Report

OpenStreetMap tags for wheelchair routing

Authors:
Michael Reichert, Frederik Ramm

7th March 2025

Client
serviceplan
House of Communication
Friedenstraße 24
81671 München
Germany

Contractor
Geofabrik GmbH
Amalienstraße 44
76133 Karlsruhe
Germany
https://www.geofabrik.de/
info@geofabrik.de

Contents

List of Figures

List of Tables

1 An introduction into OpenStreetMap

1.1 History and motivation behind OpenStreetMap

The OpenStreetMap project (abbreviated as OSM) was founded by Steve Coast in London in summer 2004. It aims to collect data for a free map. Back in these days, available maps were either expensive or not available under a free and open license. Therefore, OpenStreetMap builds upon similar ideas as the free software movement – the desire to make with the data whatever one would like to. [4]

About 5000 to 6000 users contribute every day [10]. Among them, 700 to 1100 contribute in Germany [11].

Since 2006, the OpenStreetMap Foundation acts as the formal organisation of the OpenStreetMap project. It runs the core database servers and few other important services. Since 2012 when OpenStreetMap switched from the *Creative Commons Attribution Share-Alike 2.0* license to the *Open Database License 1.0* (ODbL), the Foundation holds the rights on the data and grants everyone a permission to use them under the terms of ODbL [2, 4, 20]

Other than Wikipedia, OpenStreetMap does not have a set of criteria deciding whether a feature is relevant to be mapped or not. However, OpenStreetMap records only those pieces of information that are verifyable on the grond and are not subject to data protection (e.g. names of inhabitants of a house). [4, 19, 21]

In many areas, OpenStreetMap started with zero data. In some regions, a sufficient coverage was achieved by importing third-party datasets published under an open license (or being public domain). In other regoins (e. g. large parts of Europe), a large community arised mapping all features on the ground. Up to these days, the communities in German speaking countries are large and – are the largest compared to the number of inhabitants (between 2004 and December 2011 31 percent of all users contributed most of their edits in Germany, Austria or Switzerland [12]).

Since November 2010, OpenStreetMap may use satellite imgeray by Bing Maps as a datasource to draw roads, buildings, rivers etc. [5, 12] In the meantime, various providers of satellite or aerial imagery granted the OpenStreetMap community a permission to use their imagery as data source to draw features.

1.2 OpenStreetMap data model

OSM has three types of objects – nodes, ways and relations. All these objects may have tags.

The data model follows the KISS principle (Keep it simple, stupid) and is adapted on the requirments of a crowdsourcing project. There are few, fixed specifications how to map certain features. The object types (nodes, ways, relations) do not follow established standards for geospatial information systems. Instead, the entrance level for new mappers and developers should be kept as low as possible. [4]

1.2.1 Tags

Tags, the OSM term for key-value pairs, describe what an OSM object represents. Key and value can be up to 256 characters long. [15] Mappers can choose any key and value the would like to use (the *any tags you like* rule [3]).

Because an uncountable number of application uses OSM data, certain de-facto standard were established. Frequently used tags are documented in the *Map Features* list on the OSM Wiki dokumentiert. [9]

The data model was intentionally kept flexible to avoid an early determination of future developments.

Examples for regularly used tags:

- `highway = residential` for residential streets
- `shop = supermarket` for a supermarket
- `name = Kaiserstraße` for an object named "‘Kaiserstraße"’

1.2.2 Nodes

In OpenStreetMap, points are called *nodes*. They are the only type of objects which has coordinates. Either they represent a point-like object (e. g. a single tree or a postbox) or they serve as a vertex of a way. In the latter case, the do not have any tags.

1.2.3 Ways

Lines are called *ways* in OpenStreetMap. They may have one or multiple tags and reference between one and 2000 nodes. Together, the list of referenced nodes describe the geometry of the way.

1.2.4 Relations

Relations are used for objects and relationships that cannot be easily modeled with nodes, ways and tags. The can have tags and an ordered list of members. Members can have roles. Relatios are frequently used for complex polygons with inner rings (holes), signposted routes and turn restrictions.

1.2.5 Area

The current data model does not define areas. Therefore, closed ways (start and end node are identical) serve as areas. If areas are more complex than a single outer ring, relations are used for that purpose.

1.2.6 History

All nodes, ways and relations have a history. Thereby, changes to the data are recorded permanently and can be reverted if necessary.

