencies in OSM data:
 - **TagInfo**: information & statistics on the usage of OSM tags



English

Data from: 2018-04-14 00:58 UTC

[KEYS](#) · [TAGS](#) · [RELATIONS](#) · [PROJECTS](#) · [REPORTS](#) · [ABOUT](#)

building=church

A building that was built as a church.

Comparison list (0 items)

Filter: No filter

XAPI

JOSM

Level0 Editor

Overpass turbo

Overview

Combinations

Map

Wiki

Projects

Overview

Type	Number of objects	
All	228 837	0.00%
Node	10 905	0.01%
Way	215 817	0.04%
Relation	2 115	0.04%



<https://taginfo.openstreetmap.org>



How to check the quality of OSM data?

59

- Many tools are available to check for mistake/inconsistencies in OSM data:
 - **Italian street directory**: finds mistakes in the Italian street names

Ricerca per nome del Comune

Q Como

Cerca

— Strade a Como 75

Piazza Pietro Amato Perretta ortografia	3	
SP ex SS35 Statale dei Giovi DUG non conosciuta	12	
Strada Monte Boletto ortografia	1	
Via Adriano Auguadri ortografia	2	
Via Agliati ortografia	1	
Via Alberina	1	

<https://osmit3.wmflabs.org/stradario>

Games



How is OSM used in games?

61

- Many games use OSM as the base map source:

- X-Plane



<http://www.x-plane.com>

- Tom Clancy's The Division



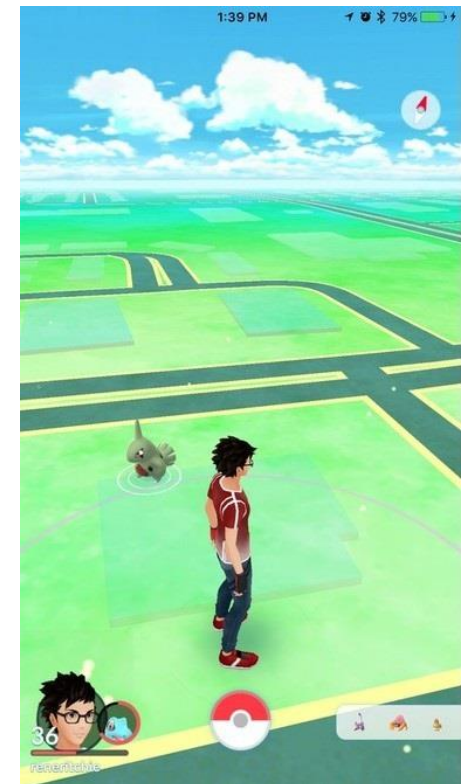
<https://tomclancy-thedivision.ubisoft.com/game/en-us>

- Collapse



<http://collapse-thedivisiongame.ubi.com>

- Pokemon Go



<https://pokemongolive.com>

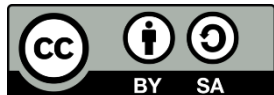


- A nice reference:
 - Mooney P. & Minghini M. (2017) A review of OpenStreetMap data. In: Foody G., See L., Fritz S., Mooney P., Olteanu-Raimond A.-M., Fonte C.C. and Antoniou V. (Eds) *Mapping and the Citizen Sensor*, 37-59. London: Ubiquity Press.
<https://www.ubiquitypress.com/site/books/10.5334/bbf>

Thank you!

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Monia Elisa Molinari – moniaelisa.molinari@polimi.it



<https://creativecommons.org/licenses/by-sa/4.0>





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Geodesy and geoinformatics for sustainable development in Jordan (GEO4D)

 POLITECNICO DI MILANO



Humanitarian applications of OpenStreetMap

Marco Minghini & Monia Elisa Molinari

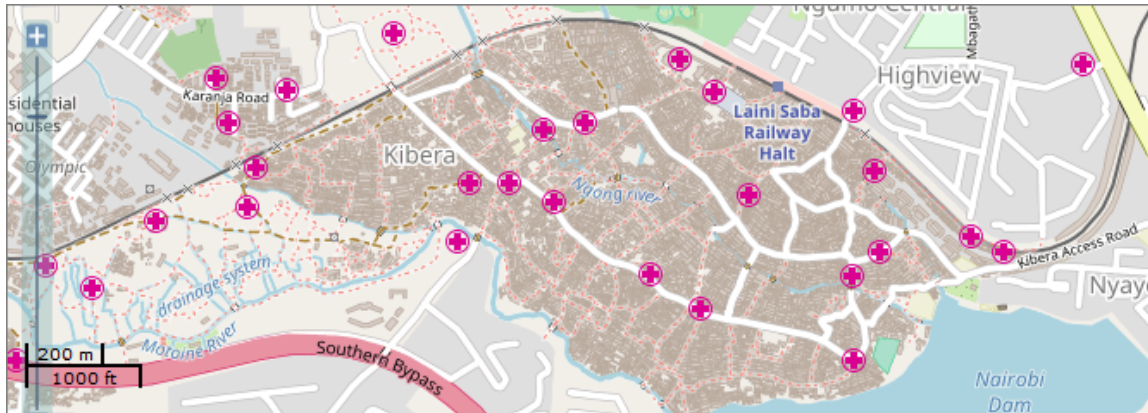
Politecnico di Milano, Lecco Campus – June 20, 2018



Humanitarian mapping in OpenStreetMap

2

- OSM features important humanitarian applications:
 - in many regions of the world, OSM is the only available map!



<https://tools.geofabrik.de/mc/#15/-1.3142/36.7924&num=4&mt0=mapnik&mt1=geofabrik-basic-pastel&mt2=google-map&mt3=google-satellite>



Humanitarian OpenStreetMap Team (HOT)³

- Born after the Haiti earthquake in 2010 to coordinate collaborative OSM mapping in areas affected by natural disasters or humanitarian crises.



<https://www.hotosm.org>

@hotosm 



https://www.youtube.com/watch?v=oNZ_ZBCTRqc



Humanitarian OpenStreetMap Team (HOT)⁴

- Born after the Haiti earthquake in 2010 to coordinate collaborative OSM mapping in areas affected by natural disasters or humanitarian crises.

[WHAT WE DO](#)[OUR WORK](#)[TOOLS & DATA](#)[NEWS](#)[COMMUNITY & ORGANIZATION](#)[PARTNER WITH US](#)[GET INVOLVED](#)

OUR IMPACT

HOT's work is global in scale and contributes to the achievement of the Sustainable Development Goals (SDGs). Check out our core impact areas and learn more about where we're making a difference.

