



POLITECNICO
MILANO 1863

Working with OpenStreetMap data

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Background

OSM looks to map ALL visible physical objects such as: points of interest, roads, buildings, transportation systems, land use, social facilities such as health, education, government, law, shops, industry, water systems, sanitation systems, energy systems, environmental features.

Also looks to map administrative and legal boundaries, land parcels, administrative zones, transportation lines etc..



Data Model

All features in OSM are either nodes, polylines, polygons or relations

- **Nodes** – single point -geo coordinate + tags
- **Polylines** – an ordered list of nodes + tags (start and end node are different)
- **Polygons** – an ordered list of nodes + tags (start and end node are the same)
- **Relations** – a logical grouping of nodes, polylines and polygons + tags (example – country boundary)



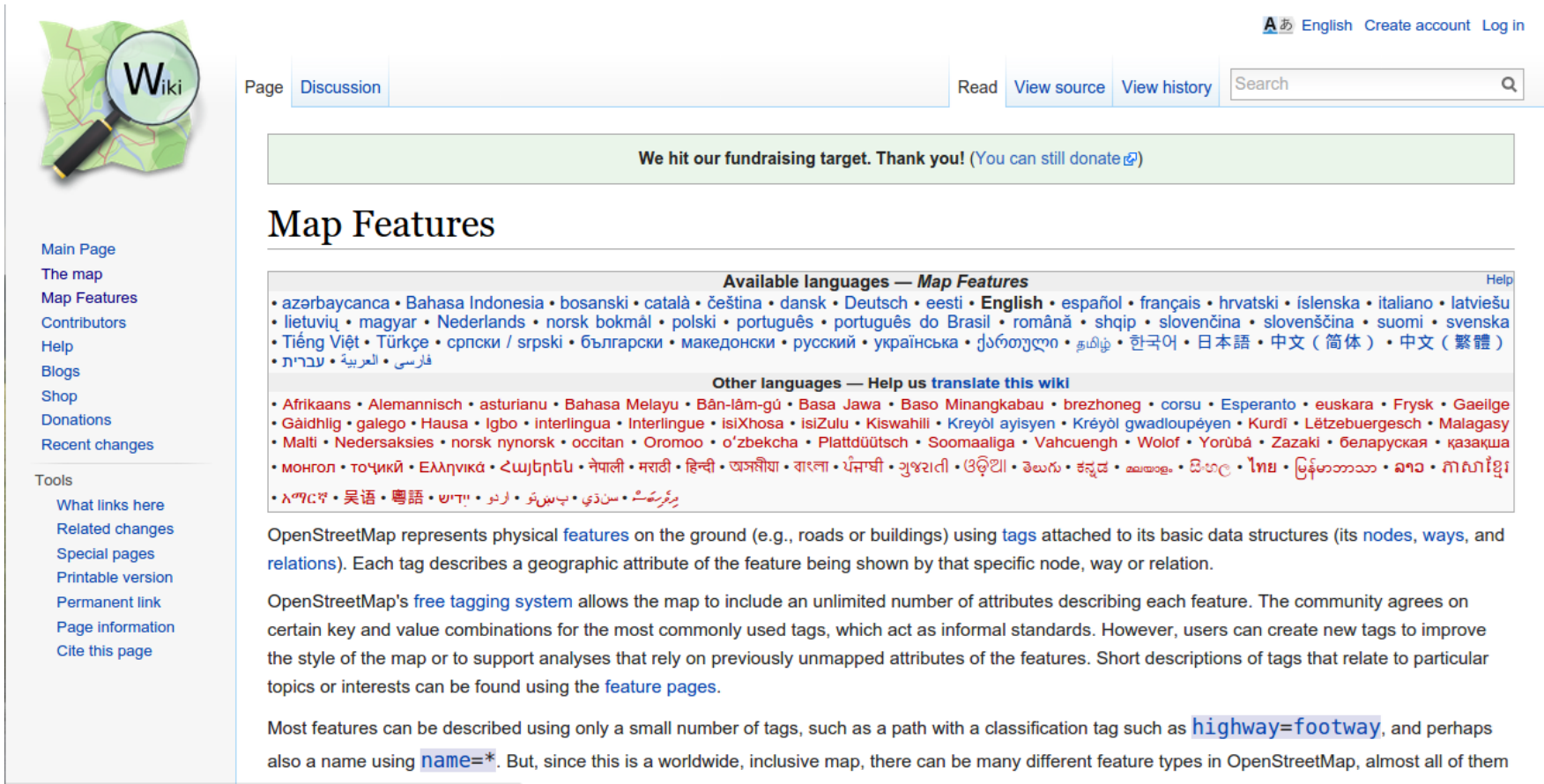
Data Model

- In OSM terminology the term **WAY** is used to describe either polylines or polygons
- Usually tags are then used to distinguish between WAYS which represent polylines or polygons.
- In many websites you will find the term WAY instead of polylines or polygon. They can be used interchangeably



Data Structure - Tags

- Tagging is one of the most important aspects of OpenStreetMap
- Tagging in OpenStreetMap is very flexible



The screenshot shows the OpenStreetMap Wiki page for 'Map Features'. The page has a green header with a 'Wiki' logo and a search bar. The main content area is titled 'Map Features' and contains two sections: 'Available languages — Map Features' and 'Other languages — Help us translate this wiki'. The 'Available languages' section lists 20 languages, including English, which is highlighted. The 'Other languages' section lists 20 more languages, including Afrikaans, Alemannisch, and others. The page also has a sidebar with links to 'Main Page', 'The map', 'Map Features', 'Contributors', 'Help', 'Blogs', 'Shop', 'Donations', and 'Recent changes'. At the bottom, there is a footer with the Politecnico Milano 1863 logo and name.