1.3 Modelling the foot network in OpenStreetMap

OpenStreetMap models roads, streets and paths as ways. Attributes of the streets are usually added as tags to the way. Following tags can be considered as established. Some are present on almost all streets, some are rarely used.

key value	meaning	
`highway`	`motorway, trunk, primary, …, residential, service, track, pedestrian, footway, …`	road class
`oneway`	`yes, no, -1`	one-way street (in direction of OSM way/not/in opposite direction)
`surface`	`asphalt, paving_stones, cobblestone, gravel, …`	surface Key:surface
`lit`	`yes, no`	whether street is lit
`width`		width of the street
`smoothness`		roughness of the surface, see wiki page Key:smoothness
`maxspeed`		speed limit
`incline`	`up, down, value in %`	incline

Most of these attributes refer to the carriageway, not the associated pavements.

There are two methods to map footpaths along streets:

By ading `sidewalk=*` (or `sidewalk:left/right/both=*`) to the way, the presence of a sidewalk is recorded. All keys describing the quality of the pavement (width, surface, smoothness) have to be prefixed. This means `surface=*` becomes `sidewalk:surface=*` or `sidewalk:right:surface=*` etc. This method is shown in figure 1.1.

However, multiple projects which aimed to forster routing for wheelchair users and blind pedestrians, prefered to map pavements as separate ways. They make it easier to model the crossings of the carriageway at intersections because lowered kerbs are requirement for wheelchair users to make crossing the carriageway possible at all.

Adding just tags to the way of the road avoids drawing of extra ways and looks simple at first glance. On the other hand, a routing engine cannot recommend users which side of the road to use unless it becomes aware about the different sides of the road.

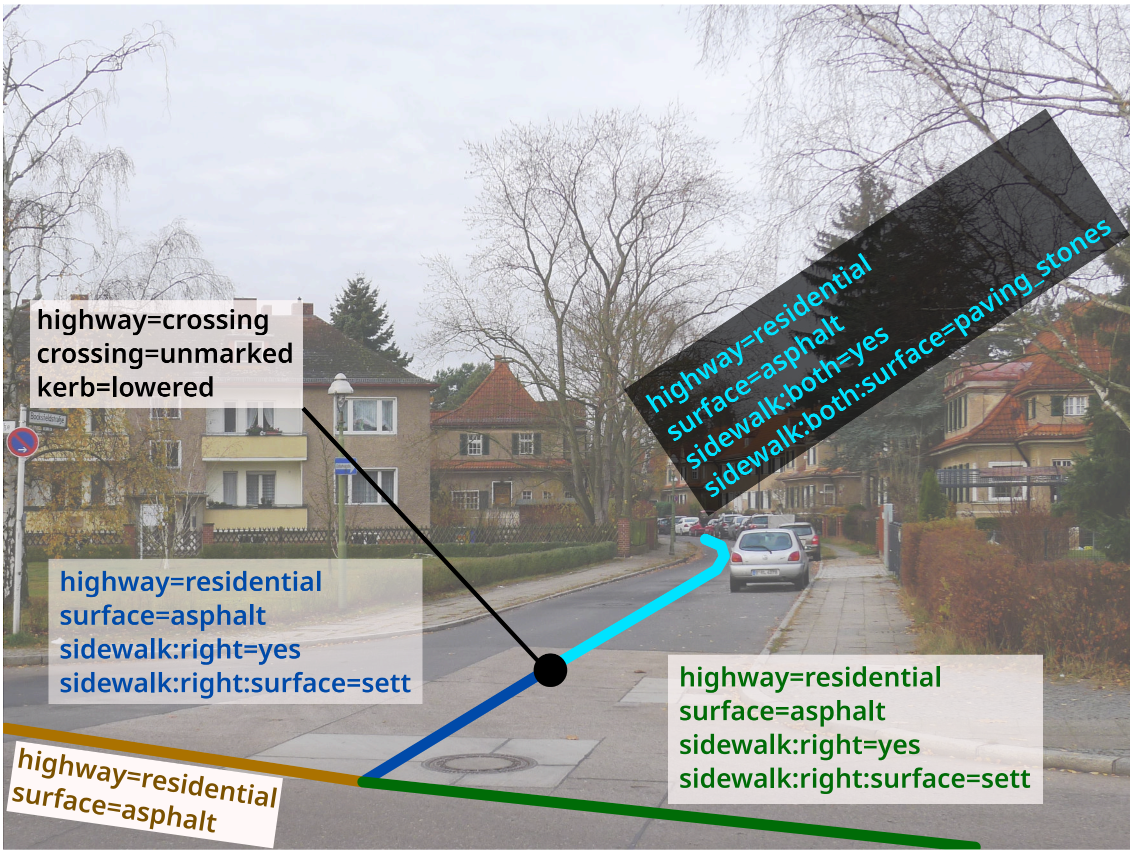

Figure 1.1: Mapping pavements and their details by adding tags to the way representing the centreline of the street [22]

