

OpenStreetMap

Marco Minghini

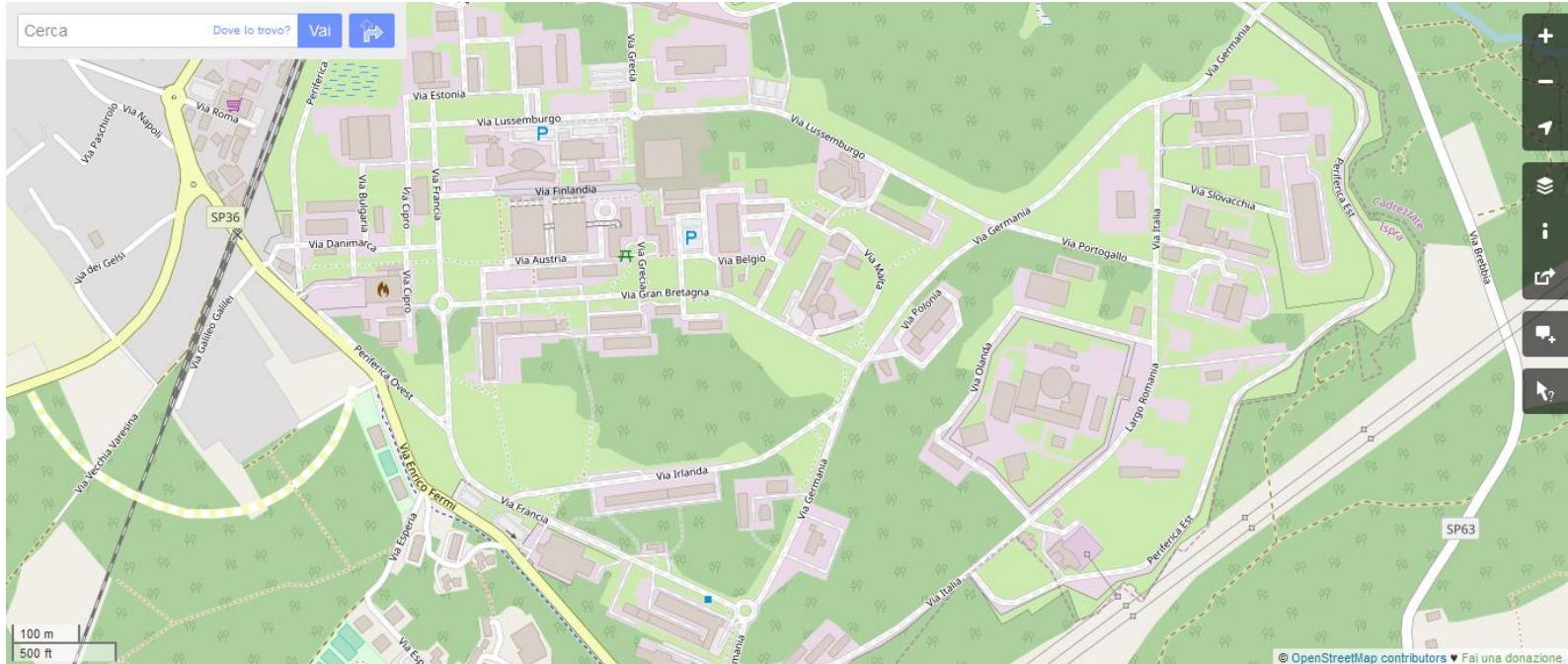
**The European Commission's
science and knowledge service**
Joint Research Centre

JRC Spatial Data Infrastructures
Ispra, 17/05/2019



What is OpenStreetMap?

- The OpenStreetMap (OSM) project was born in 2004 to encourage the creation of geospatial data that could be **free to use** and **shareable** with anyone.



About OpenStreetMap

Why OpenStreetMap?

- The success and growth of the OSM project are due to many reasons:
 - geospatial data is not yet available in some parts of the world (e.g. developing countries)
 - geospatial data is not free in many parts of the world
 - the Internet has spread around the world
 - low-cost GPS-equipped devices are increasingly available

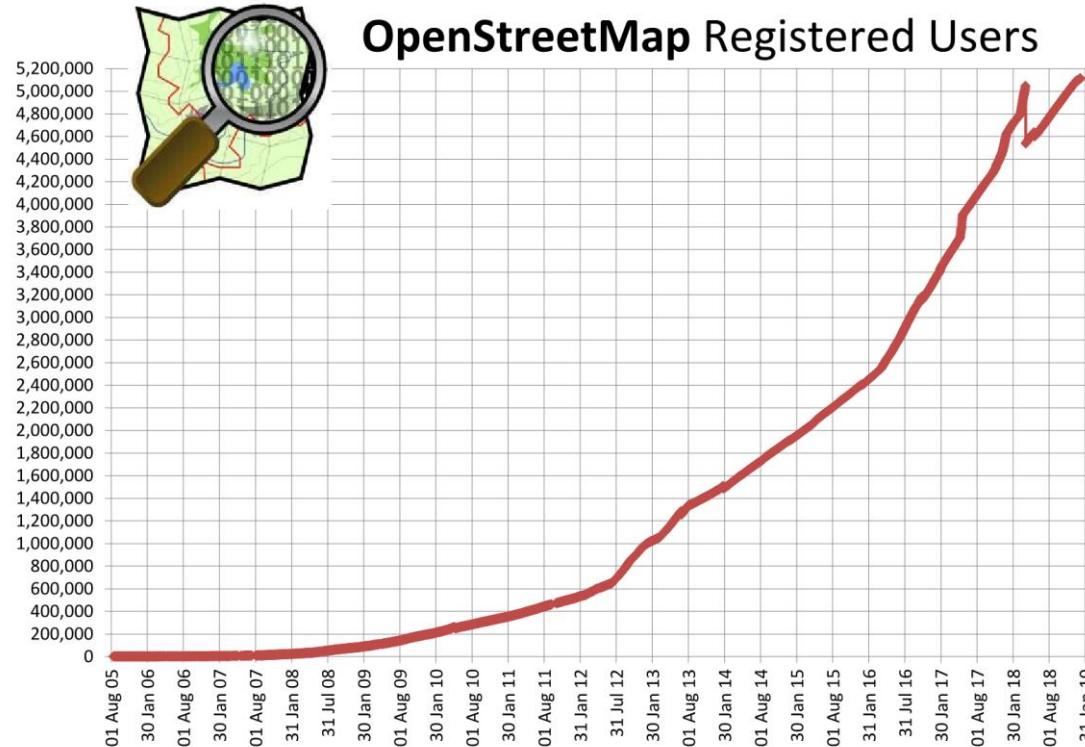


- 10 years of OSM (2004-2014):
<https://www.youtube.com/watch?v=7sC83j6vzjo>

OpenStreetMap (OSM) – How many users?



- Currently (May 2019) there are more than 5.4 million registered users.