Available languages — Map Features

• azərbaycanca • Bahasa Indonesia • bosanski • català • čeština • dansk • Deutsch • eesti • **English** • español • français • hrvatski • íslenska • italiano • latviešu • lietuvių • magyar • Nederlands • norsk bokmål • polski • português • português do Brasil • română • shqip • slovenčina • slovenščina • suomi • svenska • Tiếng Việt • Türkçe • српски / srpski • български • македонски • русский • українська • ქართული • தமிழ் • 한국어 • 日本語 • 中文（简体） • 中文（繁體） • עברית • العربية • فارسی

Other languages — Help us translate this wiki

• Afrikaans • Alemannisch • asturianu • Bahasa Melayu • Bân-lâm-gú • Basa Jawa • Baso Minangkabau • brezhoneg • corsu • Esperanto • euskara • Frysk • Gaeilge • Gàidhlig • galego • Hausa • Igbo • interlingua • Interlingue • isiXhosa • isiZulu • Kiswahili • Kreyòl ayisyen • Kreyòl gwadloupéyen • Kurdî • Lëtzebuergesch • Malagasy • Malti • Nedersaksies • norsk nynorsk • occitan • Oromoo • oʻzbekcha • Plattdüütsch • Soomaaliga • Vahcuengh • Wolof • Yorùbá • Zazaki • беларуская • қазақша • монгол • тоҷикӣ • Ελληνικά • Հայերեն • नेपाली • मराठी • हिन्दी • অসমীয়া • বাংলা • ਪੰਜਾਬੀ • ગુજરાતી • ଓଡ଼ିଆ • తెలుగు • ಕನ್ನಡ • ಕುಮಾಯೂ • മലയാളം • ཇི་ཡུང་ • ไทย • မြန်မာဘာသာ • ລາວ • གཤམ་ཡིག་ • ལྷ་ཁྱེད་ • 吴语 • 粵語 • עברית • اردو • سنڌي • پښتو • ལྷ་ཁྱེད་

OpenStreetMap represents physical **features** on the ground (e.g., roads or buildings) using **tags** attached to its basic data structures (its **nodes**, **ways**, and **relations**). Each tag describes a geographic attribute of the feature being shown by that specific node, way or relation.

OpenStreetMap's **free tagging system** allows the map to include an unlimited number of attributes describing each feature. The community agrees on certain key and value combinations for the most commonly used tags, which act as informal standards. However, users can create new tags to improve the style of the map or to support analyses that rely on previously unmapped attributes of the features. Short descriptions of tags that relate to particular topics or interests can be found using the **feature pages**.

Most features can be described using only a small number of tags, such as a path with a classification tag such as **highway=footway**, and perhaps also a name using **name=***. But, since this is a worldwide, inclusive map, there can be many different feature types in OpenStreetMap, almost all of them



Data Structure - Tags

- An object can have at minimum 1 attribute (tag) – and there is no upper limit.
- There are no strict rules on how many attributes any object should have
- This flexibility means that you must use your own judgement in regards to how many attributes you provide



Data Structure - Tags



Main Page
The map
Map Features
Contributors
Help
Blogs
Shop
Donations
Recent changes

Tools

What links here
Related changes
Special pages
Printable version
Permanent link
Page information
Cite this page

Page

Discussion

Read

View source

View history

Search

Aあ

We hit our fundraising target. Thank you! (You can still donate [🔗](#))

Tag:amenity=restaurant

Available languages — *Tag:amenity=restaurant*

• Deutsch • English • español • français • italiano • português do Brasil • русский • 日本語

Other languages — [Help us translate this wiki](#)

amenity=restaurant is for a generally formal place with sit-down facilities selling full meals served by waiters and often licensed (where allowed) to sell alcoholic drinks.

Contents [hide]

- 1 How to Map
- 2 Examples
- 3 Rendering
- 4 See Also

How to Map

Add a node at the centre of the building and add **amenity=restaurant** to it. You can name it with **name=***. If the whole building is used for this feature and its footprint is present in OSM, you can apply the tags on the area if you prefer.

Optionally, you can further classify it using the **cuisine=*** tag with a value suitable for your nation's environment

 ameni



Description

Is for a generally formal sit-down facility selling full meals served by waiters and often licensed (where allowed) to sell alcoholic drinks.



Data Structure - Tags

One tag is mandatory. In this case the most appropriate is amenity = restaurant

All the others are not mandatory

amenity = restaurant

name = Riva

cuisine = Italian

smoking = no

internet_access = wlan



The screenshot shows the OpenStreetMap Wiki page for the tag **amenity=restaurant**. The page layout includes a sidebar on the left with links like 'Main Page', 'The map', 'Map Features', 'Contributors', 'Help', 'Blogs', 'Shop', 'Donations', 'Recent changes', 'Tools', 'What links here', 'Related changes', 'Special pages', 'Printable version', 'Permanent link', 'Page information', and 'Cite this page'. The main content area has a header 'Tag:amenity=restaurant' and a sub-header 'Available languages — Tag:amenity=restaurant' with links for Deutsch, English, español, français, italiano, português do Brasil, русский, and 日本語. Below this is a description: 'amenity=restaurant is for a generally formal place with sit-down facilities selling full meals served by waiters and often licensed (where allowed) to sell alcoholic drinks.' There is also a 'Contents' section with links to '1 How to Map', '2 Examples', '3 Rendering', and '4 See Also'. The 'How to Map' section provides instructions on how to add a node to a building and apply the tag. On the right side, there is a small image of a restaurant interior and a 'Description' section.