[Disaster Risk Reduction](#)[Transportation](#)[Poverty Elimination](#)[Gender Equality](#)[Sustainable Cities](#)[Refugee Response](#)[Environment](#)[Public Health](#)[Disaster Response](#)[Clean Energy](#)[Water & Sanitation](#)



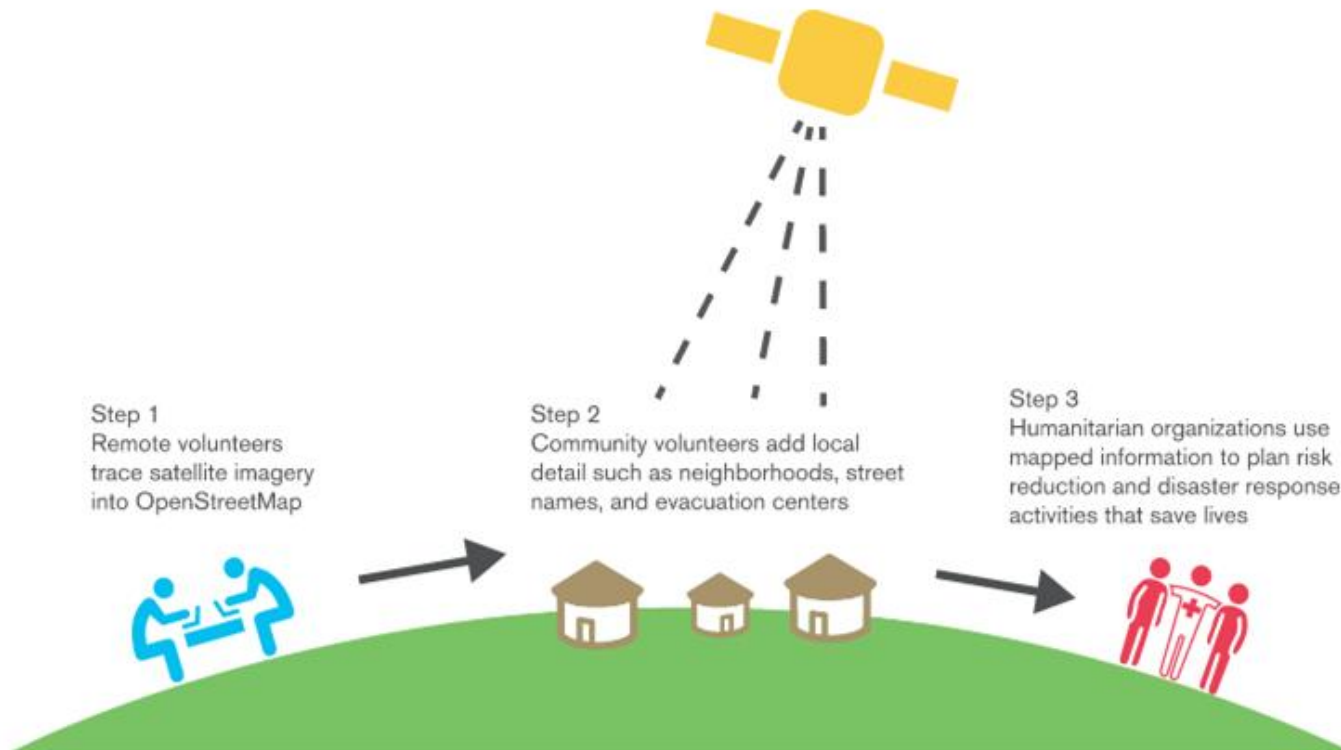
- Focused on anticipating humanitarian crises by identifying and mapping the **most vulnerable areas** of the world where maps do not exist.



**MISSING
MAPS**

<http://www.missingmaps.org>

@TheMissingMaps 





HOT Tasking Manager (TM)

6

- The area to be mapped is divided into small and independent **tasks**, that can be quickly completed by **multiple users** working simultaneously:
 - coordinated **mapping, validation & monitoring** during emergencies

HOT TASKING MANAGER Contribute Learn About What is New? English mingo23

Instructions

Entities to map
Buildings only

Changeset Comment
#hotosm-project-4371 #Mapgive #hotosm #withrefugees #missingmaps

Imagery
tms[22]:https://{switch:services,server}.arcgisonline.com/arcgis/rest/services/World_Imagery/MapServer/tile/{zoom}/{y}/{x}?blankTile=false

For this task, mappers are being asked to map buildings only across the entire area

- In the ID editor: label the area as "Building", then correct for right angles with the "S" key
- In JOSM: from the Tags/Memberships window, click "Add" and use the tag "building=yes"; then correct for right angles using the "Q" key. For this task, mappers are being asked to map buildings only across the entire area

The imagery will show buildings as a mixture of 'formal' constructions, huts and other structures

Shelters

- In the ID editor: label the area as "Building", then correct for right angles with the

Legend

- Ready
- Mapped
- Bad imagery
- Validated
- Invalidated
- Locked
- Locked by you