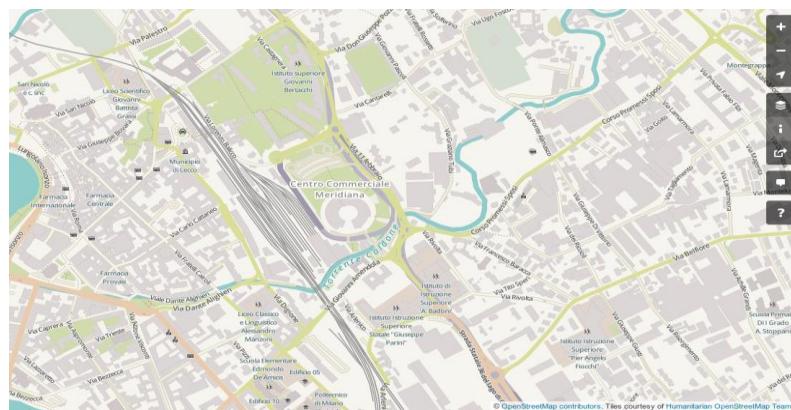
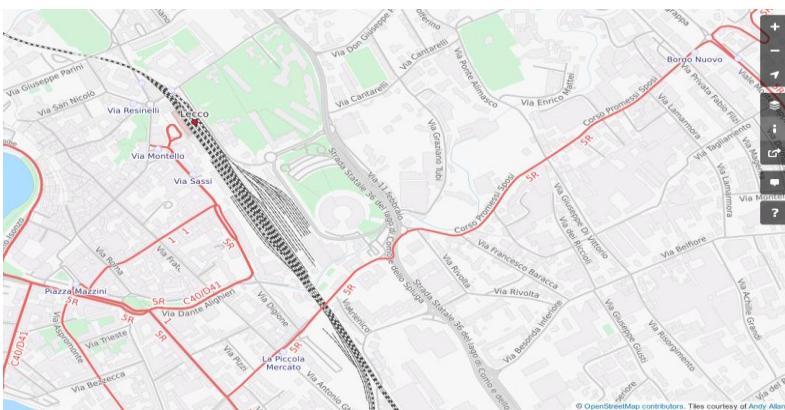
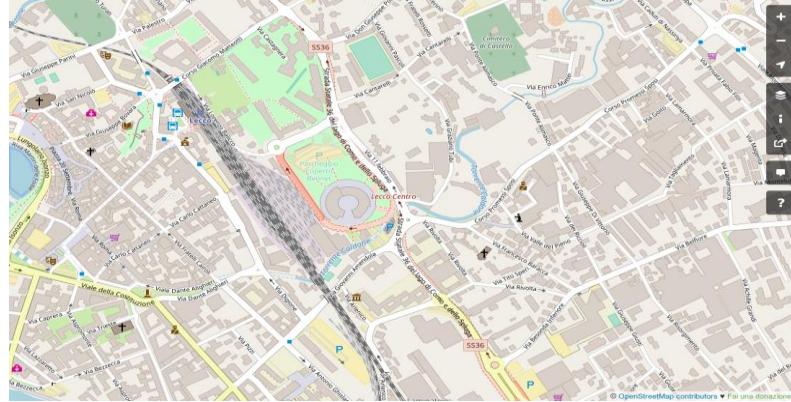
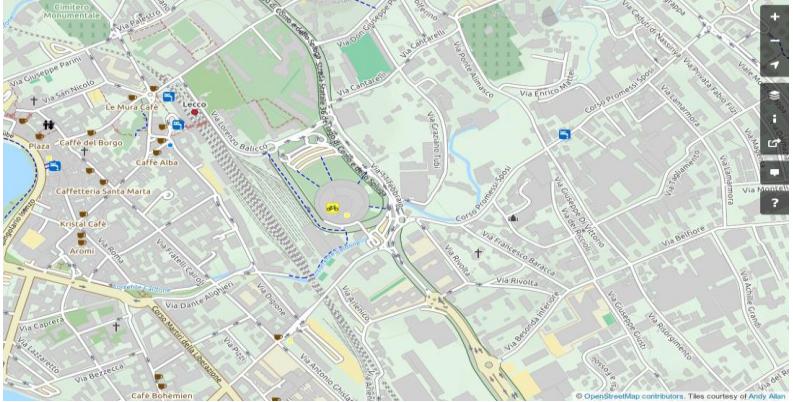
OpenStreetMap database

- OpenStreetMap is the largest, most diverse, most complete and most up-to-date geospatial database in the world.



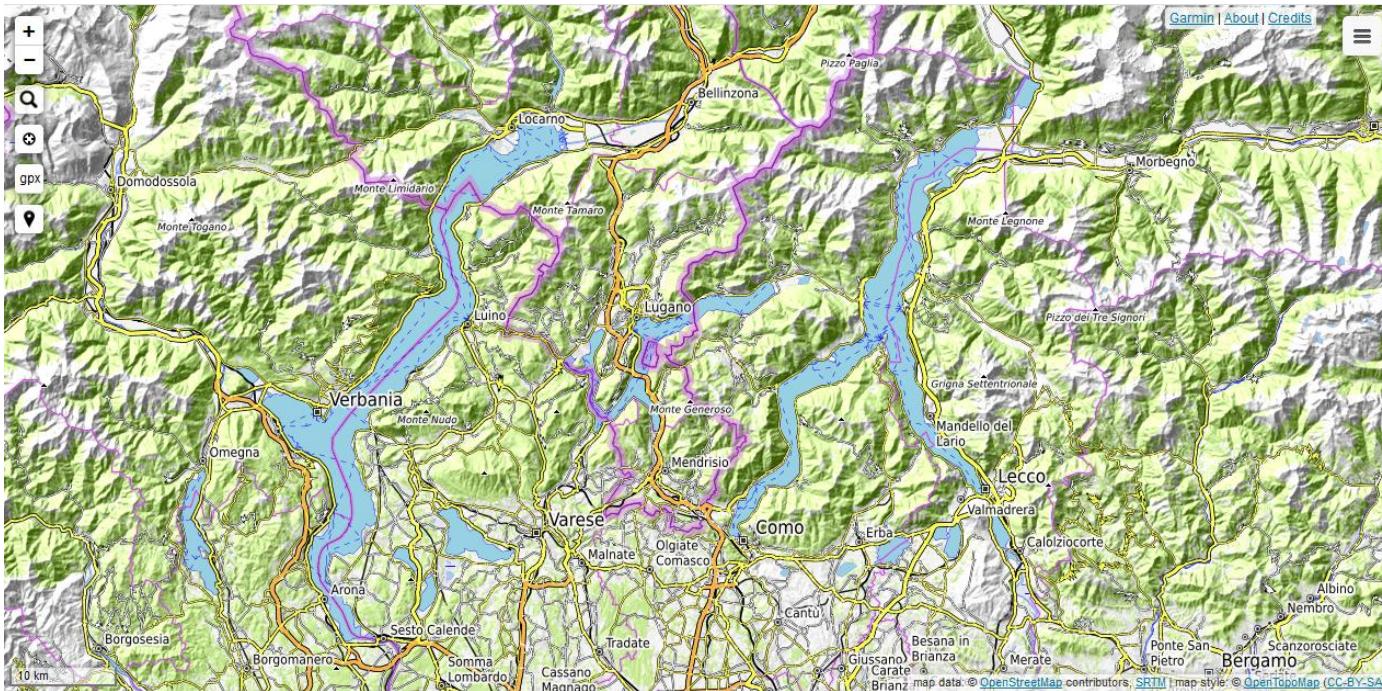
OpenStreetMap visualization

- The same data can be visualized in multiple different styles.