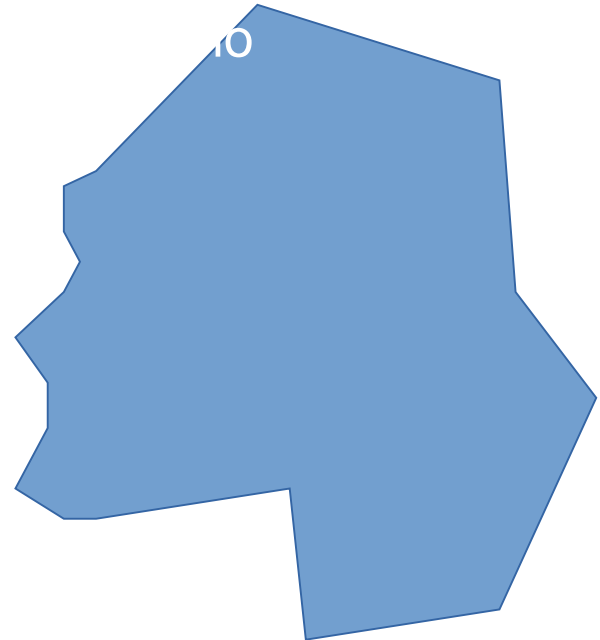
Data Structure - Tags

Highway=residential
Name = Sleepy Street
Ref = R167



Name = NH Hotel
Amenity = Hotel
Building = hotel
Address = 27 S. Street
City = Como

Building = yes
Address = 17 S. Street
City = Como



Data Structure - Tags

All the tags can be found in taginfo, with statistical information:

<https://taginfo.openstreetmap.org/>



Data from: 2015-07-07 23:58 UTC

English ▼

KEYS

- building • source • highway • name • amenity •
- addr:housenumber • addr:street •
- shop • landuse • surface • natural • ...

[See all keys...](#)

TAGS

- building=yes •
- highway=residential •
- highway=service • building=house
- wall=no • highway=track •
- waterway=stream • ...

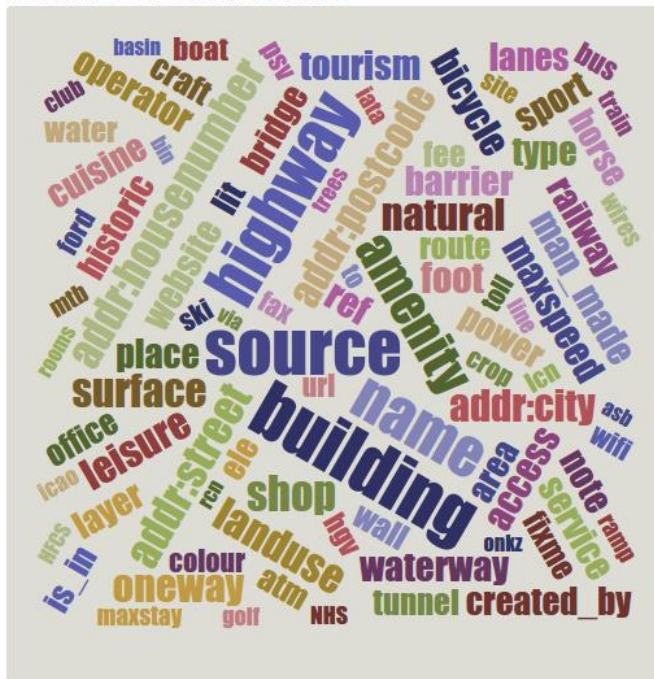
[See most common tags...](#)

RELATION TYPES

multipolygon • restriction • route •
boundary • associatedStreet • site
• public_transport • route_master
• destination_sign • waterway •
turnlanes:turns • ...

[See all relation types...](#)

SOME POPULAR KEYS



REPORTS

Reports show the tag data from different angles. They often bring together data from several sources in interesting ways. Some of the reports can help with finding specific errors.

- Characters in keys
- Database statistics
- Frequently used keys without wiki page
- Historic development
- Key lengths
- Language comparison table for keys in the wiki
- Languages
- Similar keys
- Wiki images
- Wiki pages about non-existing keys

[See all reports...](#)

ABOUT

OpenStreetMap uses **tags** of the form **key=value** to add meaning to geographic objects. Taginfo collects information about these tags from several sources to help you understand what they mean and how they are used.

More about taginfo...

INTERNATIONAL

This is the main taginfo site. It contains OSM data for the whole planet and is updated daily.

→ See other taginfo sites...

→ [OpenStreetMap](#) · Data © OSM contributors (ODbL)