2 km

OpenStreetMap contributors

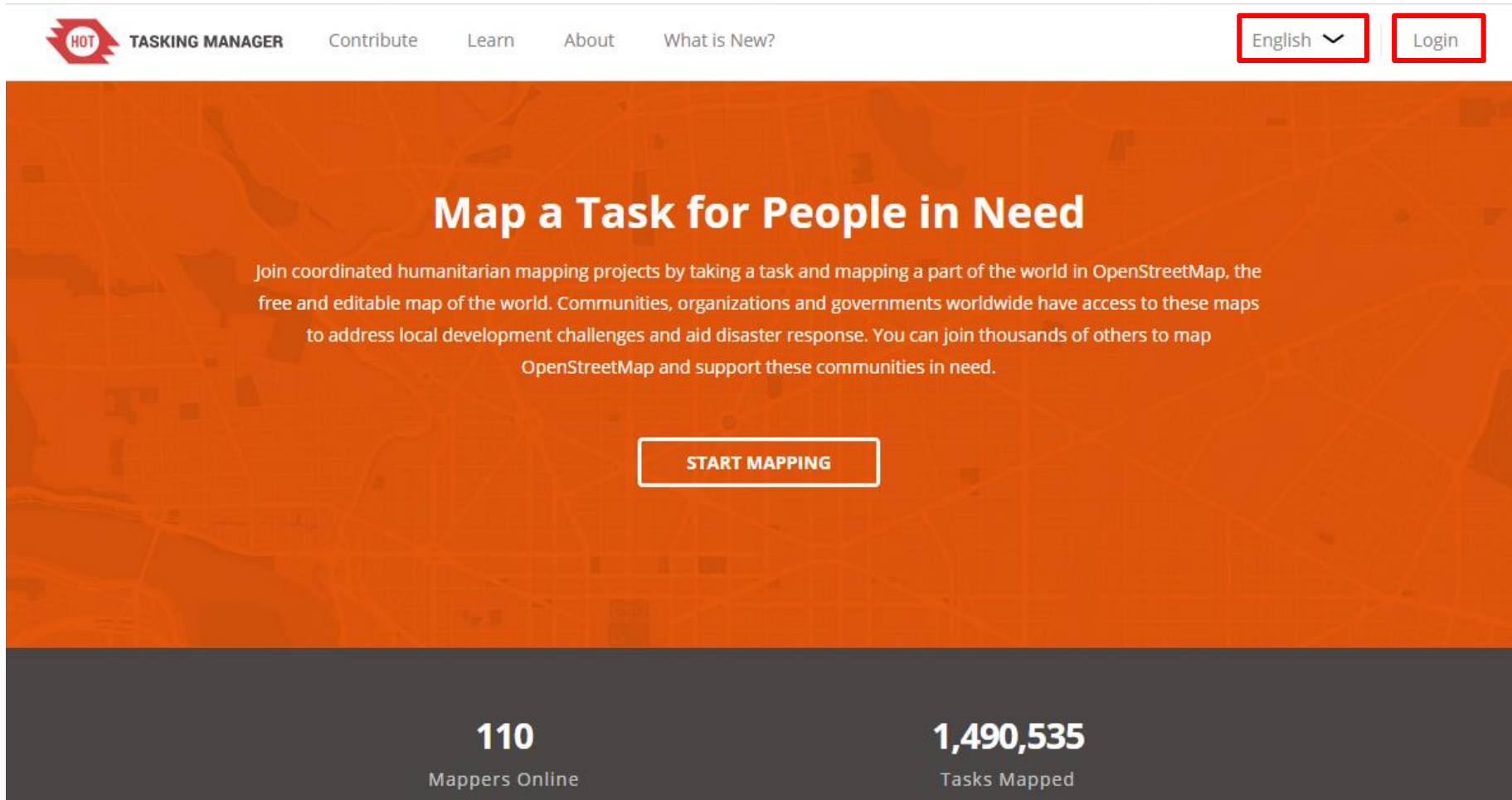
<https://tasks.hotosm.org>



HOT Tasking Manager – Get started

7

- Use the [Login](#) button to login with your OSM credentials.
- Change the Tasking Manager [language](#) from the corresponding menu.



The screenshot shows the HOT Tasking Manager homepage. At the top, there is a navigation bar with the HOT Tasking Manager logo, links for 'Contribute', 'Learn', 'About', and 'What is New?', a language dropdown menu set to 'English', and a 'Login' button. The main content area has an orange background with a map overlay. It features the heading 'Map a Task for People in Need' and a paragraph explaining the project's purpose: 'Join coordinated humanitarian mapping projects by taking a task and mapping a part of the world in OpenStreetMap, the free and editable map of the world. Communities, organizations and governments worldwide have access to these maps to address local development challenges and aid disaster response. You can join thousands of others to map OpenStreetMap and support these communities in need.' Below this text is a 'START MAPPING' button. At the bottom, a dark grey bar displays '110 Mappers Online' and '1,490,535 Tasks Mapped'.

HOT TASKING MANAGER Contribute Learn About What is New? English ▼ Login

Map a Task for People in Need

Join coordinated humanitarian mapping projects by taking a task and mapping a part of the world in OpenStreetMap, the free and editable map of the world. Communities, organizations and governments worldwide have access to these maps to address local development challenges and aid disaster response. You can join thousands of others to map OpenStreetMap and support these communities in need.

START MAPPING

110
Mappers Online

1,490,535
Tasks Mapped



HOT Tasking Manager – Get started

8

- Click the [Learn](#) button to access instructions on how to use the TM.
- Click the [About](#) button to access information on the TM.
- Click the [What is New?](#) button to know the news of the TM version 3.
- Click the [Contribute](#) button or the [Start Mapping](#) button to start mapping.

HOT TASKING MANAGER

[Contribute](#) [Learn](#) [About](#) [What is New?](#)

English ▾ | [Login](#)

Map a Task for People in Need

Join coordinated humanitarian mapping projects by taking a task and mapping a part of the world in OpenStreetMap, the free and editable map of the world. Communities, organizations and governments worldwide have access to these maps to address local development challenges and aid disaster response. You can join thousands of others to map OpenStreetMap and support these communities in need.

START MAPPING



HOT Tasking Manager – Mapping projects

9

- On the left, you can use multiple **filters** to search specific mapping projects.
- On the right, you can visualize the mapping projects in a **Grid view**.

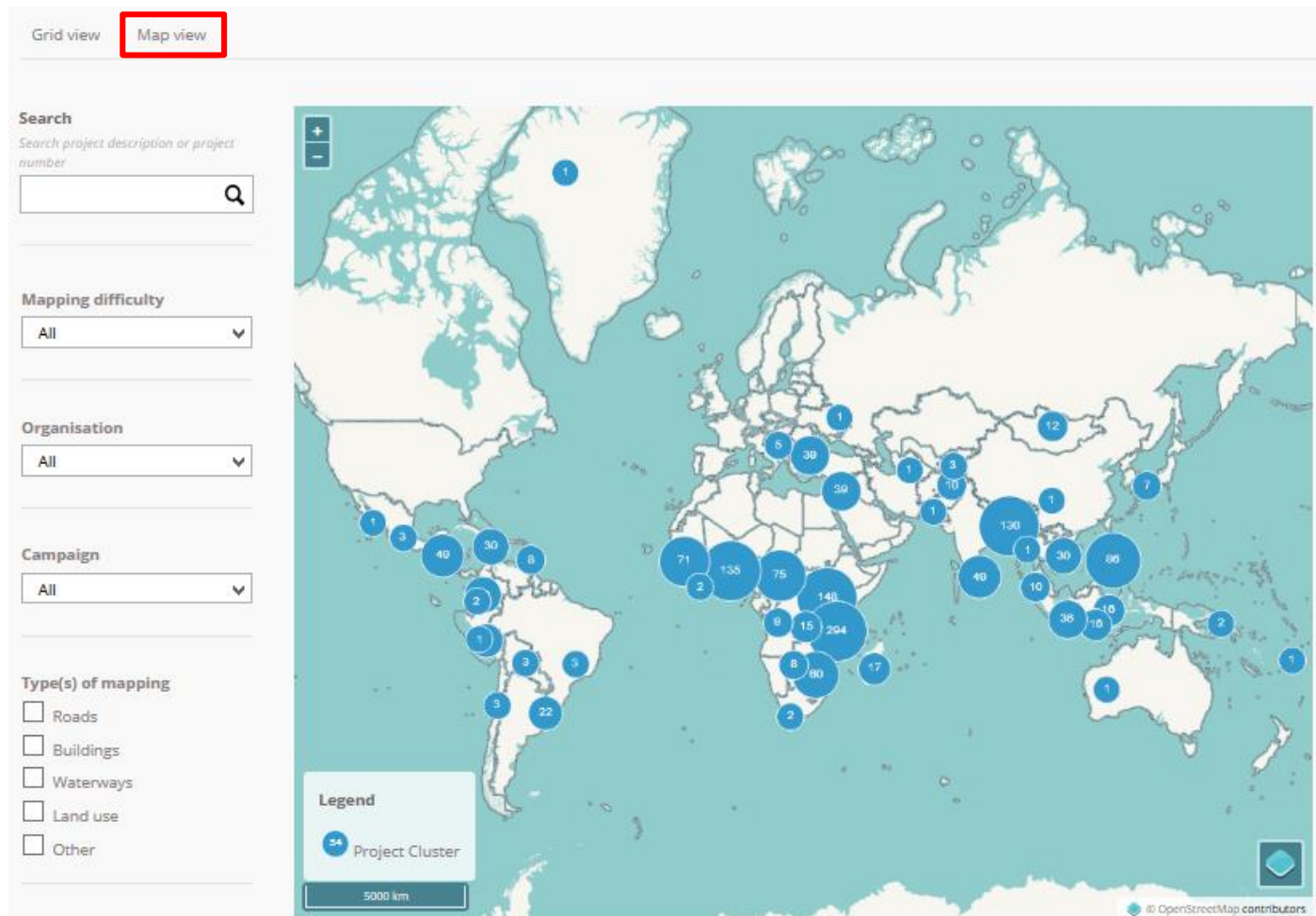
The screenshot displays the HOT Tasking Manager interface in Grid view. On the left, there are four filter sections: 'Search' with a text input and a magnifying glass icon; 'Mapping difficulty' with a dropdown menu set to 'All'; 'Organisation' with a dropdown menu set to 'All'; and 'Campaign' with a dropdown menu set to 'All'. Below these is a 'Type(s) of mapping' section with checkboxes for 'Roads', 'Buildings', 'Waterways', 'Land use', and 'Other'. The main area shows four project cards in a 2x2 grid. Each card includes a status (URGENT or HIGH), a project title, a description, organization and campaign details, and progress bars for 'Mapped' and 'Validated' tasks. The first two cards are for Sri Lanka flood response projects, and the last two are for Matete and Bangladesh refugee crisis projects.