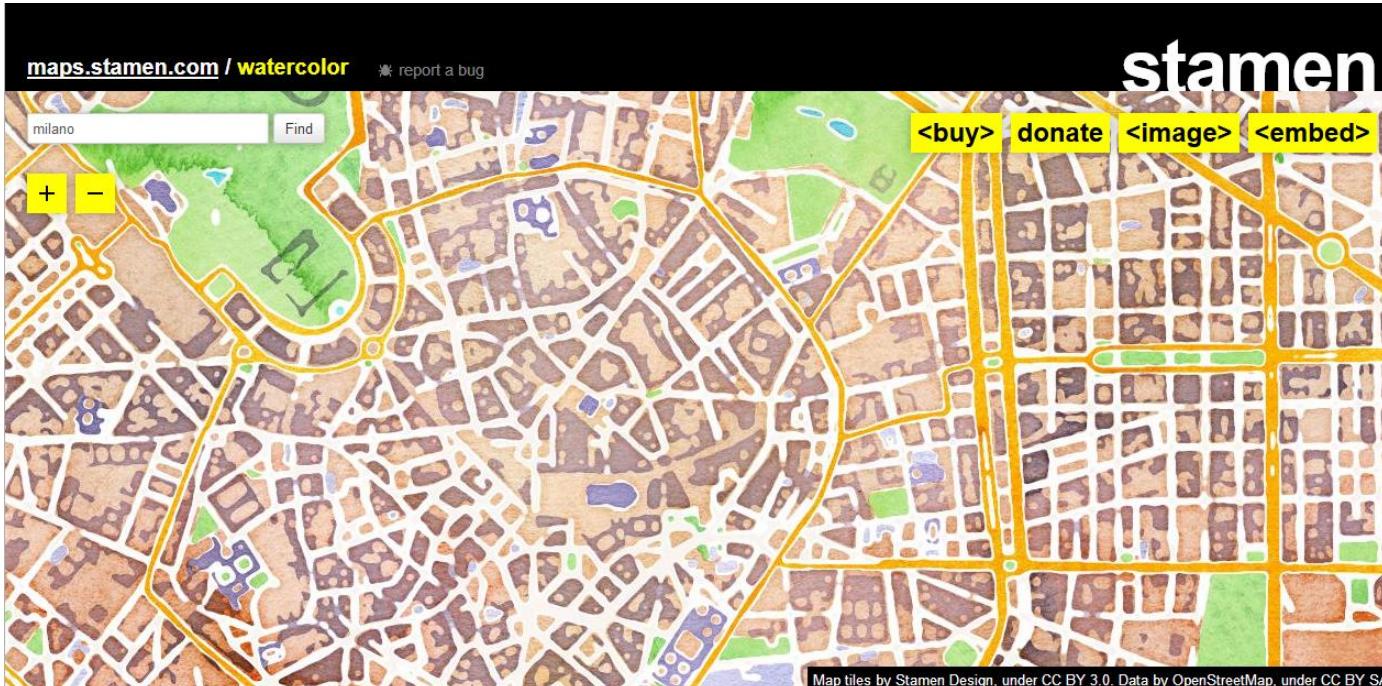
OpenStreetMap visualization

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



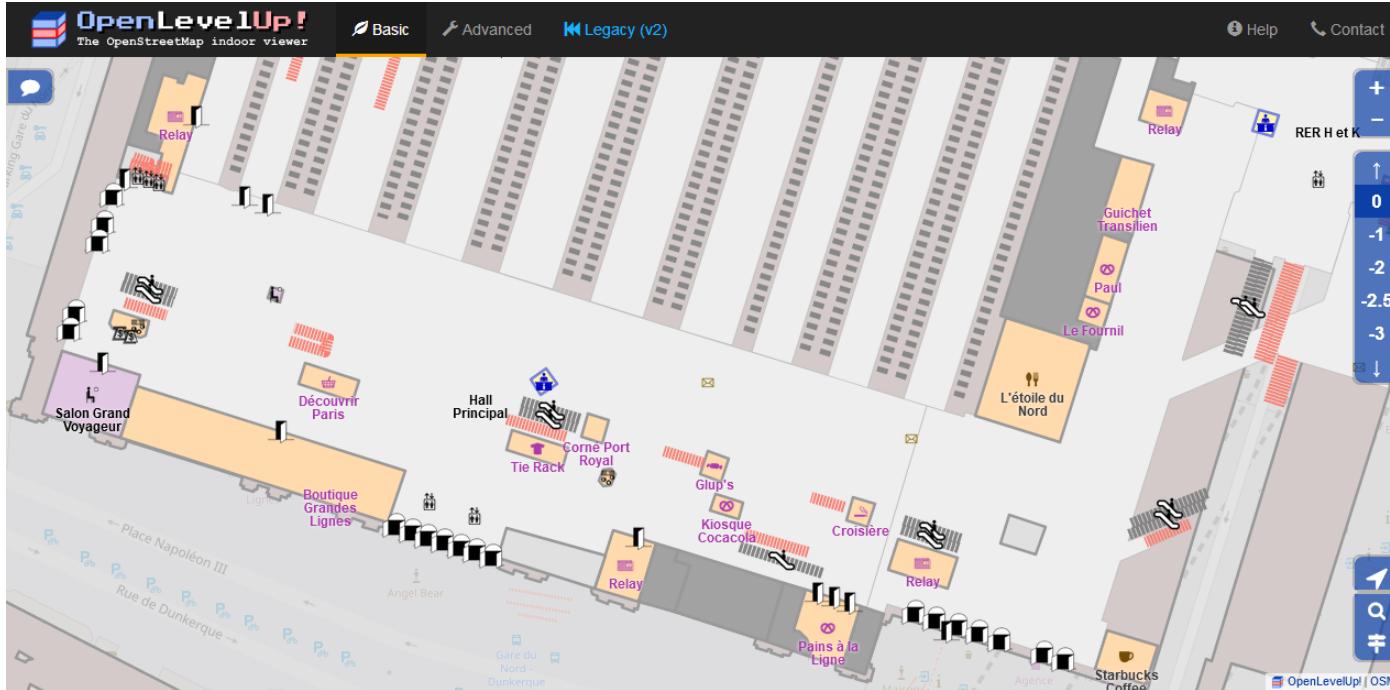
OpenStreetMap visualization

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



OpenStreetMap visualization

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



OpenStreetMap visualization

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



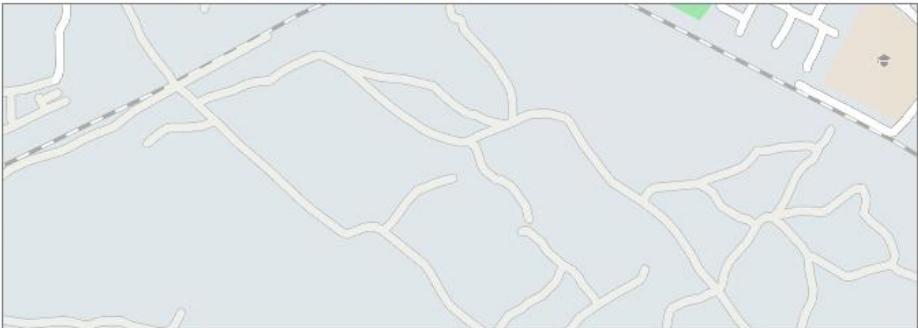
OpenStreetMap vs. other geospatial data sources

- OpenStreetMap is often richer than any other database!