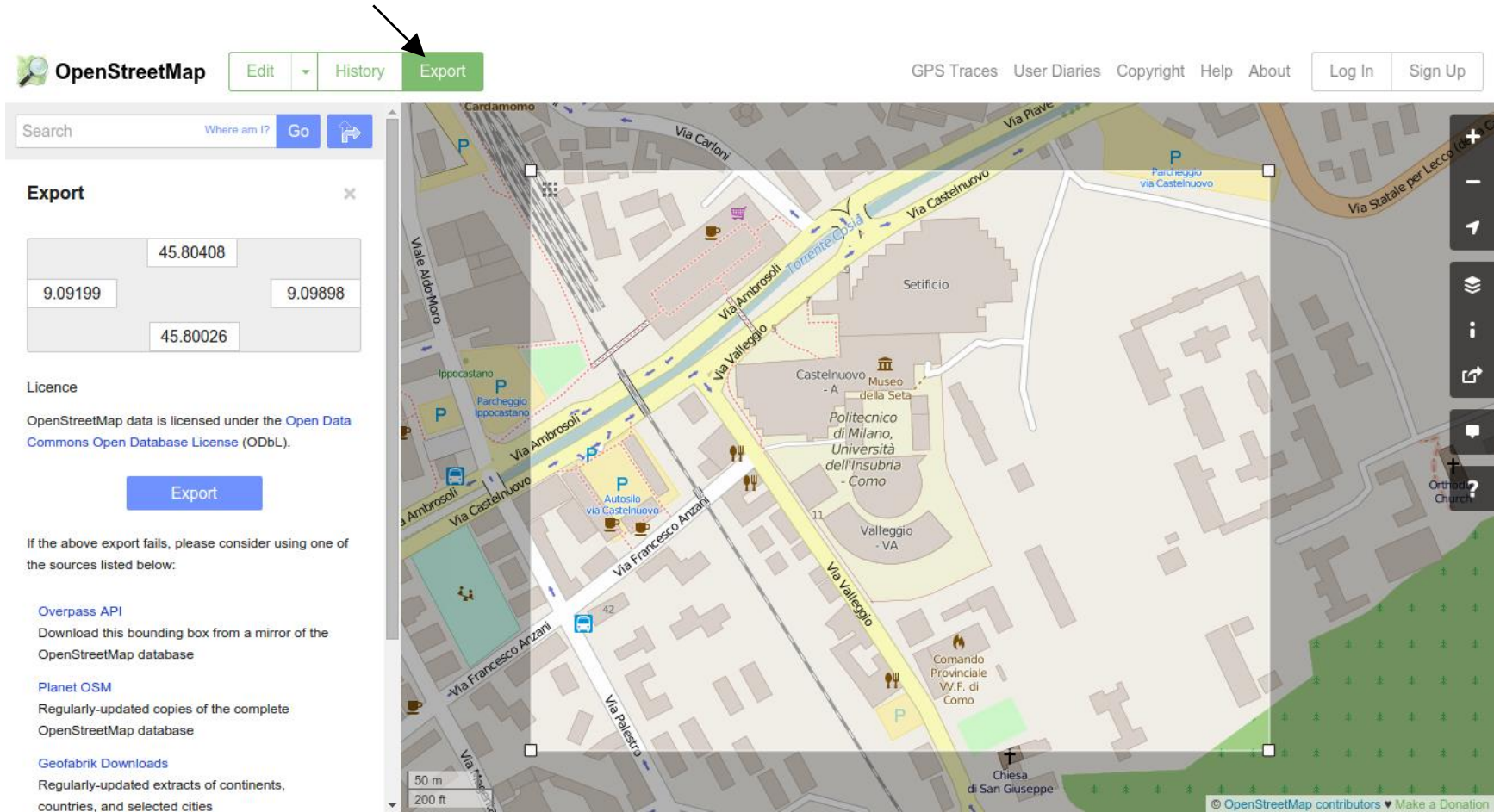
[Keys](#) · [Tags](#) · [Relations](#) · [Reports](#) · [Sources](#) · [Projects](#) · [Download](#) · [API](#) · [About](#) · [Help](#) · [→ taginfo wiki page](#)



POLITECNICO MILANO 1863

Data Download

OpenStreetMap allows users to download the data from their main website (<http://www.openstreetmap.org/>), in XML format.



Data Download

Even though XML format contains all the necessary information it is quite difficult to read sometimes. And for large areas, the size of the file could be very big

```
<nd ref="945090749" />
<tag k="addr:city" v="Como" />
<tag k="addr:housenumber" v="42" />
<tag k="addr:postcode" v="22100" />
<tag k="addr:street" v="Via Anzani" />
<tag k="building" v="university" />
<tag k="name" v="Politecnico di Milano" />
<tag k="wheelchair" v="yes" />
</way>
<way id="31722004" visible="true" version="3" changeset="11049724" timestamp="2012-03-21T08:59:01Z" user="N"
<nd ref="354922518" />
<nd ref="354922521" />
<tag k="highway" v="tertiary" />
<tag k="name" v="Via Valleggio" />
<tag k="oneway" v="yes" />
</way>
<way id="31722068" visible="true" version="2" changeset="11049724" timestamp="2012-03-21T08:59:01Z" user="N"
<nd ref="354922521" />
<nd ref="354922523" />
<nd ref="273205003" />
<tag k="highway" v="tertiary" />
<tag k="name" v="Via Valleggio" />
<tag k="oneway" v="yes" />
</way>
<way id="31722069" visible="true" version="6" changeset="27554027" timestamp="2014-12-18T16:47:07Z" user="M"
<nd ref="354922521" />
<nd ref="3120553222" />
<nd ref="3241236209" />
<nd ref="769081171" />
<nd ref="273205915" />
<nd ref="769081179" />
<nd ref="2083450731" />
```

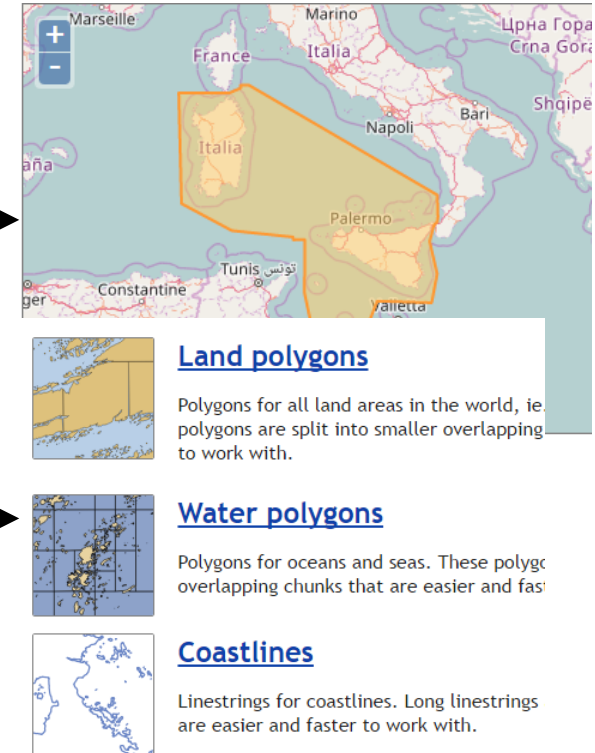
- ID of the object
- VERSION of the object
- CHANGESET it is part of
- TIMESTAMP of when it was created/edited
- USER who created it
- USER ID
- The ordered list of NODES
- The list of tags (no order)



Data Download – Different formats

There are services where you can download OSM data in different formats

- Geofabrik (<http://download.geofabrik.de/>)
 - Download in ESRI SHAPEFILE Format (but not custom area)
- The OpenStreetMap Data (<http://openstreetmapdata.com/>) website provides access to OSM data in SHAPEFILE format.
- Other services are available to provide access to OSM data in other formats such as JSON and GPX



Data Download – Metro Extracts

Mapzen - metro extracts (<https://mapzen.com/data/metro-extracts/>) permits to download custom area in bulk, in an easy way. It is the best method to download large area, such cities or provinces, keeping the consistency of the data.

metro extracts

Every week, Metro Extracts automatically creates snapshots of [OpenStreetMap](#) data into manageable, metro-area files in a variety of formats for you to use. Download an extract from the list of **200 most popular extracts** below to get started right away.