Project ID	Status	Description	Organization	Campaign	Level	Mapped	Validated	Count
#4747	URGENT	Monsoon rains have caused severe flooding in the Kurunagala and Puttalam districts of Sri Lanka. Your help is needed to map these areas so first responders and aid agencies can deliver life saving relief to those affected.	Disaster Management Centre of Sri Lanka	Disaster Response	BEGINNER	25%	3%	4
#4639	URGENT	Monsoon rains have caused severe flooding in the Kurunagala and Puttalam districts of Sri Lanka. Your help is needed to map these areas so first responders and aid agencies can deliver life saving relief to those affected.	Disaster Management Centre of Sri Lanka	Disaster Response	BEGINNER	100%	47%	
#4764	HIGH	During the rainy season that has just ended. Several poor neighborhoods of kinshasa are currently under permanent threat of flooding, erosion, in the neighborhoods between the rivers Ndjili, Matete and Kinsenso						
#4688	HIGH	Almost 1 million Rohingya refugees have fled Myanmar for Southeast Bangladesh in the past few months. CartONG is supporting several humanitarian organizations and in particular						



HOT Tasking Manager – Mapping projects¹⁰

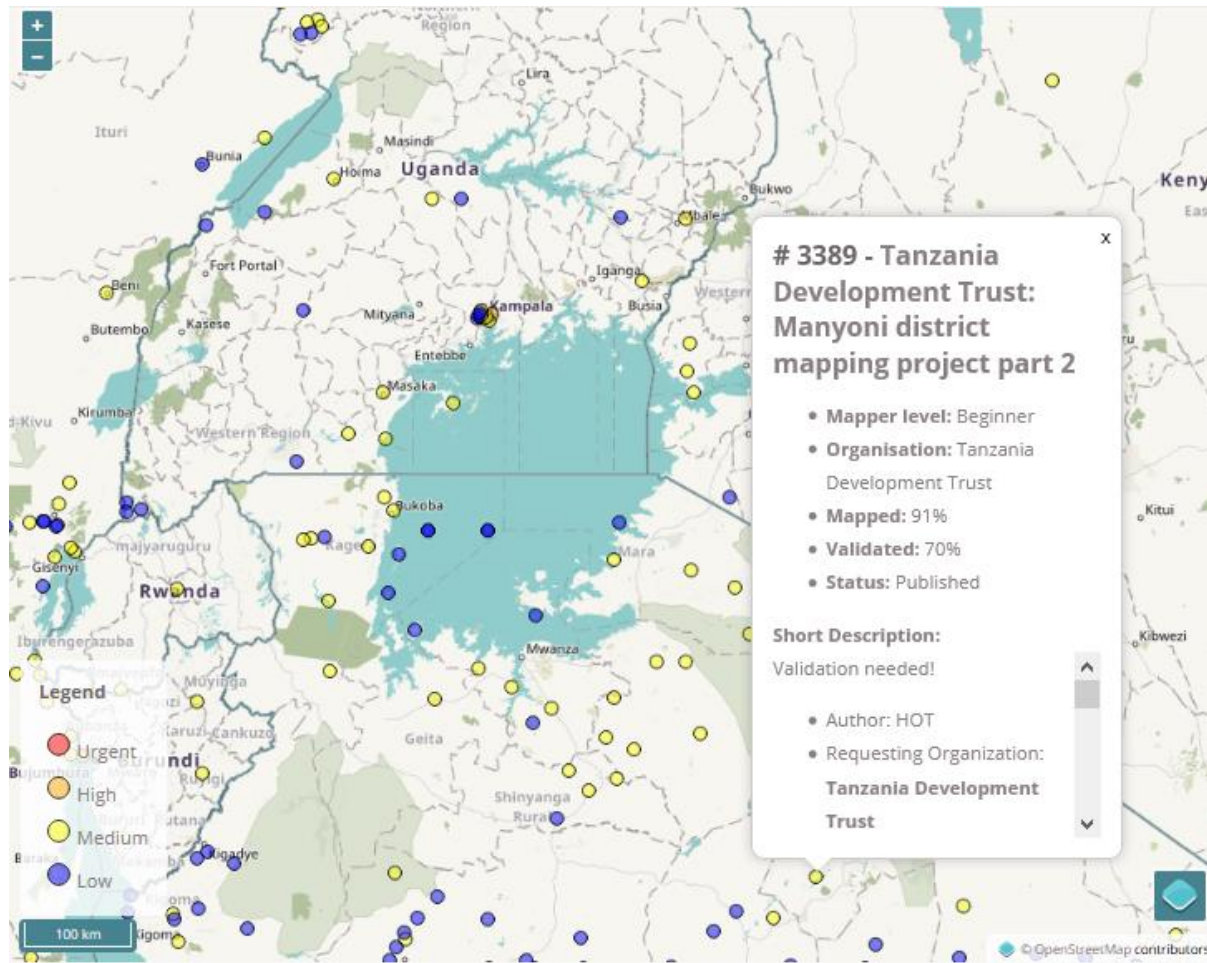
- On the left, you can use multiple **filters** to search specific mapping projects.
- On the right, you can visualize the mapping projects in a **Grid view**.





HOT Tasking Manager – Mapping projects¹¹

- When zooming the map, each single mapping project becomes visible:
 - click on the point to access the project details





HOT Tasking Manager – Mapping projects¹²

- Search for project #4747 (suitable for beginners):
 - click the project title #4747 Sri Lanka Flood Response 2018 Project 3 to access the details and start mapping

Search
Search project description or project number

Mapping difficulty

All ▼

Organisation

All ▼

Campaign

All ▼

URGENT

#4747 Sri Lanka Flood Response 2018 Project 3

Monsoon rains have caused severe flooding in the Kurunagala and Puttalam districts of Sri Lanka. Your help is needed to map these areas so first responders and aid agencies can deliver life saving relief to those affected.