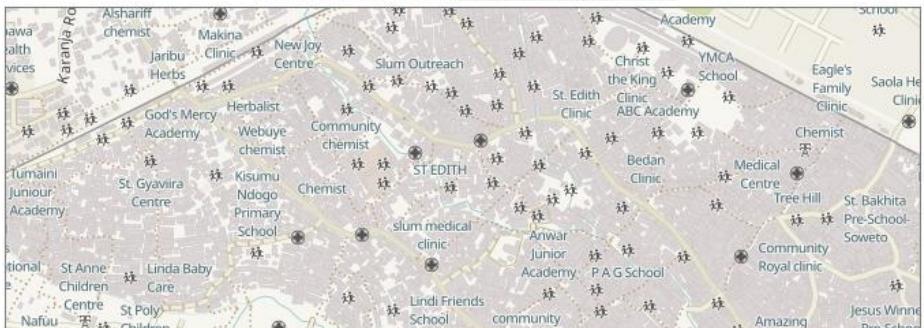
Choose map type: OSM Carto



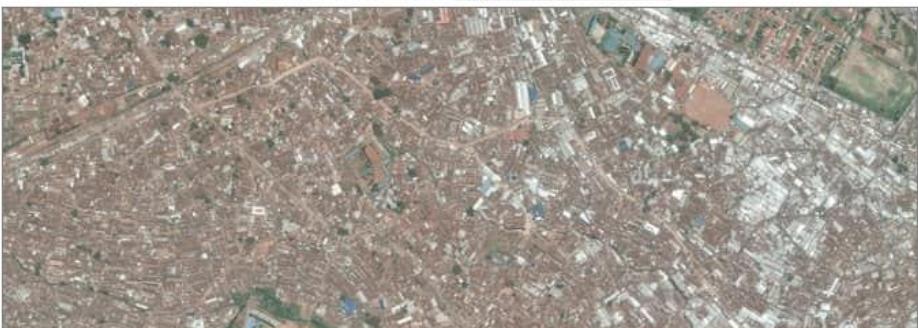
Choose map type: HERE Map



Choose map type: OSM Humanitarian



Choose map type: HERE Satellite



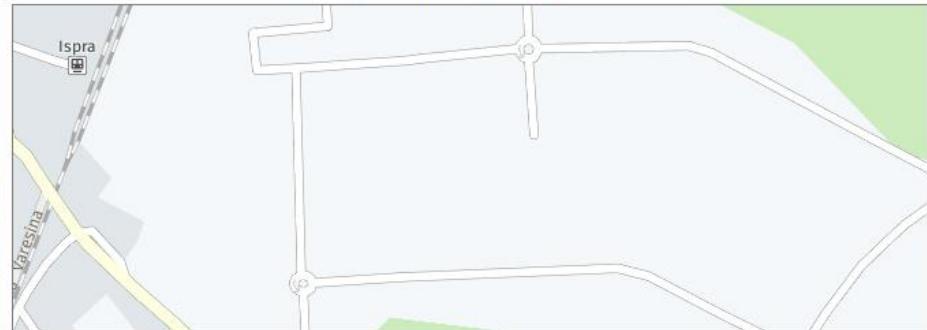
OpenStreetMap vs. other geospatial data sources

- OpenStreetMap is often richer than any other database!

Choose map type: OSM Carto



Choose map type: HERE Map



Choose map type: OSM Humanitarian



Choose map type: HERE Satellite



OpenStreetMap License

- OpenStreetMap is open data, licensed under the [Open Data Commons Open Database License \(ODbL\)](#) by the OpenStreetMap Foundation (OSMF).

You are free:



To Share: To copy, distribute and use the database.



To Create: To produce works from the database.



To Adapt: To modify, transform and build upon the database.

As long as you:



Attribute: You must attribute any public use of the database, or works produced from the database, in the manner specified in the ODbL. For any use or redistribution of the database, or works produced from it, you must make clear to others the license of the database and keep intact any notices on the original database.



Share-Alike: If you publicly use any adapted version of this database, or works produced from an adapted database, you must also offer that adapted database under the ODbL.



Keep open: If you redistribute the database, or an adapted version of it, then you may use technological measures that restrict the work (such as DRM) as long as you also redistribute a version without such measures.

<http://opendatacommons.org/licenses/odbl/summary>

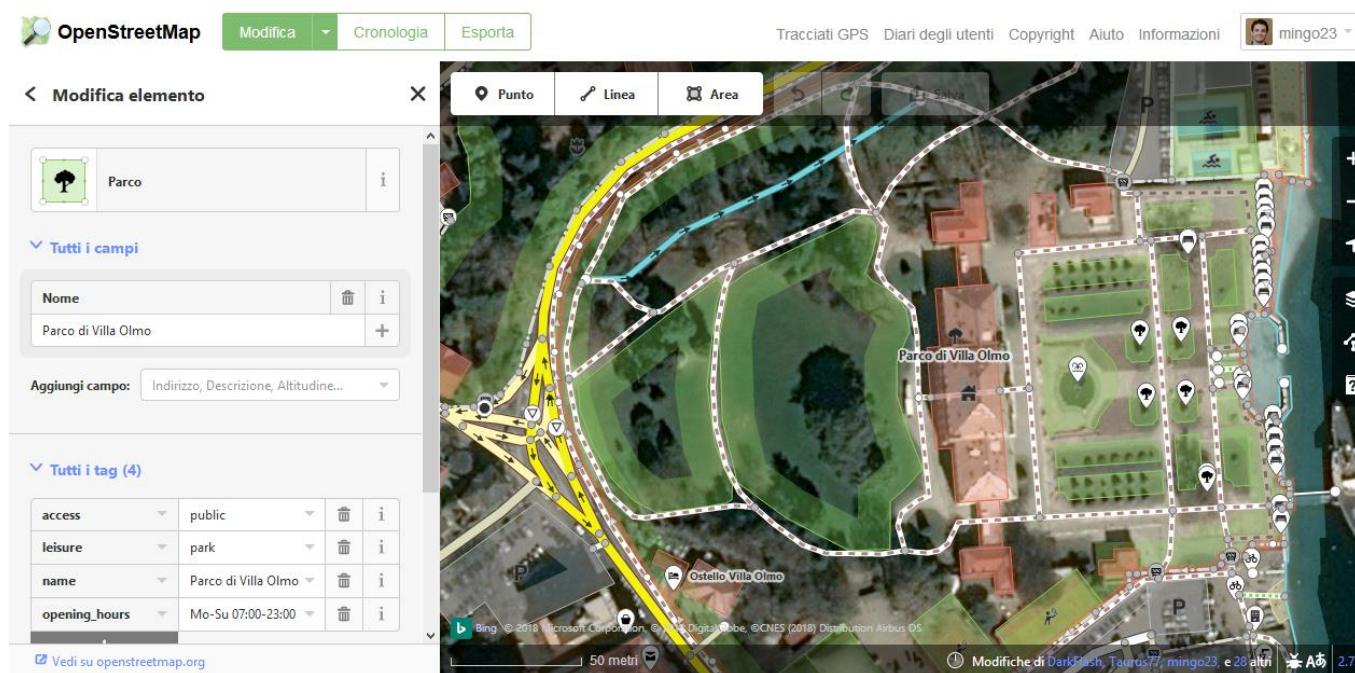
How to contribute?