Can't find what you are looking for? You can get **custom extracts** of anywhere in the world! To get started, search for the place you are looking for.

[Your Custom Extracts](#) | [Documentation](#) | [Tutorial](#) | [File Format Guide](#)

SEARCH FOR A CITY OR REGION

Looks like the place you are looking for is part of a popular extract:

Milan

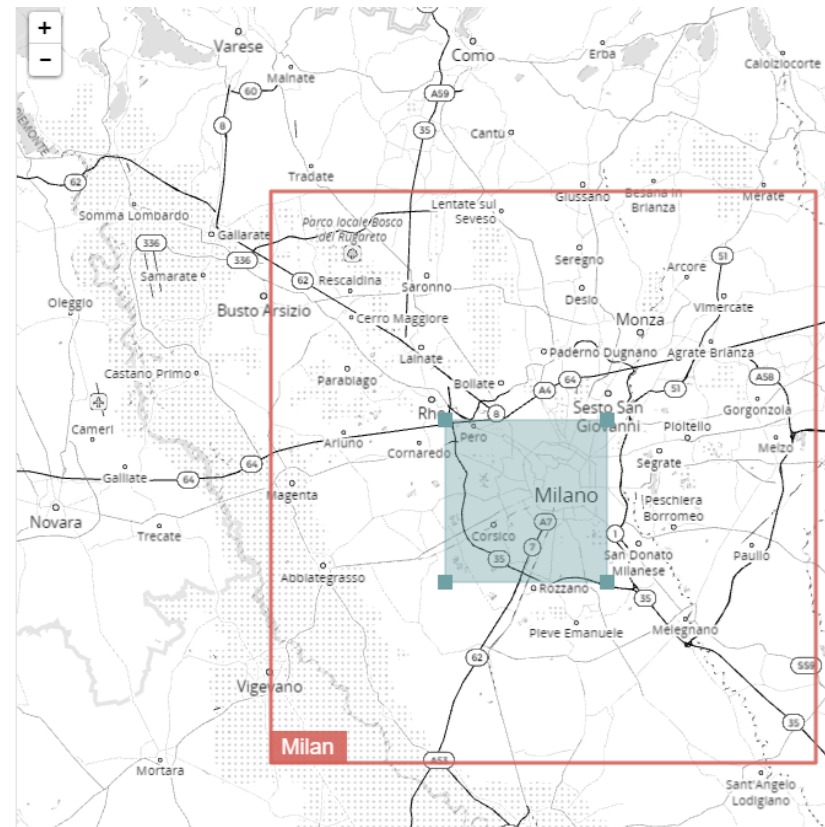
You can make your own extract for Città metropolitana di Milano too!

Step 1: Confirm the boundaries of your custom extract. Drag the corners of the blue box on the map to adjust.

Step 2: Choose a name for your extract:

GET EXTRACT

(Note: Custom extracts take about 30-60 minutes to generate and you will be guided to sign in or sign up for a free Mapzen Developer account)



POLITECNICO MILANO 1863

Data Download – Italian regional extracts

Provided by Wikimedia Italy (OSM Italian chapter): <http://osm-estratti.wmflabs.org/estratti>

Estratti / Marche

Estratti OpenStreetMap

Questa è la pagina della Regione Marche, contiene i dati geografici del database di [OpenStreetMap](#). Sono disponibili per il download gratuito secondo i termini della Licenza [ODbL](#), sono stati estratti alle 00:34 CET del 02/02/2017 e vengono aggiornati ogni giorno. Questo significa che, una modifica fatta adesso, comparirà negli estratti di domani. [Partecipa](#) e migliora la mappa della tua Regione!



Lista delle province in Marche

Se necessiti degli estratti comunali, puoi scegliere una provincia dall'elenco sottostante.

A Ancona **Ascoli Piceno** **F** Fermo **M** Macerata **P** Pesaro e Urbino

Statistiche e Download

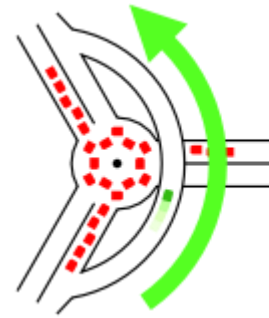
Ogni settimana effettuiamo statistiche sui dati geografici della Regione Marche, per verificare l'andamento del processo di mappatura OpenStreetMap. Confrontiamo quindi questi dati con i valori precedenti e visualizziamo i valori nella tabella qui sotto.



Data Download – Overpass API

- The Overpass API serves up custom selected parts of the OSM map data. It acts as a database over the web: the client sends a query to the API and gets back the data set that corresponds to the query.