Organization: Disaster Management Centre of Sri Lanka
Campaign: Disaster Response
Level: BEGINNER

26% Mapped 3% Validated 3

Previous 1 Next

<https://tasks.hotosm.org/project/4747>



HOT Tasking Manager – Mapping projects¹³

- At the top of the page, **general information** on the project is provided.
 - the mapping priority (in this case **URGENT**) is shown on the top left
 - the **SHARE** button allows to share the project on social medias

URGENT 3 - Active Mappers

#4747 - Sri Lanka Flood Response 2018 Project 3

Monsoon rains have caused severe flooding in the Kurunagala and Puttalam districts of Sri Lanka. Your help is needed to map these areas so first responders and aid agencies can deliver life saving relief to those affected.

HOT has received a request from the Disaster Management Centre of Sri Lanka to trace buildings in the inundated areas.

Status: PUBLISHED **Created by:** russdeffner

Last updated: 2 minutes ago **Difficulty:** BEGINNER

Priority: URGENT **Type(s) of mapping:** BUILDINGS

Organisation: Disaster Management Centre of Sri Lanka **Campaign:** Disaster Response

Mapper level required: No **Validator role required:** Yes

SHARE

- Twitter
- Facebook
- LinkedIn

<https://tasks.hotosm.org/project/4747>



HOT Tasking Manager – Mapping projects¹⁴

- Scrolling down the page, the **Instructions** tab includes mapping instructions:
 - entities to map, changest comments, imagery and specific notes

Instructions | Map | Validate | Questions and Comments

Instructions

Entities to map
Buildings only

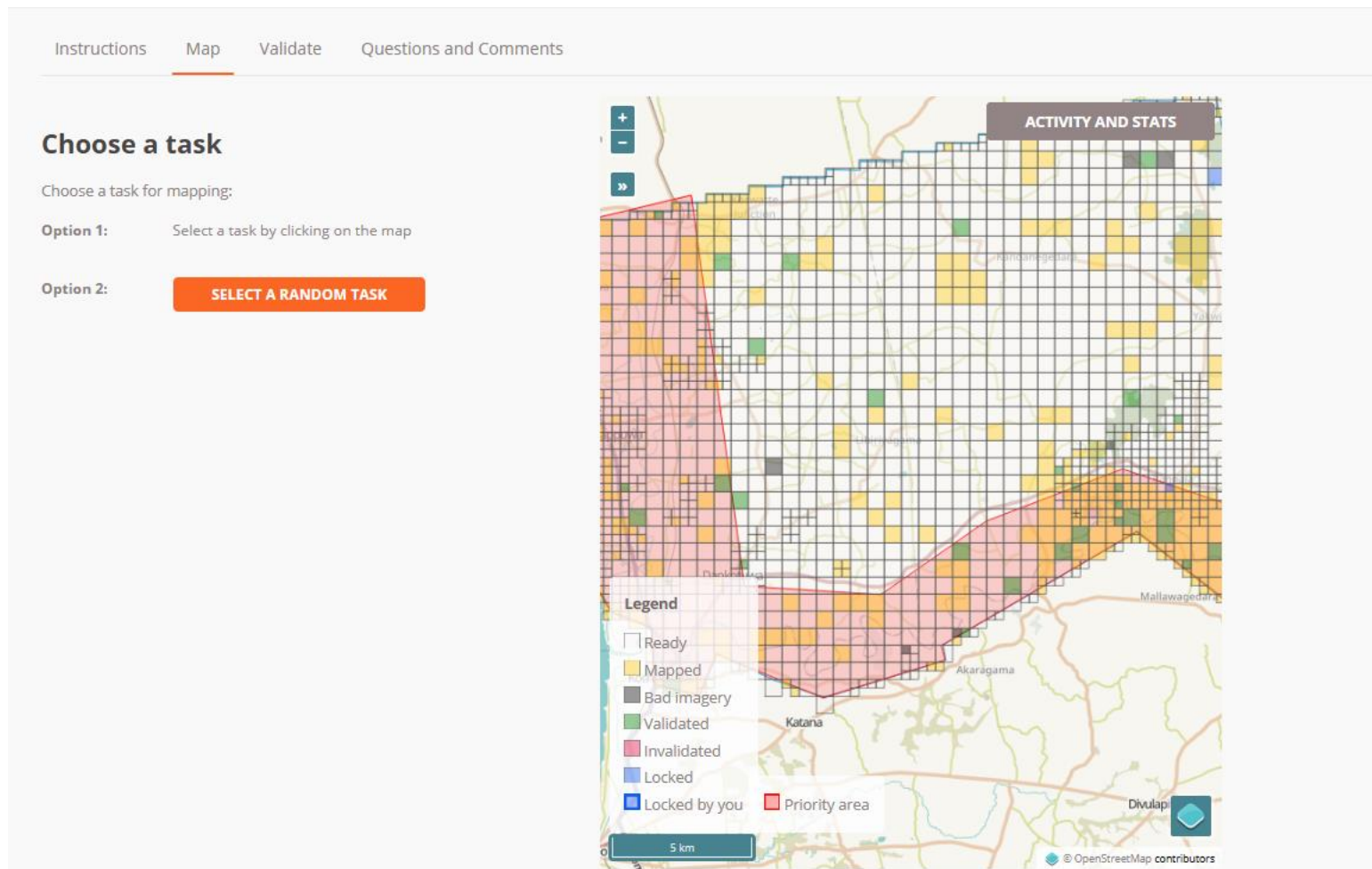
Changeset Comment
#hotosm-project-4747 #SriLankaFloods2018 #SriLanka request for buildings

Imagery
tms[22]:https://{switch:a,b,c,d}.tiles.mapbox.com/v4/digitalglobe.316c9a2e/{zoom}
/{x}/{y}.png?access_token=pk.eyJ1IjoZGlnaXRhbGdsb2JlIiwiaYSI6ImNqZGFrZ2c2dzFIMWgyd2x0ZHdmMDB6NzYifQ.9Pl3XOO82ArX94fHV289Pg

