

# Spatial Morphology Lab 01. International laboratory for comparative research in urban form. Street networks, Sweden - Non-Motorised network of Eskilstuna

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## Description

GIS-datasets for the Street networks of Stockholm, Gothenburg and Eskilstuna produced as part of the Spatial Morphology Lab (SMoL).

The goal of the SMoL project is to develop a strong theory and methodology for urban planning & design research with an analytical approach. Three frequently recurring variables of spatial urban form are studied that together quite well capture and describe the central characteristics and qualities of the built environment: density, diversity and proximity.

The first measure describes how intensive a place can be used depending on how much built up area is found there. The second measure captures how differentiated the use of a place can be depending on the division in smaller units such as plots. The third measure describes how accessible a place is depending on how it relates with other places. Empirical studies have shown strong links between these metrics and people's use of cities such as pedestrian movement patterns.

To support this goal, a central objective of the project is the establishment of an international platform of GIS data models for comparative studies in spatial urban form comprising three European capitals: London in the UK, Amsterdam in the Netherlands and Stockholm in Sweden, as well as two additional Swedish cities of smaller size than Stockholm: Gothenburg and Eskilstuna.

The result of the project is a GIS database for the five cities covering the three basic layers of urban form: street network (motorised and non-motorised), buildings and plots systems.

The data is shared via SND to create a research infrastructure that is open to new study initiatives.

The datasets for Amsterdam will also be uploaded to SND. The datasets of London cannot be uploaded because of licensing restrictions.

The street network GIS-maps include motorised and non-motorised networks. The non-motorized networks include all streets and paths that are accessible for people walking or cycling, including those that are shared with vehicles. All streets where walking or cycling is forbidden, such as motorways, highways, or high-speed tunnels, are not included in the network.

The non-motorised network layers for Stockholm and Eskilstuna are based on the Swedish national road database, NVDB (Nationell Vägdatas), downloaded from Trafikverket (<https://lastkajen.trafikverket.se>, date of download 15-5-2016, last update 8-11-2015). For Gothenburg, it is based on Open Street Maps (openstreetmap.org, <http://download.geofabrik.de>, date of download 29-4-2016), because the NVDB did not provide enough detail for the non-motorized network, as in the other cities. The original road-centre-line maps of all cities were edited based on the same basic representational principles and were converted into line-segment maps, using the following software: FME, Mapinfo professional and PST (Place Syntax Tool). The coordinate system is SWEREF99TM.

In the final line-segment maps (GIS-layers) all streets or paths are represented with one line irrespectively of the number of lanes or type, meaning that parallel lines representing a street and a pedestrian or a cycle path running on the side, are reduced to one line. The reason is that these parallel lines are nor physically or perceptually separated, and thus are accessible and recognized from pedestrians as one "line of movement" in the street network. If there are obstacles or great distance between parallel streets and paths, then the multiple lines remain. The aim is to make a skeletal network that better represents the total space, which is accessible for pedestrians to move, irrespectively of the typical separations or distinctions of streets and paths. This representational choice follows the Space Syntax methodology in representing the public space and the street network.

We followed the same editing and generalizing procedure for all maps aiming to remove errors and to increase comparability between networks. This process included removing duplicate and isolated lines, snapping and generalizing. The snapping threshold used was 2m (end points closer than 2m were snapped together). The generalizing threshold used was 1m (successive line segments with angular deviation less than 1m were merged into one). In the final editing step, all road polylines were segmented to their constituting line-segments. The aim was to create appropriate line-segment maps to be analysed using Angular Segment Analysis, a network centrality analysis method introduced in Space Syntax.

All network layers are complemented with an "Unlink points" layer; a GIS point layer with the locations of all non-level intersections, such as pedestrian bridges and tunnels. The Unlink point layer is necessary to conduct network analysis that takes into account the non-planarity of the street network, using such software as PST (Place Syntax Tool).

### **Data contains personal data**

No

### **Language**

[English](#)

### **Time period(s) investigated**

2016-01-01 – 2016-01-01

## Variables

1

## Data format / data structure

[Geospatial](#)

## Geographic spread

Geographic location: [Göteborg Municipality](#), [Eskilstuna Municipality](#), [Netherlands](#), [Stockholm Municipality](#), [Västra Götaland County](#)

Geographic description: The data cover three cities in Sweden (Stockholm, Gothenburg and Eskilstuna) and Amsterdam in the Netherlands. The study areas include the metropolitan areas of the cities, which span out of their municipal boundaries and include the whole urbanised areas. To define these metropolitan areas, we used the Urban Morphological Zone (UMZ) boundaries, as they are defined by the European Environment Agency (EEA) and the Eurostat for all European cities. Urban morphological zones (UMZ) are defined by Corine land cover classes that are considered to contribute to the urban tissue and function (source:

<http://www.eea.europa.eu/data-and-maps/data/urban-morphological-zones-2006> (download date 13-7-2016). A UMZ can be defined as a set of urban areas laying less than 200m apart. UMZ boundaries are used for the statistical comparisons between the cities of the European Union. However, because of their highly irregular shapes which could become problematic for spatial analysis, what was instead used as the boundary of each study area, was the convex hull of each UMZ.