- Overpass API is optimized for data consumers that need a few elements within a glimpse or up to roughly 100 million elements in some minutes



Overpass
API

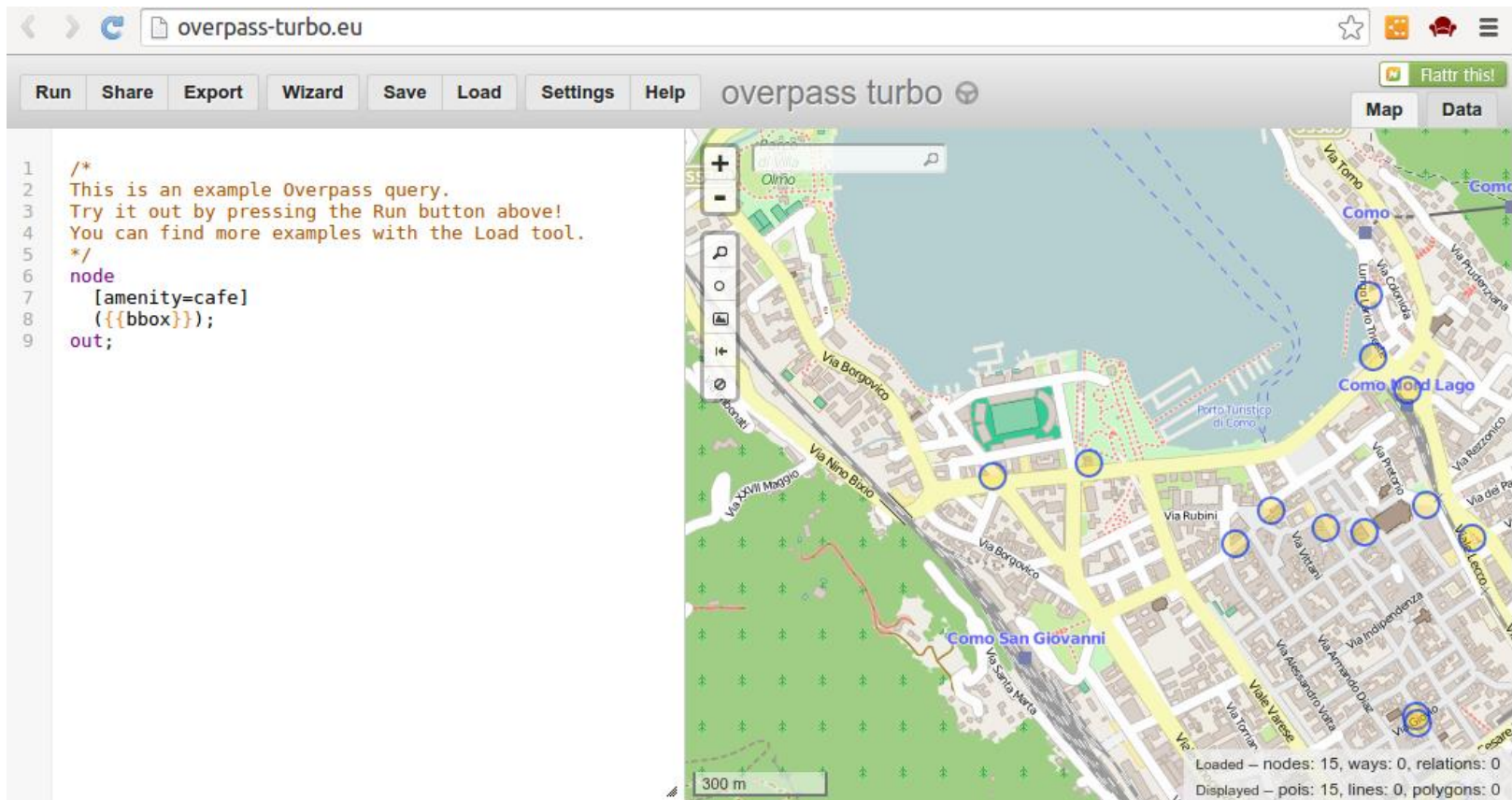
<https://overpass-turbo.eu/>



Data Download – Overpass API

The Overpass API has its own specific query language

http://wiki.openstreetmap.org/wiki/Overpass_API/Language_Guide



The screenshot shows the Overpass Turbo web interface. The browser address bar displays "overpass-turbo.eu". The interface includes a menu bar with "Run", "Share", "Export", "Wizard", "Save", "Load", "Settings", and "Help". A "Run" button is visible. The main area is split into a code editor on the left and a map on the right. The code editor contains the following query:

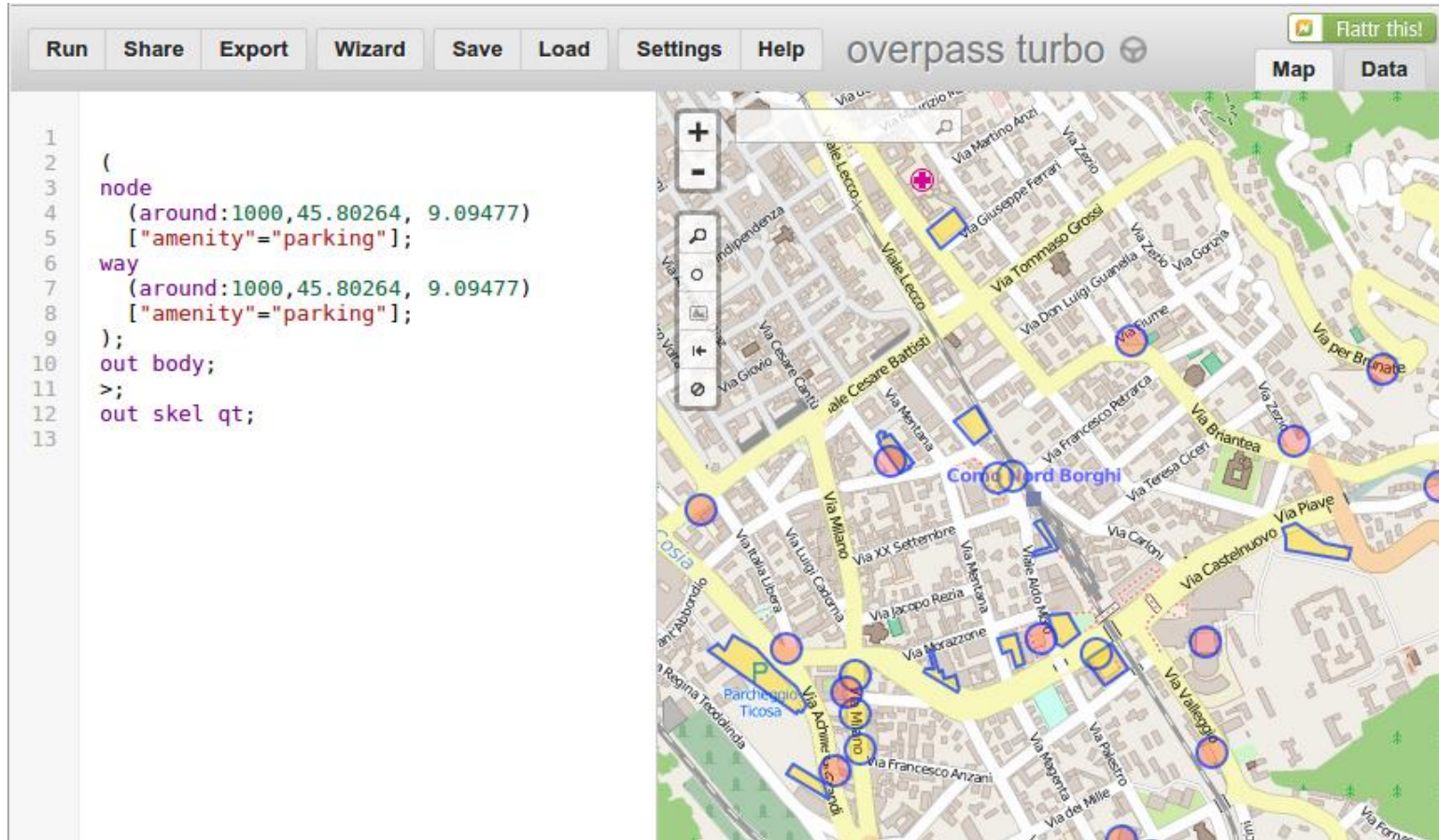
```
1 /*
2 This is an example Overpass query.
3 Try it out by pressing the Run button above!
4 You can find more examples with the Load tool.
5 */
6 node
7   [amenity=cafe]
8   {{{bbox}}};
9 out;
```

The map on the right shows a street view of Como, Italy, with several blue circular markers indicating the locations of cafes. The map includes a search bar, a scale bar (300 m), and a status bar at the bottom right that reads: "Loaded – nodes: 15, ways: 0, relations: 0" and "Displayed – pois: 15, lines: 0, polygons: 0".



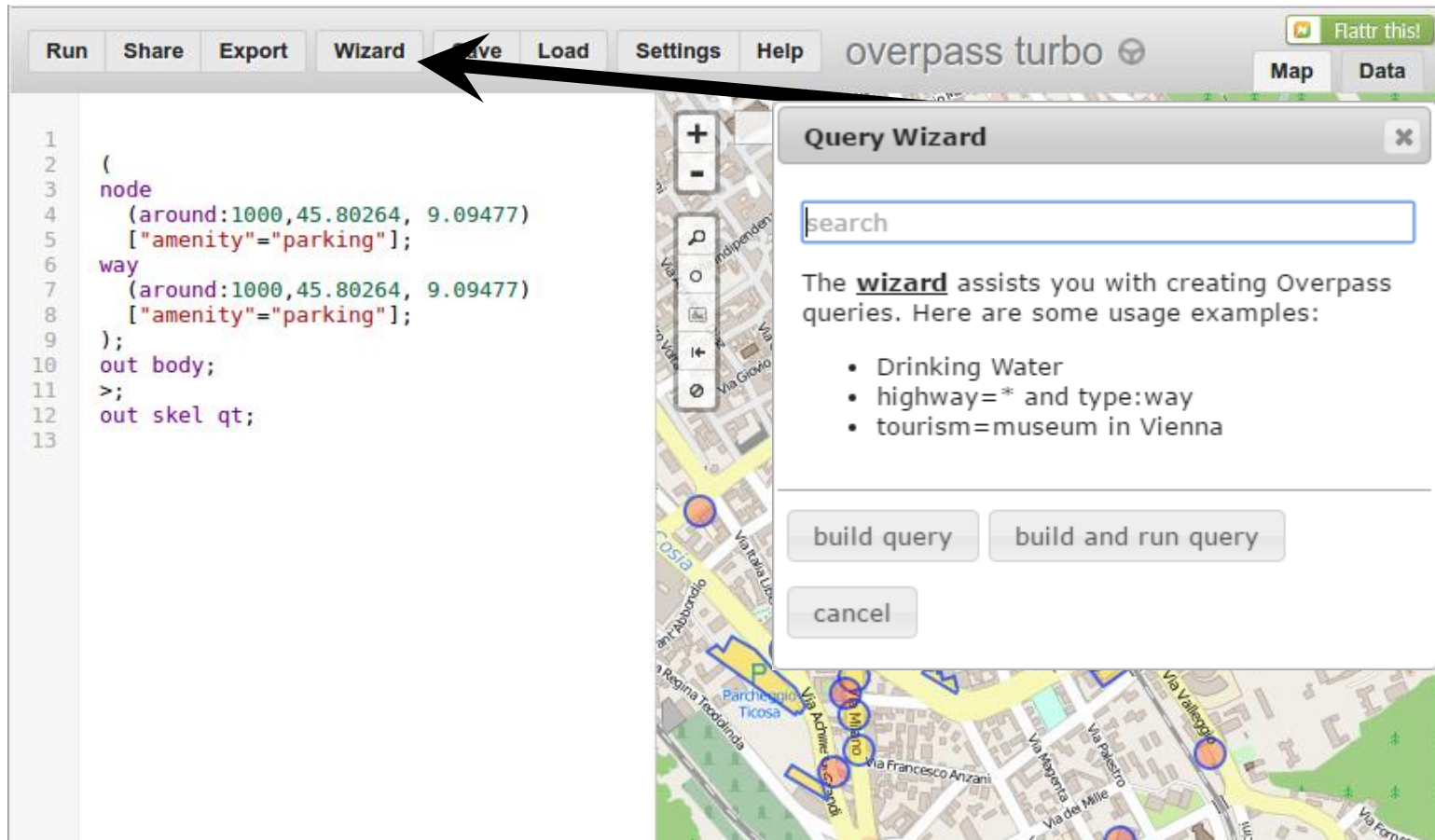
Data Download – Overpass API

Example to extract all feature tagged with amenity=parking, around a specific point