Project Specific Mapping Notes

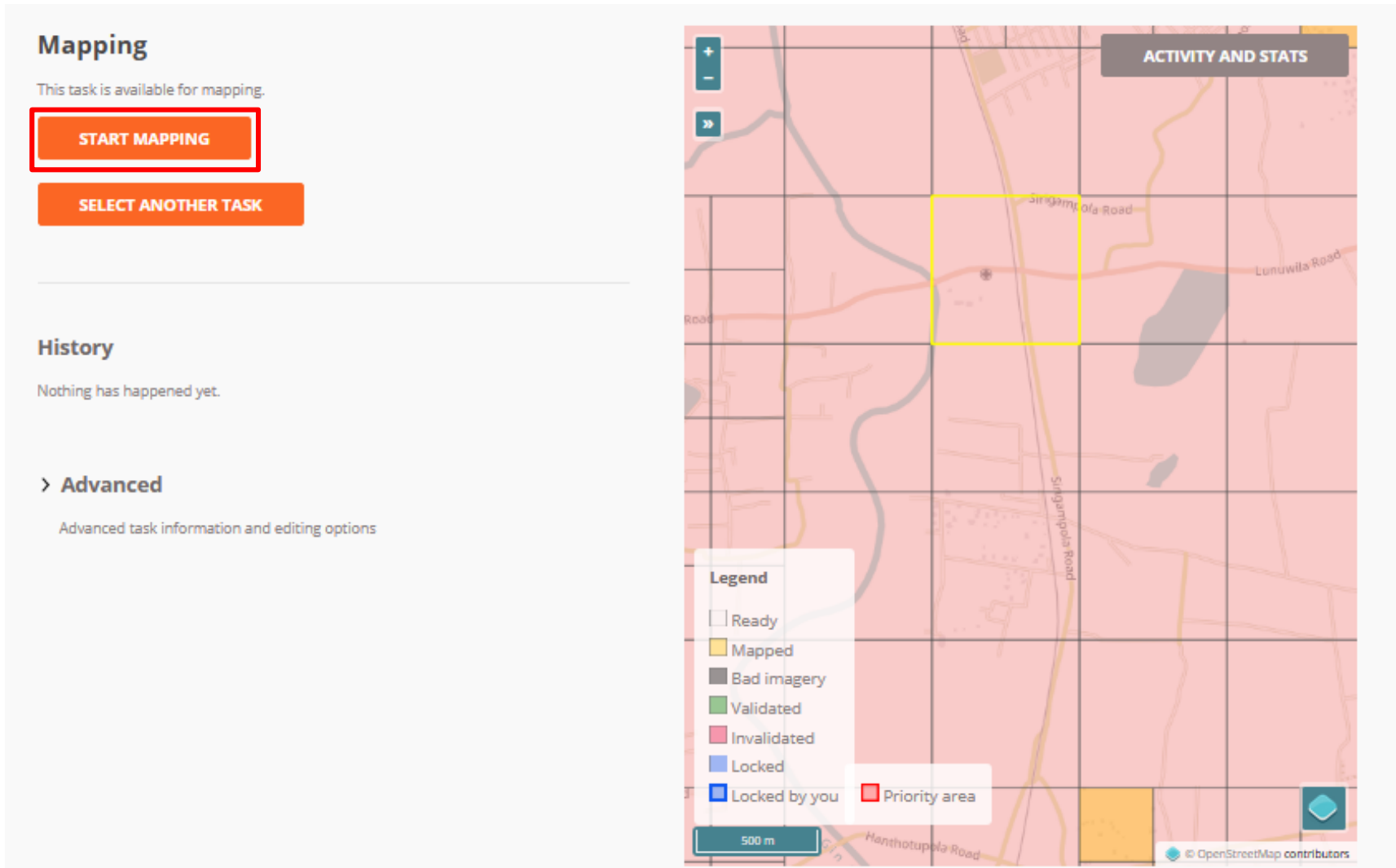
<https://tasks.hotosm.org/project/4747>

- Scrolling down the page, the **Map** tab allows to start mapping:
 - choose an area (either randomly or selecting a cell on the map)



The screenshot displays the 'Map' tab of the HOT Tasking Manager interface. At the top, there are four tabs: 'Instructions', 'Map' (which is selected and underlined), 'Validate', and 'Questions and Comments'. Below the tabs, the section is titled 'Choose a task'. Under this title, it says 'Choose a task for mapping:'. There are two options: 'Option 1: Select a task by clicking on the map' and 'Option 2: SELECT A RANDOM TASK' (which is highlighted with an orange button). To the right of the text is a map of a city area with a grid overlay. The grid cells are color-coded: white for 'Ready', yellow for 'Mapped', grey for 'Bad imagery', green for 'Validated', pink for 'Invalidated', blue for 'Locked', and dark blue for 'Locked by you'. A red outline on the map indicates a 'Priority area'. In the top right corner of the map area, there is a box labeled 'ACTIVITY AND STATS'. In the bottom left corner of the map area, there is a 'Legend' box with the color-coded keys. At the bottom of the map, there is a scale bar for 5 km and a copyright notice for OpenStreetMap contributors.

- Once a cell on the map has been selected, click **START MAPPING**.



The screenshot displays the HOT Tasking Manager interface. On the left, the 'Mapping' section is active, showing a message 'This task is available for mapping.' Below this, the 'START MAPPING' button is highlighted with a red border, and the 'SELECT ANOTHER TASK' button is visible below it. The 'History' section shows 'Nothing has happened yet.' and the 'Advanced' section is collapsed. On the right, a map shows a grid of task cells. A yellow square highlights a specific cell, indicating it is the selected task. A legend in the bottom right corner of the map area defines the colors: Ready (white), Mapped (yellow), Bad imagery (grey), Validated (green), Invalidated (pink), Locked (blue), Locked by you (dark blue), and Priority area (red). The map also shows a scale bar for 500m and a copyright notice for OpenStreetMap contributors.

- Select the iD Editor as OSM editor, and click START EDITOR to start it.

Mapping

Get started by choosing your editor of choice.

iD Editor **START EDITOR**

Download this task as a gpx file to see its boundary.

Done editing? Leave a comment and select one of the options below that matches your editing status

Leave a comment

500 characters remaining

MARK AS COMPLETELY MAPPED

MARK AS BAD IMAGERY **STOP MAPPING**

SPLIT TASK

Legend

- Ready
- Mapped
- Bad imagery
- Validated
- Invalidated
- Locked
- Locked by you
- Priority area