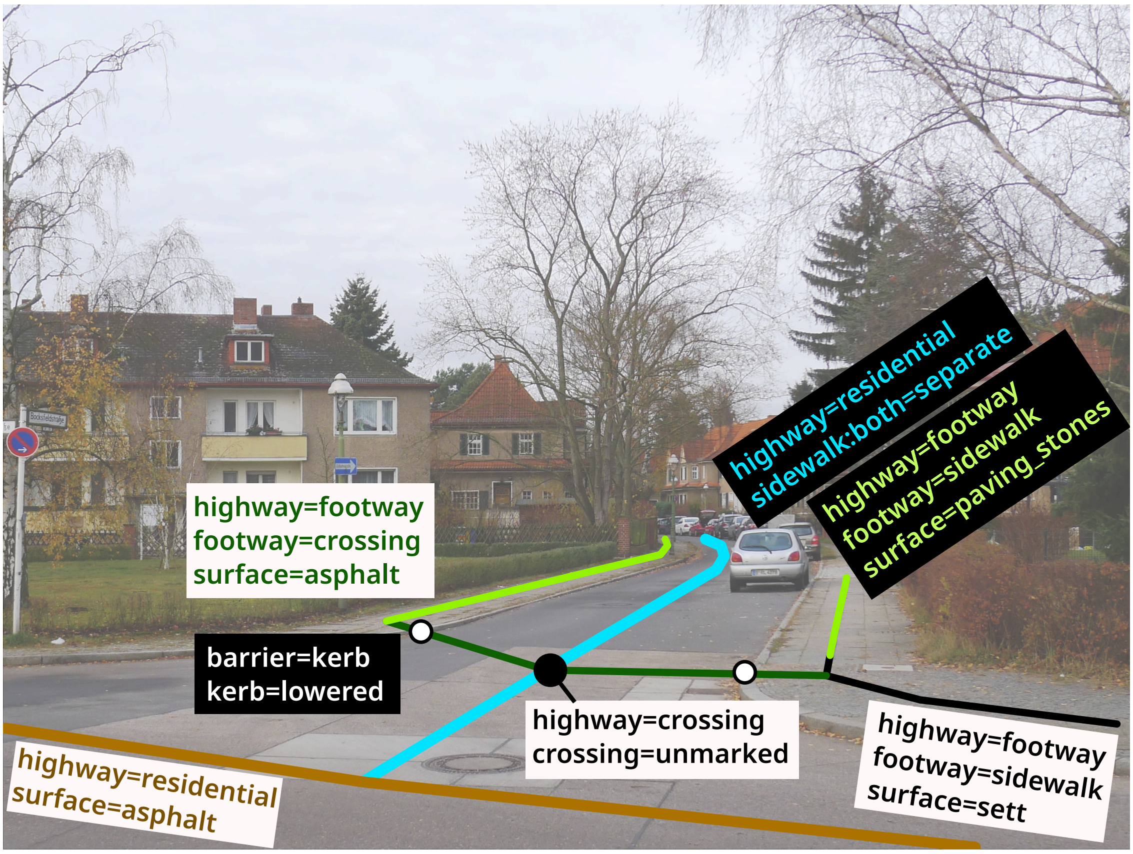

Figure 1.2: Mapping pavements and their details by adding separate ways for them [22]

In contrast, pavements mapped as separate ways as shown in figure 1.2 can be consumed by existing routing applications and are easier to understand by mappers. If attributes of the pavement change between two intersections, the way representing the carriageway does not have to be split. Thereby, it avoids fragmentation of the carriaway's way.

On the other hand, mapping pavements as separate ways is unable to model that a carriageway can be crossed by pedestrians without disabilities almost everywhere[1]. Either an uncountable number of extra crossings across the carriageway needed to be drawn, or routers would return detours to the next crossing when a user requested a route from one side of the road to another.

For more than ten years, no consensus has been reached among the OpenStreetMap community. However, many mappers who are against separate ways agree that separate ways are fine if there is a physical separation such as a handrail, a fence or a strip of grass between the pavement and the carriageway and crossing the carriageway is not possible everywhere.

1.4 Modelling of barriers in OpenStreetMap

Barriers are mapped as nodes on the way. Frequently used tags are:

key	value	meaning
`barrier`	`bollard, cycle_barrier, block, lift_gate, gate, …`	type of barrier
`maxwidth:physical`		maximum width of a vehicle which can pass
`locked`	`yes, no`	whether the barrier is locked (e. g. gates)

[1]In some countries, jaywalking is forbidden but it is legal and usual in many others.