OpenStreetMap Contribution

- There are three main ways to contribute data to OSM:
 - **outdoor mapping (field mapping)** implies to know the area to be mapped through a personal field survey; data is uploaded using specific software.
 - **armchair mapping (remote mapping)** 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.
 - **community import (bulk import)** 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.

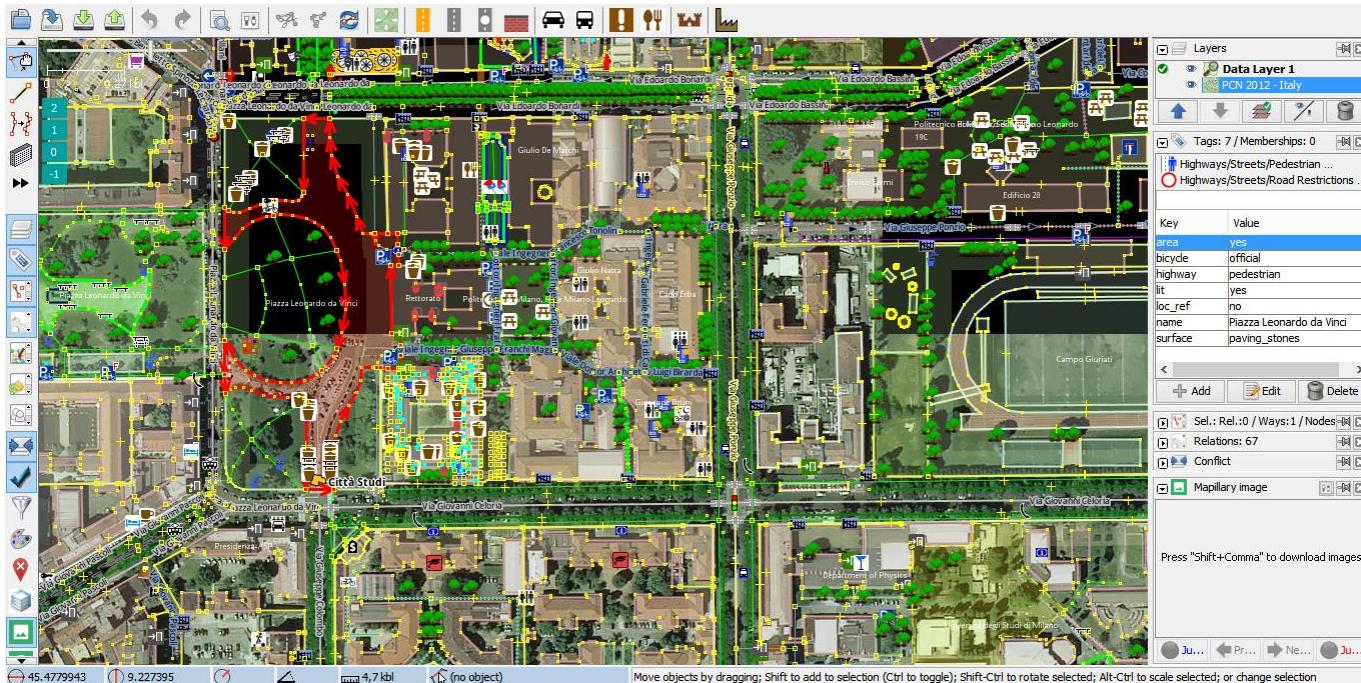
OpenStreetMap Contribution

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



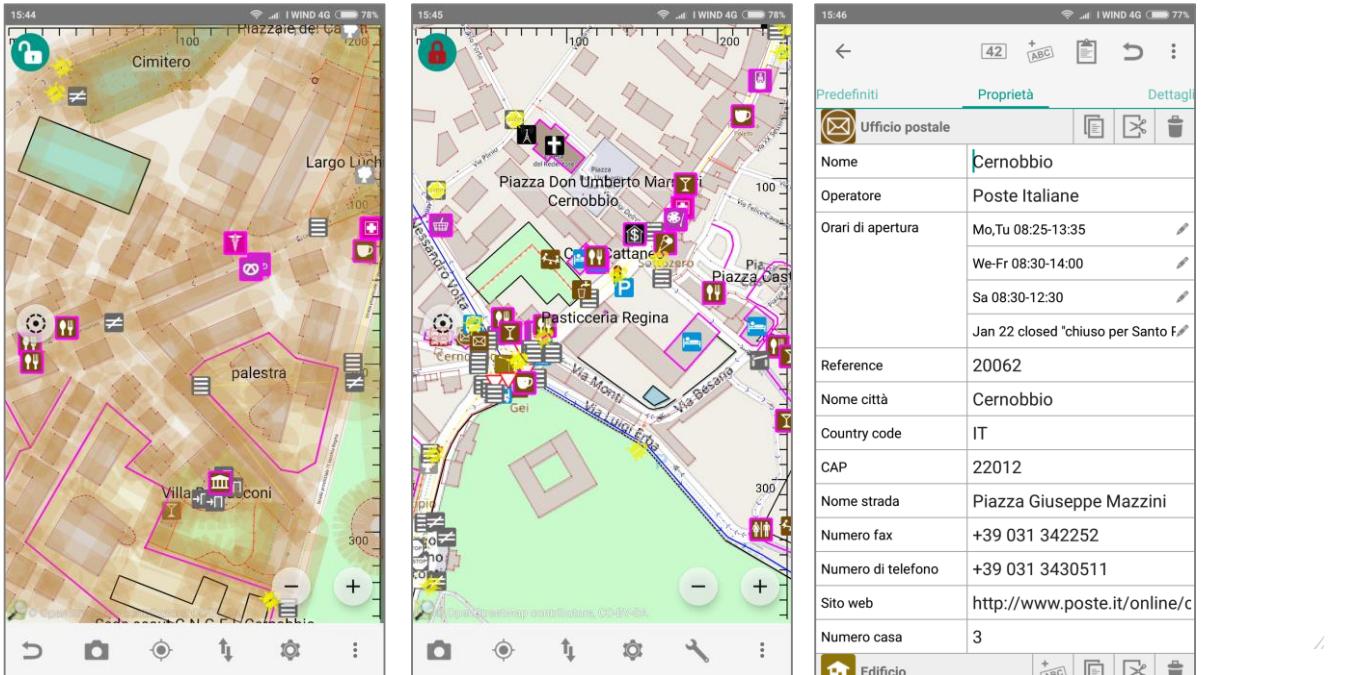
OpenStreetMap Contribution

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



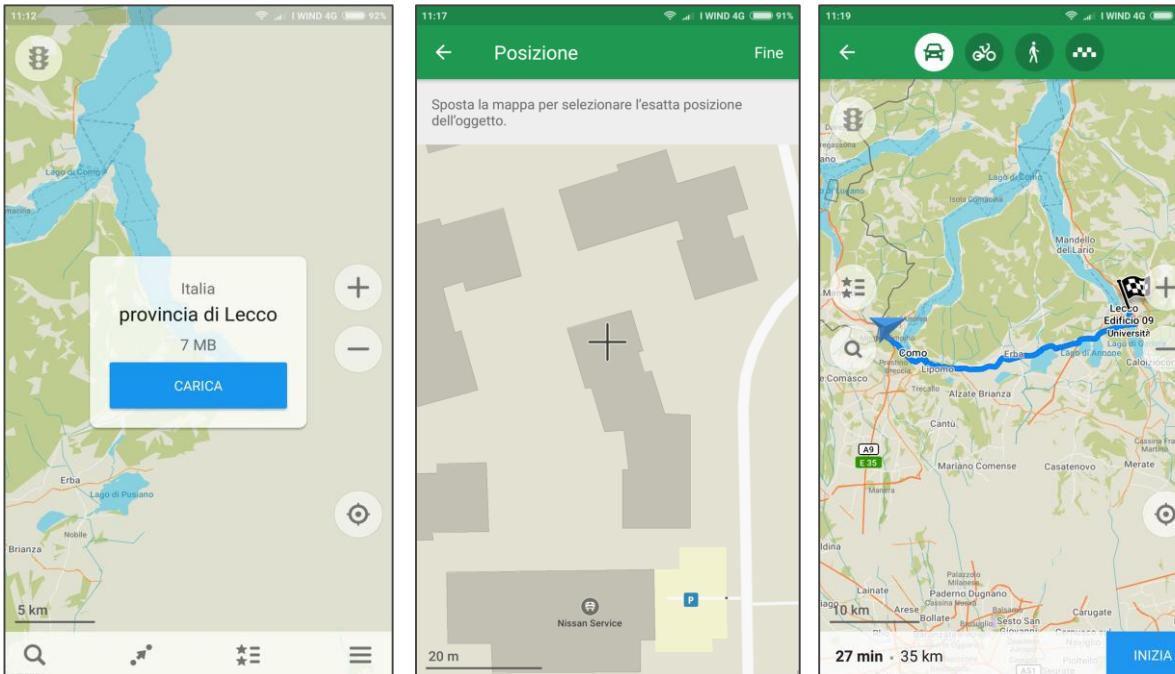
OpenStreetMap Contribution

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



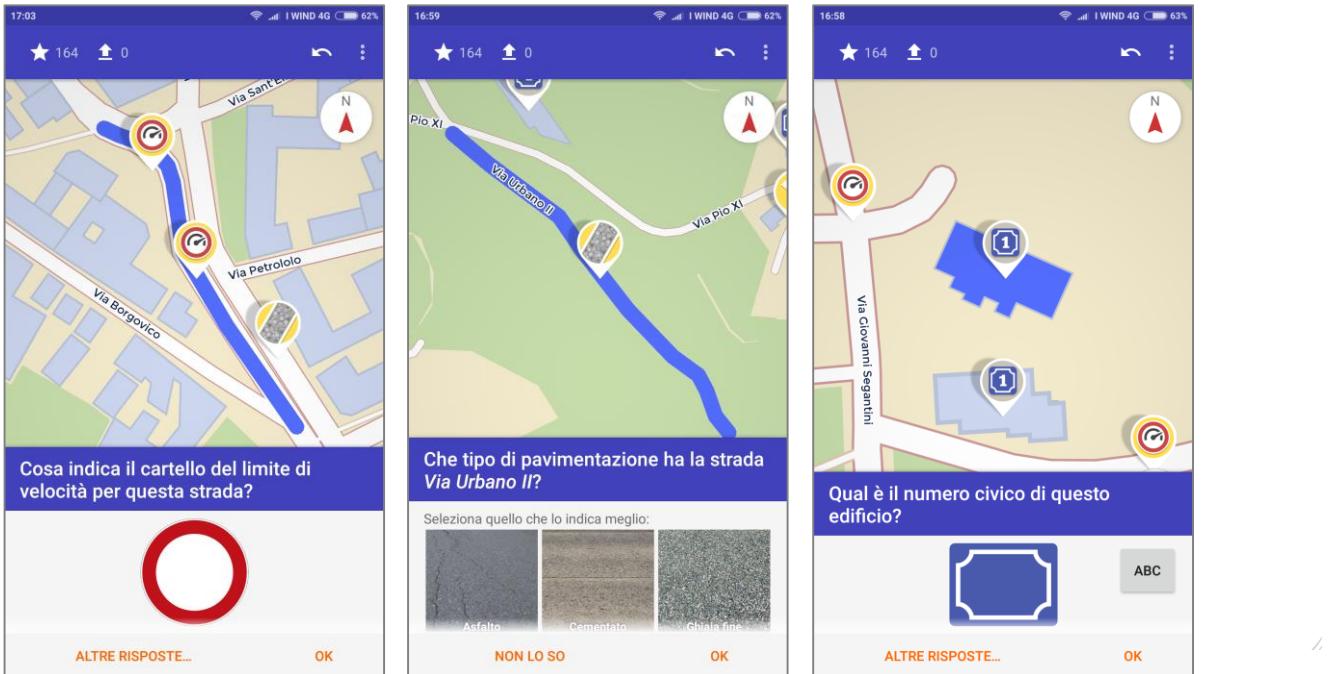
OpenStreetMap Contribution

- OSM editors include:
 - [MAPS.ME](#): Android/iOS app to add OSM nodes and navigate offline



OpenStreetMap Contribution

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



OpenStreetMap data model

OpenStreetMap data model - Geometries

- Each object is the result of a combination between a **geometry** and one or more **tags**.
- There are three different types of **geometry**:
 - **node** - a single point: 
 - point objects: tree, bench, gate, trash bin, etc.
 - **way** - an ordered list of up to 2000 nodes:   
 - linear objects: road, river, wall, hedge, etc.
 - polygonal objects: building, lake, residential area, etc.
 - **relation** - an ordered list of nodes, ways and/or other relations: 
 - complex data structures: transportation lines, multipolygon, etc.

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

OpenStreetMap data model - Tags

- Each object is the result of a combination between a **geometry** and one or more **tags**.
- **Tags** are the geometry **attributes**. The objects tagging is a very critical process:
 - each tag consists of two elements: a **key** and a **value**
 - example:

building	=	hotel
----------	---	-------

key value
- Each object must have at least one tag
- There is no limit to the number of tags

OpenStreetMap – How to create an object

- Create the **geometry** of the feature.