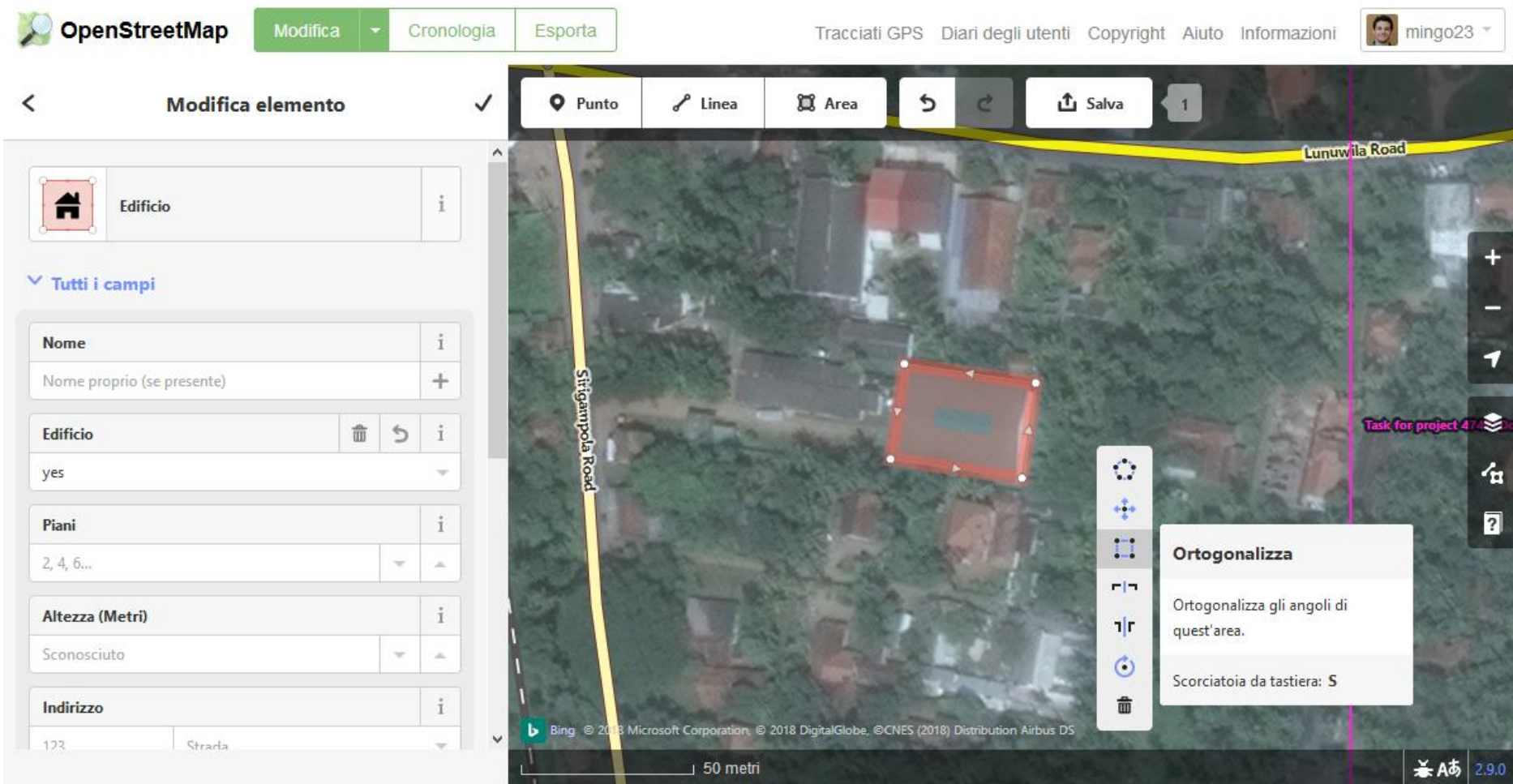
500 m

© OpenStreetMap contributors

- As background, select the Bing aerial imagery from the right menu.

The screenshot shows the OpenStreetMap web interface. At the top, there's a navigation bar with the OpenStreetMap logo, buttons for 'Modifica', 'Cronologia', and 'Esporta', and links for 'Tracciati GPS', 'Diari degli utenti', 'Copyright', 'Aiuto', and 'Informazioni'. A user profile 'mingo23' is visible in the top right. Below the navigation bar, there's a search bar labeled 'Cerca elementi' and a search input field with the placeholder 'Cerca'. The main map area shows an aerial view of a residential area with a yellow line indicating a road labeled 'Sirigampola Road'. To the right of the map, there's a 'Sfondo' (Background) menu with a list of background options. The option 'Immagini aeree Bing' is selected and highlighted with a red box. Other options include 'Immagini DigitalGlobe Premium', 'Immagini DigitalGlobe Standard', 'Mapbox Satellite', 'OpenStreetMap (French Style)', 'OpenStreetMap (HOT Style)', 'OpenStreetMap (Standard)', 'Stamen Terrain', 'Thunderforest Landscape', 'Nessuno', and 'Personalizzato'. A 'Mostra miniatura' checkbox is also present. At the bottom of the map, there's a scale bar indicating '50 metri' and a copyright notice: '© 2018 Microsoft Corporation, © 2018 DigitalGlobe, © CNES (2018) Distribution'. The bottom right corner shows a zoom level of '2.9.0'.

- Draw the building footprints by carefully **digitizing** the satellite imagery:
 - don't forget to square the polygons and add the tag **building=yes**



The screenshot displays the OpenStreetMap HOT Tasking Manager interface. On the left, the 'Modifica elemento' (Edit element) panel is active, showing a building footprint being edited. The panel includes a 'Nome' field, a 'Edificio' dropdown set to 'yes', a 'Piani' dropdown set to '2, 4, 6...', an 'Altezza (Metri)' dropdown set to 'Sconosciuto', and an 'Indirizzo' field. The main map area shows a satellite view of a residential area with a building footprint outlined in red. A yellow line represents a road, labeled 'Lunuwila Road' and 'Sittigampola Road'. A toolbar at the top of the map area includes buttons for 'Punto', 'Linea', 'Area', 'Salva', and a '1' button. A 'Task for project 474' is visible on the right. A '50 metri' scale bar is at the bottom. The bottom right corner shows the OpenStreetMap logo and version '2.9.0'.

OpenStreetMap

Modifica Cronologia Esporta

Tracciati GPS Diari degli utenti Copyright Aiuto Informazioni mingo23

Modifica elemento

Punto Linea Area Salva 1

Edificio

Tutti i campi

Nome

Nome proprio (se presente)

Edificio

yes

Piani

2, 4, 6...

Altezza (Metri)

Sconosciuto

Indirizzo

123 Strada

Lunuwila Road

Sittigampola Road

Task for project 474

Ortogonalizza

Ortogonalizza gli angoli di quest'area.