2 Routing engines

There are multiple routing engines with wheelchair support in OpenStreetMap.

2.1 Openrouteservice

Openrouteservice is an open source routing engine for OpenStreetMap data and developed by Heidelberg Institute for Geoinformation Technology. Among multiple profiles for cars, cycling, walking, trucks and buses, Openroutservice supports a wheelchair profile. Openrouteservice has world-wide coverage. It takes following attributes into account:

- `sidewalk=*`
- `surface=*`
  - inaccessible: `earth`, `grass`, `dirt`, `mud`, `sand`, `snow`, `ice`, `salt`
  - problematic: `woodchips`, `grass_paver`, `pebblestone`, `compacted`, `gravel`, `unpaved`, `sett`, `unhew_cobblestone`, `cobblestone`
  - preferred: `asphalt`, `paved`
  - Any other value is considered as neither preferred nor problematic or inaccessible. This includes the following common values: `paving_stones`, `concrete`, `concrete:lanes`, `asphalt:lanes`, `wood`, `metal` and any other value not specified explicitly.
- `smoothness=*`
  - inaccessible: `bad`, `very_bad`, `horrible`, `very_horrible`
  - problematic: `intermediate`
  - preferred: `excellent`
  - Any other value is considered as neither preferred nor problematic or inaccessible. This means that the common value `good` and any other value not specified explicitly is considered as an acceptable value.
- `tracktype=*`
  - inaccessible: `grade4`, `grade5`
  - problematic: `grade2`, `grade3`
  - Any other value is considered as neither preferred nor problematic or inaccessible. This means that the common value `grade1` and any other value not specified explicitly is considered as an acceptable value.

- `bicycle=*`
- `horse=*`
- `maxspeed=*`
- `incline=*`
- `kerb=*` and `curb=*`
- `kerb:height=*`
- `width=*`
- `sac_scale=*`

If pavements are mapped as tags of the way representing the street, Openrouteservice will store three edges in the graph: one edge representing the carriagway and two edges representing the pavements. Information about the quality of the pavement (surface, smoothness, incline etc.) that applies to the pavements only (key prefixed with `sideway:*`) will be stored in the edges representing the pavements only.

Openrouteservice supports barriers mapped as node on a way, too. Following tags are taken into account.

Blocking access by default:

- `barrier=fence`
- `barrier=wall`
- `barrier=hedge`
- `barrier=retaining_wall`
- `barrier=city_wall`
- `barrier=ditch`
- `barrier=hedge_bank`
- `barrier=guard_rail`
- `barrier=wire_fence`
- `barrier=embankment`

Passable by default unless `wheelchair=no` is set:

- `barrier=gate`
- `barrier=bollard`
- `barrier=lift_gate`
- `barrier=cycle_barrier`
- `barrier=entrance`
- `barrier=cattle_grid`

- `barrier=swing_gate`
- `barrier=chain`
- `barrier=bump_gate`

Impassible:

- `barrier=stile`
- `barrier=block`
- `barrier=kissing_gate`
- `barrier=turnstile`
- `barrier=hampshire_gate`

HeiGIT, the developer of Openrouteservice, is well connected with federal agencies in Germany and achieved that Openrouteservice became the default routing engine for the federal administration and runs an on-premise instance for the Federal Agency for Geodesy and Cartography [8, 13, 16].

2.2 OpenSidewalks/AccesMap

Other than Openrouteservice, the *OpenSidewalks* project is a combination of a routing engine with a mapping project within the greater OpenStreetMap project. It is run by Taskar Center for Accessible Technology (TCAT) at the University of Washington, together with Feet First, a pedestrian advocacy group operating in Washington State and University of Washington's eScience Institute [**opensidewalks-website**]. The projects websites are available at [**opensidewalks-website**] and [**accessmap-app**]. The source code is available at [**access-map-github**].

They aim to map all pavements as individual ways using a new tagging standard [14] and provide a demo routing service for pedestrians on pavements. The project strongly argues in favour of separate ways because it is easier to map barriers on pavements, kerb details and the width of a carriageway to be crossed if the pavements are mapped as independent ways. In addition the exact location of a pavement cannot be determined unless either the pavement is mapped as a separate way or the width of the street is mapped using `width=*=*`.

In addition, they work on importing pavement datasets into OpenStreetMap, and provide a routing engine on that network of footpaths.

The project uses *Unweaver* [7] as its routing engine. The data pipeline to load OpenStreetMap and third party footpath datasets is shown in figure 2.1. The OSM import is implemented as a spatial ETL[1] process using Snakemake [17]. The ETL process returns the data in a custom schema in GeoJSON format [18].