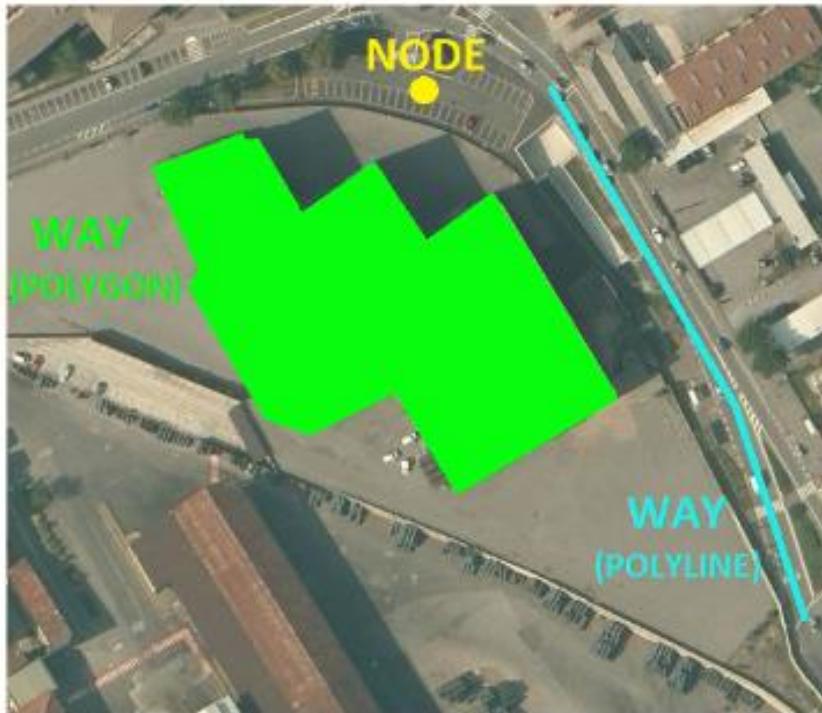
OpenStreetMap – How to create an object

- Create the **geometry** of the feature.



OpenStreetMap – How to create an object

- Create the **geometry** of the feature.



OpenStreetMap – How to create an object

- Create the **geometry** of the feature.
- Add **tags** to the feature.



OpenStreetMap Data Model - Tags

- Each object is the result of a combination between a **geometry** and one or more **tags**.
- **Tags** are the geometry **attributes**. The objects tagging is a very critical process:
 - manuals and services are available to guide the tagging process

Building				
Key	Value	Element	Comment	Photo
Accommodation				
building	apartments	<input checked="" type="checkbox"/>	A building arranged into individual dwellings, often on separate floors. May also have retail outlets on the ground floor.	
building	farm	<input checked="" type="checkbox"/>	A residential building on a farm (farmhouse). For other buildings see below <code>building=farm_auxiliary</code> , <code>building=barn</code> , ... If in your country farmhouse looks same as general residential house then you can tag as <code>building=house</code> as well. See also <code>landuse=farmyard</code>	
building	hotel	<input checked="" type="checkbox"/>	A building designed with separate rooms available for overnight accommodation. Normally used in conjunction with <code>tourism=hotel</code> for the hotel grounds including recreation areas and parking.	
building	house	<input checked="" type="checkbox"/>	A dwelling unit inhabited by a single household (a family or small group sharing facilities such as a kitchen). Houses forming half of a semi-detached pair, or one of a row of terraced houses, should share at least two nodes with joined neighbours, thereby defining the <code>party_wall</code> between the properties.	
building	detached	<input checked="" type="checkbox"/>	A single dwelling unit inhabited by family or small group sharing facilities such as a kitchen.	

Tags

Pagina 1 di 6 JSON Visualizzazione da 1 a 14 di 75 oggetti

Conteggio	Chiave	Valore
211 837	building	church
413	building:use	church
359	building:part	church
98	building	parish_church

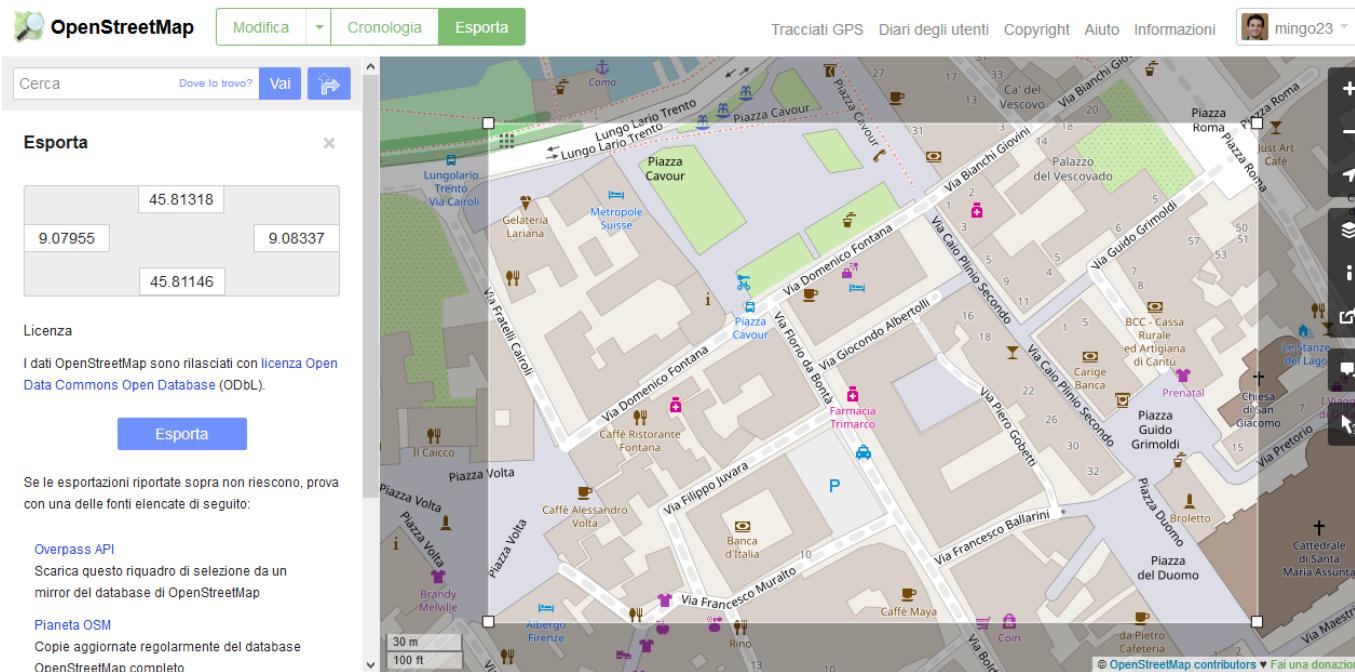
http://wiki.openstreetmap.org/wiki/Map_Features

<https://taginfo.openstreetmap.org>

OpenStreetMap data download

How to download OSM data?

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



How to download OSM data?

- 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](#)

77 GB, created 7 hours ago.

md5: 85e7f0719ba710221520d267e3017846.

[Latest Weekly Changesets](#)

2.7 GB, created 7 hours ago.

md5: 85efe45c7d245534f8c7e7bc4c385e07.

[Latest Weekly Planet PBF File](#)

45 GB, created 7 hours ago.

md5: ed14fb048b7fdd4d5c893e2fd0a00af.

<https://planet.openstreetmap.org>

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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](#)

116 GB, created 7 hours ago.

md5: 75df76ca594202eb2129a3233084ee48.