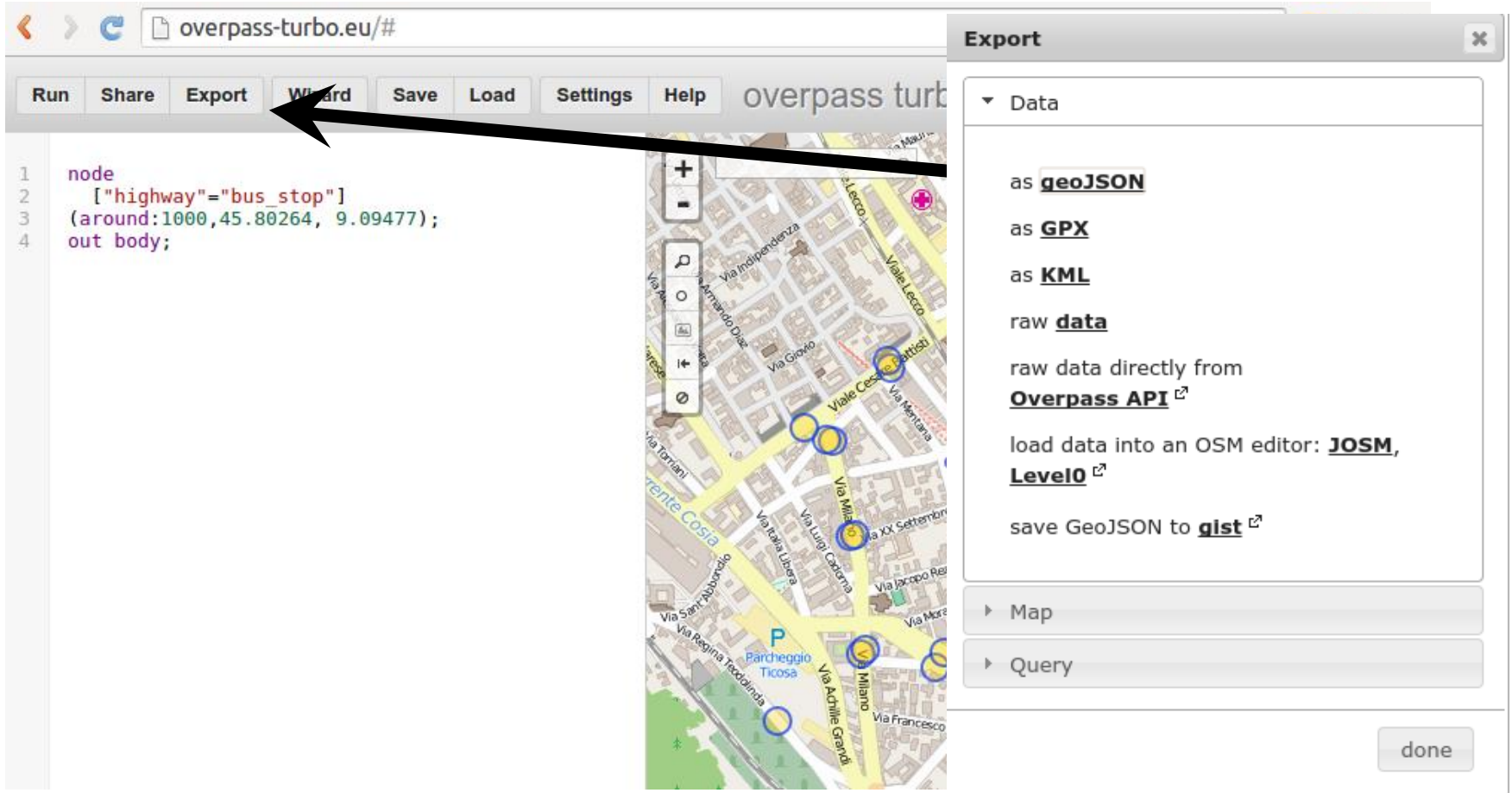
Data Download – Overpass API

It is also available a Wizard, to help you compose a query using natural language



Data Download – Overpass API

It is possible to export the data in different formats



The screenshot displays the Overpass Turbo web interface. The browser address bar shows `overpass-turbo.eu/#`. The top navigation bar includes buttons for **Run**, **Share**, **Export**, **Wizard**, **Save**, **Load**, **Settings**, and **Help**. A black arrow points from the **Export** button to the 'Export' dialog box on the right. The left panel contains a code editor with the following query:

```
1 node
2   ["highway"="bus_stop"]
3   (around:1000,45.80264, 9.09477);
4   out body;
```














The right panel shows the **Export** dialog box with the following options:

- Data**
 - as **geoJSON**
 - as **GPX**
 - as **KML**
 - raw **data**
 - raw data directly from **Overpass API**
 - load data into an OSM editor: **JOSM**, **Level0**
 - save GeoJSON to **gist**
- Map**
- Query**

A **done** button is located at the bottom right of the dialog box.



Data Download – Differences

Data Differences	Geofabrik	Osm-Estratti	OSM	Metro Extracts	Overpass
Custom Area	 100-200Km	 Limited customization		 Registration required	
Completeness	 1 Tag	 1 Tag			
Custom Features					
Data Export Format	 No raw XML, No GeoJSON	 No raw XML	 Only raw XML		
Total Score	4/10	5/10	7/10	9/10	10/10



Thanks for the attention!

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