The OSM import uses the following OSM tags [1]:

- `crossing = uncontrolled/zebra/marked/unmarked`
- `foot = yes`

[1]Extract, transform, process

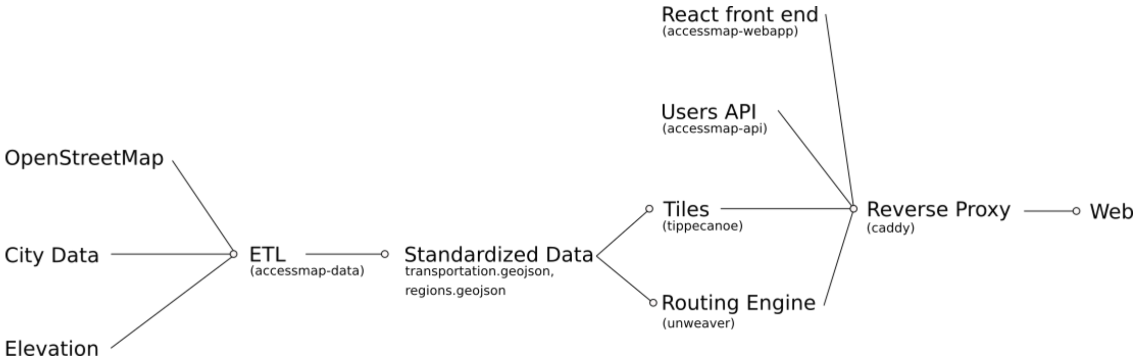

Figure 2.1: AccessMap data pipeline diagram [6]

- `indoor = yes`
- `footway = sidewalk/crossing`
- `surface = asphalt/concrete/gravel/grass/paved/paving_stones/unpaved`
- `service = alley/crossover/driveway/parking_aisle/siding/spur/yard`
- `highway = footway/cycleway/path/pedestrian/service/steps`
- `bridge=*` (all values)
- `kerb = flush/lowered/raised/rolled`[2]

While Openrouteservice tries to make a product from sparse data and makes use of pavements mapped as tags on the centreline of the street, OpenSidewalks/AccessMaps uses a different approach. They prefer mapping pavements as independent ways and focus on selected cities in the United States. In these cities, they aim a coverage at equal data quality on the complete network.

2.3 GraphHopper

GraphHopper offered a wheelchair profile in the past. Due to a lack of support for various key features (e. g. the `sidewalk=*` tag), the developers decided to remove it without replacement. In contrast to other routing engines, GraphHopper had basci support for barriers and excluded cycle barriers from wheelchair routing.

[2]no means absence of a kerb, i. e. no barrier for wheelchair users

3 Recommendations

3.1 Recommended tags for improvments

Given the limited spatial coverage of AccessMap, we recommend to focus on tags supported by Openrouteservice. Therefore, potential campaigns to support wheelchair routing should focus on tags already supported by Openrouteservice.

Many numbers in the following paragraphs will use the term *foot network*. We define it as

- all ways with `highway=footway/pedestrian/living_street/path` except ways with private access only (`access=private/no`)
- and all `highway=cycleway/bridleway` with explicit permission for pedestrians to use them (`foot=yes/designated/permissive`). This means that either ways designated for pedestrians, shared infrastructure of pedestrians and bicycles/horses or alleys with low traffic.

That network is 396 979 km long. Within the city of Munich which will serve as an example for an urban setting, that network is 4602 km long.

In addition, we define the term *car network* as all roads where car traffic and pedestrian traffic is permitted except those not open to public use.

3.1.1 Adding details to the foot network

The `surface=*` key is a very important tag because wheelchair users require a smooth surface. Ground or gravel surfaces require too much force to get forward. In addition, `surface=*` can be mapped without any special equipment and skills. As of 4 March 2025, 34 % of the foot network in Germany did not have a `surface=*` tag. However, in urban areas, the coverage is better. For example, within Munich, only 17 % of the foot network lack a `surface=*` tag (see figure 3.1).

Where surface is present in the data, `smoothness=*` comes into play. The tag describes how good a surface can be used with wheeled vehicles. Among the ways with present `surface=*` tag, only 20 % have a `smoothness=*` tag (total length: 263 748 km) but in Munich 41 % of 3817 km foot network with `surface=*` have a `smoothness=*` tag.

Because electric kick scooters are rarely used on tracks, adding missing `tracktype=*` tags can be ignored.