[Latest Full History Planet PBF File](#)

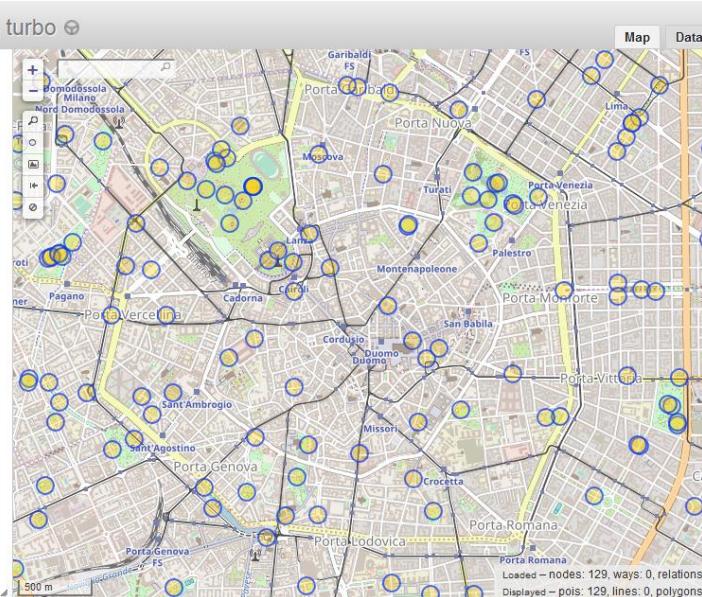
74 GB, created 7 hours ago.

md5: 77d24e5efd987b457852dc12f1fa442f.

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

How to download OSM data?

- 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



The screenshot shows the Overpass Turbo interface. At the top, there is a menu bar with options: Run, Share, Export, Wizard, Save, Load, Settings, Help, and a search bar containing "overpass turbo". Below the menu is a code editor window displaying a query:

```
1 /*
2  * This has been generated by the overpass-turbo wizard.
3  * The original search was:
4  *   "drinking water"
5  */
6 [out:json][timeout:25];
7 // gather results
8 (
9   // query part for: "drinking water"
10  node["amenity"="drinking_water"]((bbox));
11 );
12 // print results
13 out body;
14 >;
15 out skel qt;
```

To the right of the code editor is a map of Milan, Italy, showing various neighborhoods and landmarks. Numerous yellow circular markers are scattered across the map, representing the locations of drinking water points found by the query. The map includes labels for areas like "Borodossola", "Milano Nord Domodossola", "Porta Nuova", "Porta Venezia", "Palestro", "Porta Romana", and "Porta Genova". A legend in the bottom right corner indicates that the yellow circles represent "pois". A status bar at the bottom right shows statistics: "Loaded - nodes: 129, ways: 0, relations: 0" and "Displayed - pois: 129, lines: 0, polygons: 0".

How to download OSM data?

- 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.

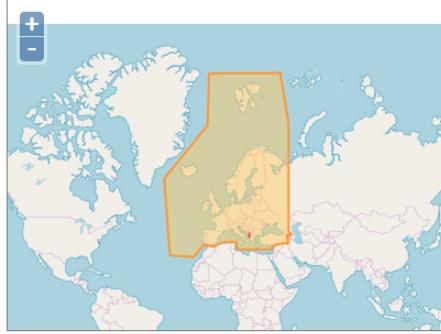
Other Formats and Auxiliary Files

- [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: [6e0ceb99c8dcf814adb229c661cf66f](#).
- [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.

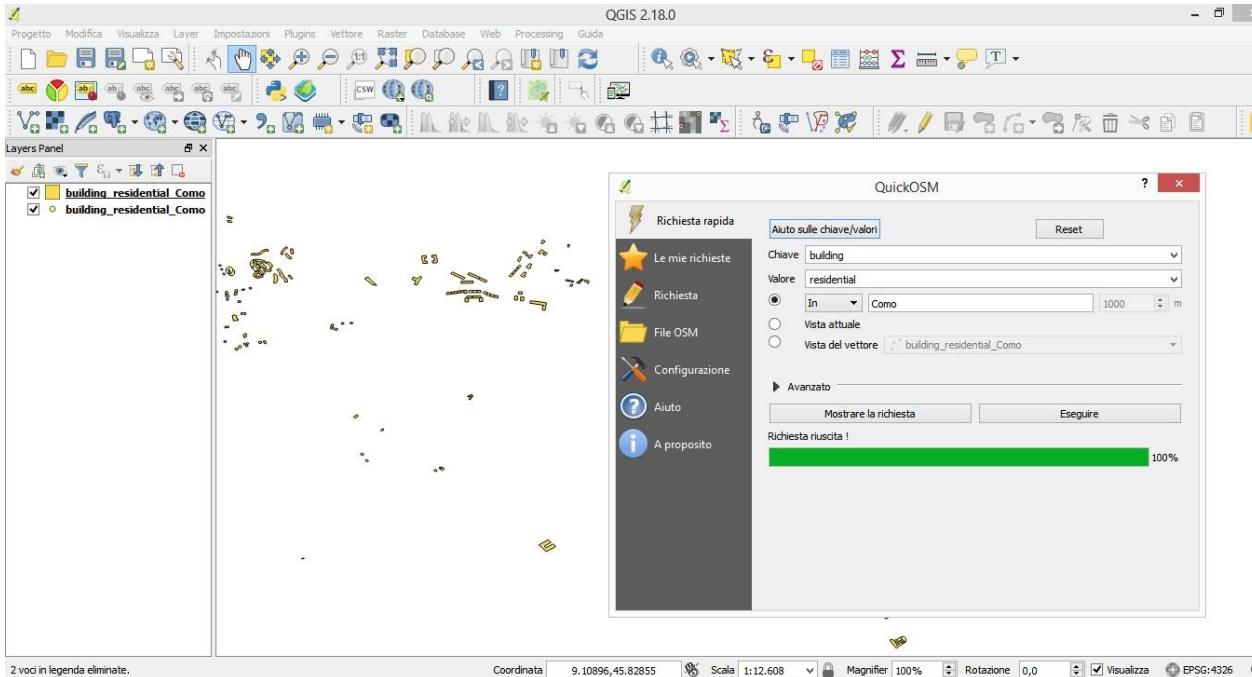
Sub Region	Quick Links		
	.osm.pbf	.shp.zip	.osm.bz2
Albania	.osm.pbf (26.5 MB)	.shp.zip	.osm.bz2
Andorra	.osm.pbf (1.5 MB)	.shp.zip	.osm.bz2



 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 website](#) and contact us if we can be of service.

How to download OSM data?

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



OpenStreetMap in games

How is OpenStreetMap used in games?

- Many games use OSM as the base map source:

- X-Plane



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

- Tom Clancy's The Division



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

- Collapse



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

- Pokemon Go



<https://pokemongolive.com>

References

- Mooney P. & Minghini M. (2017) A review of OpenStreetMap data. In: *Mapping and the Citizen Sensor*, 37-59. London: Ubiquity Press.
<https://www.ubiquitypress.com/site/books/10.5334/bbf>
- Minghini M. (2018) Digital ecosystem for OpenStreetMap Data.
<https://tinyurl.com/y5jlbnwz>

Thank you!

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LinkedIn: [Joint Research Centre](https://www.linkedin.com/company/joint-research-centre/)



YouTube: [EU Science Hub](https://www.youtube.com/EU.ScienceHub)