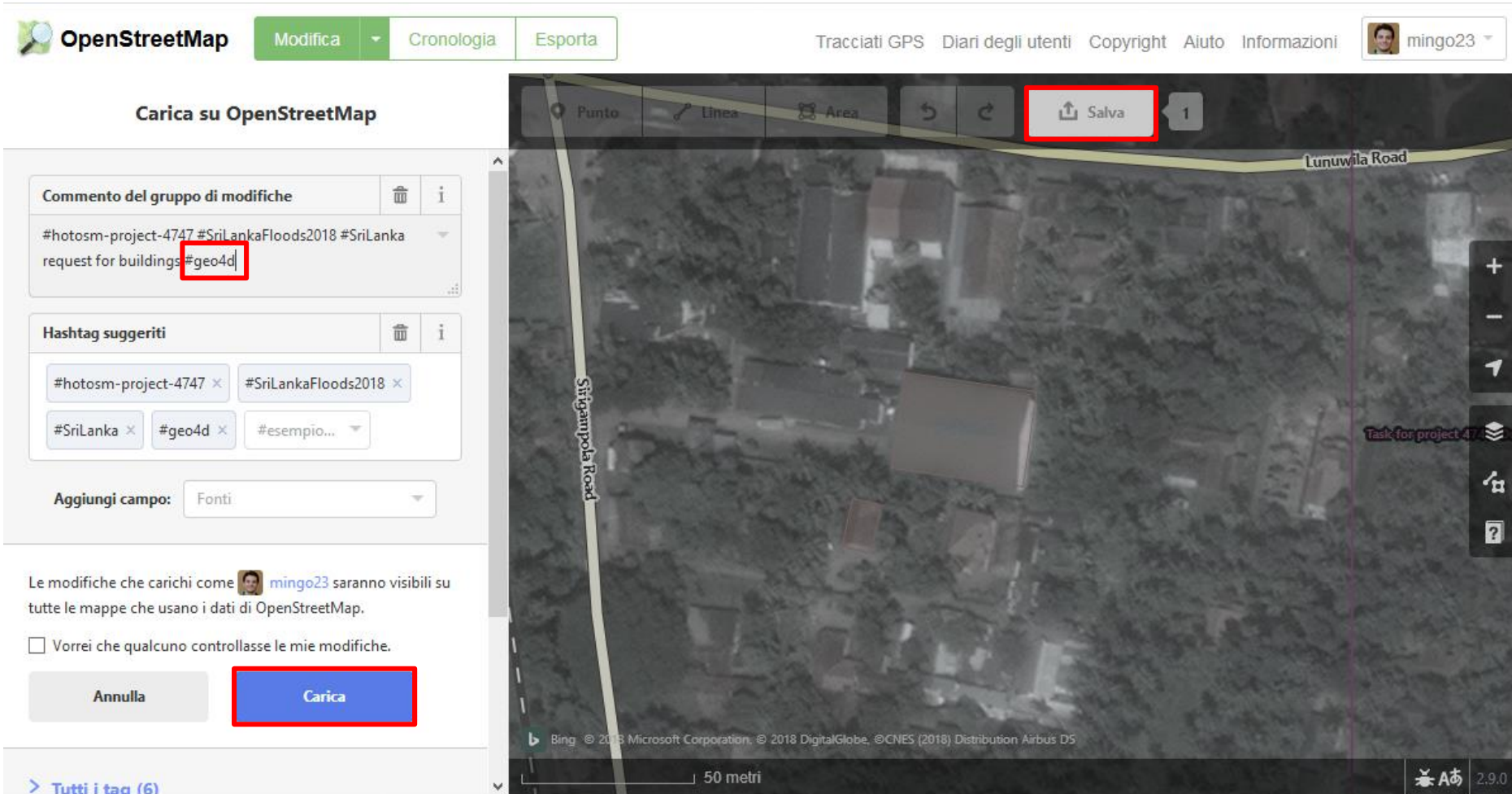
Scorciatoia da tastiera: S

Bing © 2018 Microsoft Corporation, © 2018 DigitalGlobe, ©CNES (2018) Distribution Airbus DS

50 metri

2.9.0

- Click the **Save** button to save your edits:
 - add the hashtag **#geo4d** in the changeset comment and click **Upload**



The screenshot shows the OpenStreetMap HOT Tasking Manager interface. On the left, the 'Carica su OpenStreetMap' panel is visible. It contains a 'Commento del gruppo di modifiche' field with the text '#hotsm-project-4747 #SriLankaFloods2018 #SriLanka request for buildings #geo4d', where '#geo4d' is highlighted with a red box. Below this is a 'Hashtag suggeriti' section with tags like '#hotsm-project-4747', '#SriLankaFloods2018', '#SriLanka', and '#geo4d'. At the bottom of the panel are 'Annulla' and 'Carica' buttons, with 'Carica' highlighted by a red box. The right side of the interface shows a map view of a residential area with roads labeled 'Srigampola Road' and 'Lunuwila Road'. A toolbar at the top of the map includes buttons for 'Punto', 'Linea', 'Area', and 'Salva', with 'Salva' highlighted by a red box. The user's profile 'mingo23' is visible in the top right corner.

- Once back to the Tasking Manager:
 - click the button **MARK AS COMPLETELY MAPPED** if you have mapped all the buildings in your map cell
 - click the button **MARK AS BAD IMAGERY** if the quality of the satellite imagery does not allow to map
 - click the button **STOP MAPPING** if you simply want to stop mapping on this cell
 - click the button **SPLIT TASK** to split the cell into 4 subcells

Mapping

Get started by choosing your editor of choice.

iD Editor

START EDITOR

Download this task as a gpx file to see its boundary.

Done editing? Leave a comment and select one of the options below that matches your editing status

Leave a comment

500 characters remaining

MARK AS COMPLETELY MAPPED

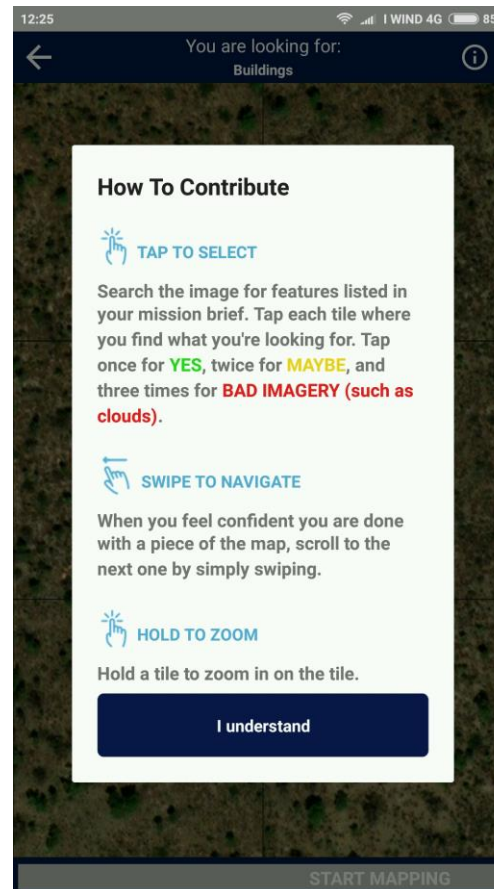
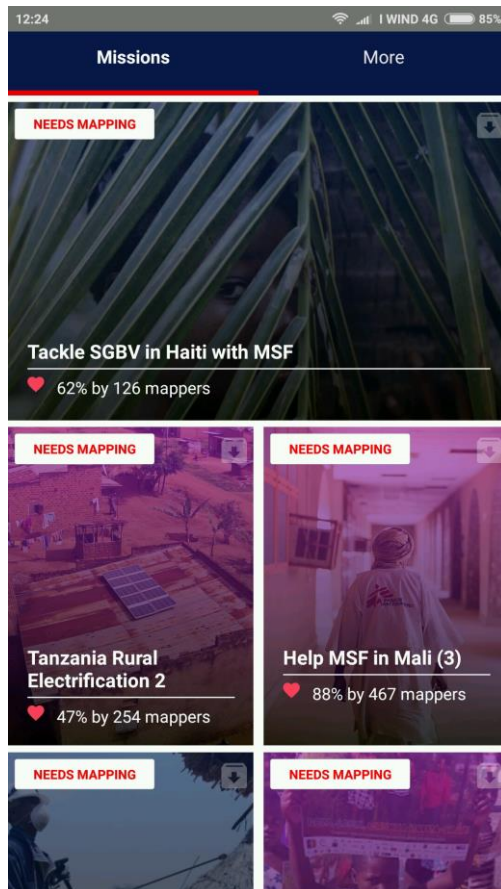
MARK AS BAD IMAGERY

STOP MAPPING

SPLIT TASK



- An Android/iOS app for image classification to detect buildings/villages:
 - used as a starting point to define areas for TM projects!



<https://mapswipe.org>



- Other useful tutorials on humanitarian mapping:
 - <http://learnosm.org/en/coordination/humanitarian>
 - <https://www.missingmaps.org/learn>
 - <https://tasks.hotosm.org/learn>

Thank you!

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