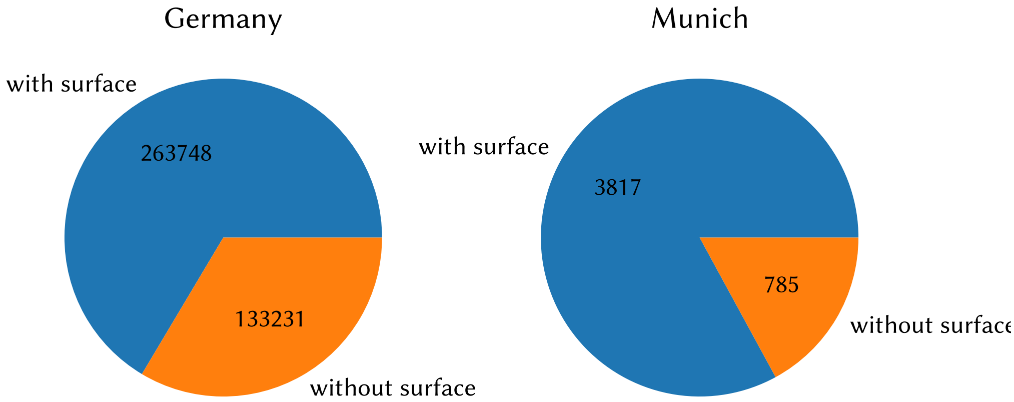

Figure 3.1: Foot network with/without `surface=*` in km

3.1.2 Adding presence of pavements

In the previous subsection, we described the presence of `surface=*` on pavements mapped as separate ways. However, pavements mapped by just adding `sidewalk=right/left/both` or a tag like `sidewalk:left=*`, `sidewalk:right=*` or `sidewalk:both=*` are very common too.

As of 4 March 2025, the car network of Germany was 899 655 km long, the car network of Munich was 3487 km long.

In Germany, 17 % of this network have pavements mapped as tags on the road centreline or separate ways. But within Munich, 57 % of this network have information about the presence of pavements.

Among these roads in complete Germany, about the half of them (77 504 km of 156 496 km) has at least one pavement mapped using tags only[1] In Munich, the proportion is a little bit larger (1115 km of 1985 km) (see figure 3.2).

However, without information about the surface of the pavement, its presence might not be useful for wheelchair users. This is the bit, where Munich differs from complete Germany. In Germany, 58 836 km of the car network with sidewalks mapped as tags on the centreline of the road *lack* surface of at least one pavement of the road. In contrast, in Munich 699 km of the previously mentioned 1115 km lack surface.

At first glance, this looks like Munich being pretty good in that regard. But it opens the opportunity for useful improvements.

[1]This means that the pavement on the other side of the road may be mapped as a separate way.

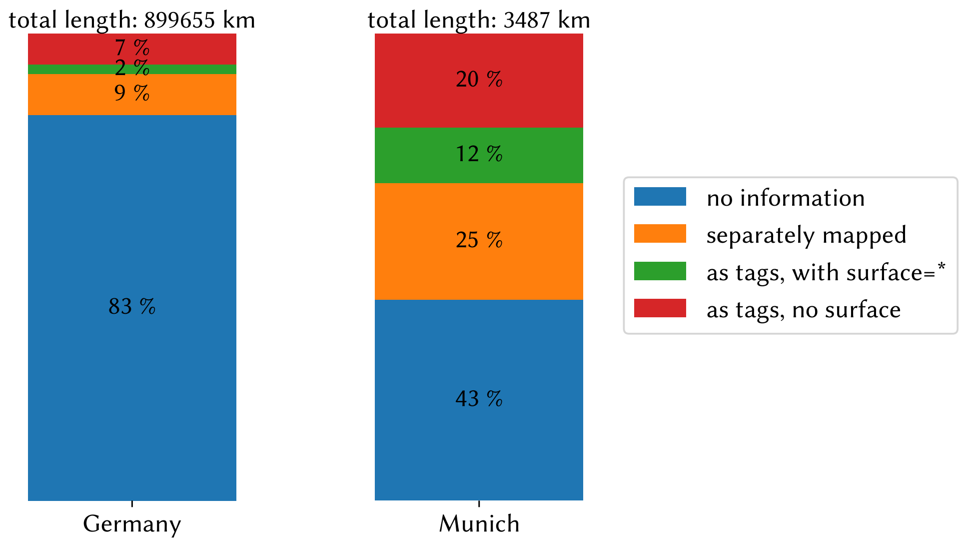

Figure 3.2: Proportion of the vehicle network where the presence/absence of pavements is recorded `surface=*`

Table 3.1: Number of Barriers in OpenStreetMap

Barrier	Germany	Munich
bollard	217 152	2786
cycle_barrier	41 876	430
entrance	11 377	143
gate	467 811	5049

3.1.3 Barrier details

Many of the barriers listed in section 2.1 are always prohibiting wheelchair access if they exist. We cannot estimate how many of them are missing because there is no dataset for comparison. Based on our experience as OpenStreetMap contributors and data consumers for many years, we think that their coverage in urban areas is excellent and good in rural areas. This means that few of them should be expected to miss in OpenStreetMap these days.

However, some types of barriers prohibit wheelchair access if their openings are too narrow. This applies to bollards, gates, cyle barriers and entrances. Openrouteservice currently uses `wheelchair`=yes/no to determine if these barriers are passable by wheelchairs. But exact widths of openings are more helpful because there are multiple different models of wheelchairs and other users (e. g. cyclists with trailers) will benefit from that information, too.

Table 3.1 show the absolute numbers in Germany and Munich. Table 3.2 show the presence of detailed information for wheelchair accessibility.

For cycle barriers, the keys `maxwidth:phyisical=*`, `opening=*`, `spacing=*` and `overlap=*` are interesting as well because the are necessary to determine whether a given wheelchair, bicycle

Table 3.2: Barriers with `wheelchair=*`, `maxwidth=*` or `maxwidth:physical=*` mapped in OpenStreetMap

Barrier	with `wheelchair=*`		with `maxwidth=*` or `maxwidth:physical=*`	
	Germany	Munich	Germany	Munich
bollard	2428	16	6572	77
cycle_barrier	613	7		
entrance	146	2	415	4
gate	5652	61	4990	71

or bicycle trailer can pass. In Germany, 476 cycle barriers (1 %) have these detailed information, 4 of them are in Munich.

3.1.4 Kerbs

A crossing over a carriageway is useable for wheelchair users if the kerbs are lowered or there are no kerbs at all. Openrouteservice takes these information into account.

As of 4 March 2025, 451 982 nodes in Germany were tagged as crossings over roads. Among them, 346 831 (77 %) lack information about the type of kerbs (either as tags on the crossing node or as separate nodes on a way representing the crossing.

In Munich, the numbers are similar (10 950 tagged crossings in total but 79 % without details about the type of kerbs.

3.1.5 Summary

A mapping campaign trying to add useful tags should focus on the following tags:

- adding missing `surface=*` on the foot network,
- adding missing `smoothness=*` on the foot network,
- adding missing `width=*` on the foot network,
- recording the presence of pavements on the car network using `sidewalk:both=*`, `sidewalk:right=*` or `sidewalk:left=*`[2],
- adding surface of pavements where pavements are mapped as tags on the centreline of the road,
- adding smoothness of pavements where pavements are mapped as tags on the centreline of the road,
- adding width of pavements where pavements are mapped as tags on the centreline of the road,
- adding missing `kerb=*` at all crossings

[2]The correct tag depends whether the road has one or two pavements.

3.2 General recommendations for a mapping campaign

There are two methods for users of electric kick scooters to support wheelchair routing in OpenStreetMap.

- Users can actively contribute details to existing ways like surface, smoothness or height of kerbs (raised, lowered, flush) if the information do not require special skills or tools.
- User can passively contribute by using their vehicle and the vehicle recording acceleration, speed and location (GPS). Due to the small wheels, electric kick scooters are sensitive to small bumps of the surface. The data can be provided to mappers for adding smoothness tags or to compare existing tagging with more objective measurements.

Actively contibuting users have the advantage of direct improvements to the database. This means, no members of the OSM community are later required to review collected data and merge it with existing OSM data. On the other hand, this approach requires a strategy for dealing with intentional damage or contributors making mapping mistakes accidentially.

While mistakes by newbies are accepted by the community because nobody is an expert from day 1 on, the mistakes done by lots of contributors at the same time will make the community freak out if fixing the mistakes requires too much manpower by volunteers contributing in their spare time.

Therefore, any direct editing of OpenStreetMap requires careful planning and consultation with the OSM community in advance.

StreetComplete is a popular Android application which lowered the bar to contribute in the past. The app asks users questions about missing details around their current location, e. g. surface of streets, opening hours of shops, roof shapes. It can only add or update tags of existing objects. It cannot add nodes into existing ways or make any other changes to the geometry. Many of the missing tags mentioned above can be added but adding kerbs as barrier nodes into ways with `footway=crossing` is not possible.

That's why we recommend to focus on StreetComplete where less training is required.

However, in some cases manual refinements with a full-featured editor like the online editor iD at the OpenStreetMap website are required. In addition, StreetComplete adds notes (a report about data issues) when users cannot answer the question with any of the pre-defined answers. They need to be resolved manually with a full-featured editor. Using StreetComplete as the only application will therefore end in an unhappy local OpenStreetMap community if they get the impression to be the unpaid cleanup companions. Therefore, one or two paid users should take for the notes created by StreetComplete and resolve them.

Bibliography

[1] URL: https://github.com/AccessMap/accessmap-data/blob/master/cities/mtvernon/Snakefile (visited on 2025-03-03).

[2] *About The License Change*. OpenStreetMap Foundation. 2012. URL: https://wiki.osmfoundation.org/wiki/Licence/About_The_Licence_Change (visited on 2016-11-15).

[3] *Any tags you like*. 2008. URL: https://wiki.openstreetmap.org/wiki/Any_tags_you_like (visited on 2016-11-15).

[4] Jonathan Bennett. *OpenStreetMap. Be your own Cartographer*. Birmingham: Packt Publishing, 2010.

[5] *Bing Maps*. URL: https://wiki.openstreetmap.org/wiki/Bing_Maps (visited on 2016-11-15).

[6] Nick Bolten. URL: https://github.com/AccessMap/accessmap/blob/main/orchestration-diagram.png (visited on 2025-03-03).

[7] Nick Bolten. *Unweaver*. URL: https://github.com/nbolten/unweaver (visited on 2025-03-03).

[8] *Erreichbarkeit einfach mit openrouteservice (ORS) ermitteln: Das EU-Projekt Gitterzellendatenbank*. Heidelberg Institute for Geoinformation Technology. 2024-06-03. URL: https://heigit.org/erreichbarkeit-einfach-mit-openrouteservice-ors-ermitteln-das-eu-projekt-gitterzellendatenbank-2/ (visited on 2025-03-03).

[9] *Map Features*. URL: https://wiki.openstreetmap.org/wiki/Map_Features (visited on 2016-11-15).

[10] Pascal Neis and altogetherlost.com. *OSMstats*. URL: http://osmstats.neis-one.org/?item=members (visited on 2025-03-07).

[11] Pascal Neis and altogetherlost.com. *OSMstats*. URL: http://osmstats.neis-one.org/?item=members&country=Germany (visited on 2025-03-07).

[12] Pascal Neis and Alexander Zipf. “Analyzing the Contributor Activity of a Volunteered Geographic Information Project – The Case of OpenStreetMap”. In: *ISPRS International Journal of Geo-Information* 1.3 (2012-07), pp. 146–165. ISSN: 2220-9964. DOI: 10.3390/ijgi1020146. URL: http://dx.doi.org/10.3390/ijgi1020146.

[13] *Openrouteservice partners with the Federal Agency for Cartography and Geodesy (BKG) in Germany*. Heidelberg Institute for Geoinformation Technology. 2017-10-14. URL: https://openrouteservice.org/ors-partners-with-bkg/ (visited on 2025-03-03).

[14] *Proposal:Sidewalk schema*. URL: https://wiki.openstreetmap.org/wiki/Proposal:Sidewalk_schema (visited on 2025-03-03).

[15] Frederik Ramm and Jochen Topf. *OpenStreetMap. Die freie Weltkarte nutzen und mitgestalten*. 3rd ed. Berlin: Lehmanns Media, 2010.

[16] *RoutingPlus - Dienst web_ors (Bund)*. Bundesamt für Kartographie und Geodäsie. URL: https://gdz.bkg.bund.de/index.php/default/webdienste/funktionale-geodatendienste/routing-plus-dienst-web-ors-001.html (visited on 2025-03-03).

[17] *Snakemake*. URL: https://snakemake.readthedocs.io/en/stable/index.html (visited on 2025-03-03).

[18] *The OpenSidewalks Schema*. URL: https://github.com/OpenSidewalks/OpenSidewalks-Schema (visited on 2025-03-03).

[19] *Verifiability*. 2009. URL: https://wiki.openstreetmap.org/wiki/Verifiability (visited on 2016-11-15).

[20] *We Are Changing The License*. OpenStreetMap Foundation. 2010. URL: https://wiki.osmfoundation.org/wiki/Licence/Historic/We_Are_Changing_The_License (visited on 2016-11-15).

[21] *Welcome to Wikipedia users*. 2016. URL: https://wiki.openstreetmap.org/wiki/Welcome_to_Wikipedia_users#We_don.27t_have_a_Notability_rule (visited on 2016-11-15).

[22] *Wohnstraße, Bocksfeldstraße (Berlin-Wilhelmstadt)*. 2013. URL: https://commons.wikimedia.org/wiki/File:Bocksfeldstra%C3%9Fe_(Berlin-Wilhelmstadt).JPG (visited on 2025-03-07).