## Responsible department/unit

Department of Architecture and Civil Engineering

## Contributor(s)

Miguel Serra - Universidade do Porto, Faculdade de Engenharia

University College London

Delft University of Technology (TU Delft)

## Funding

- Funding agency: Chalmers University of Technology

## Research area

[Engineering and technology](#) (Standard för svensk indelning av forskningsämnen 2011)

[Civil engineering](#) (Standard för svensk indelning av forskningsämnen 2011)

[Architectural engineering](#) (Standard för svensk indelning av forskningsämnen 2011)

[Infrastructure engineering](#) (Standard för svensk indelning av forskningsämnen 2011)

[Transport systems and logistics](#) (Standard för svensk indelning av forskningsämnen 2011)

[Architecture](#) (Standard för svensk indelning av forskningsämnen 2011)

[Boundaries](#) (INSPIRE topic categories)

[Structure](#) (INSPIRE topic categories)

[Economy](#) (INSPIRE topic categories)

[Geoscientific information](#) (INSPIRE topic categories)

[Environment](#) (INSPIRE topic categories)

[Location](#) (INSPIRE topic categories)

[Society](#) (INSPIRE topic categories)

[Utilities / communication](#) (INSPIRE topic categories)

[Transportation](#) (INSPIRE topic categories)

## Keywords

[Urban areas](#), [Spatial analysis](#), [Spatial data file \(gis\)](#), [Spatial database \(gis\)](#), [Administrative units](#), [Biogeographical regions](#), [Coordinate reference systems](#), [Transport networks](#), [Geospatial](#)

## Publications

Berghauser Pont Meta, Stavroulaki Gianna, Bobkova Evgeniya, Gil Jorge, Marcus Lars, Olsson Jesper, Sun Kailun, Serra Miguel, Hausleitner Birgit, Dhanani Ashley, Legeby Ann, (2019), 'The spatial distribution and frequency of street, plot and building types across five European cities', in: Environment and Planning B, Urban analytics and City science, Vol. 46(7) 1226-1242, doi:10.1177/2399808319857450

**DOI:** <https://doi.org/10.1177/2399808319857450>

Bobkova, J., L. Marcus, M. Berghauser Pont, (2017). Spatial Capacity: Introducing multivariable measures of urban form that influences urban diversity, The 11th Space Syntax Symposium (SSS11), in: Proceedings, 11th International Space Syntax Symposium, (ed. Heitor T, Serra M, Silva M, Becharel M, da Silva L), Instituto Superior Técnico, Departamento de Engenharia Civil, Arquitetura e Georrecursos, Portugal, University of Lisbon

Bobkova, E., 2019. Towards a theory of natural occupation: developing theoretical, methodological and empirical support for the relation between plot systems and urban processes. Doctoral Thesis. Chalmers University of technology, Gothenburg, Sweden.

Stavroulaki Gianna, Bolin David, Berghauser Pont Meta, Marcus Lars, Håkansson Erik, (2019), "Statistical modelling and analysis of big data on pedestrian movement", in: Proceedings, 12th International Space Syntax Symposium, Beijing Jiaotong University, Beijing , 79.1-79.18

Berghauser Pont Meta, Stavroulaki Gianna, Marcus Lars, (2019), 'Development of urban types based on network centrality, built density and their impact on pedestrian movement', in: Environment and Planning B, Urban analytics and City science, Vol. 46(8) 1549-1564, doi:10.1177/2399808319852632

Bobkova, E., Berghauser Pont, M., & Marcus, L. (2019). Towards analytical typologies of plot systems: Quantitative profile of five European cities. Environment and Planning B: Urban Analytics and City Science. <https://doi.org/10.1177/2399808319880902>

Marcus Lars, Berghauser Pont Meta, Stavroulaki Gianna, Bobkova Engeniya (2017), 'Location-based density and differentiation – adding attraction variables to space syntax', in: ISUF 2017 XXIV international conference: City and territory in the globalization age, Valencia, 27-29/9/2017

**DOI:** <https://doi.org/10.4995/ISUF2017.2017.5706>

Berghauser Pont Meta, Stavroulaki Gianna, Gil Jorge, Hausleitner Birgit, Marcus Lars, Abshirini Ehsan, Olsson Jesper, Dhanani Ashley (2017), 'Quantitative Comparison of Cities: Distribution of Street and

Building Types Based on Density and Centrality Measures', in: Proceedings, 11th International Space Syntax Symposium, (ed. Heitor T, Serra M, Silva M, Becharel M, da Silva L), Instituto Superior Técnico, Departamento de Engenharia Civil, Arquitetura e Georrecursos, Portugal, University of Lisbon, 44.1-44.18

Bobkova E, Marcus L, Berghauser Pont M, Stavroulaki G, Bolin D (2019) Structure of Plot Systems and Economic Activity in Cities: Linking Plot Types to Retail and Food Services in London, Amsterdam and Stockholm. *Urban Science*, 3 (3), 66, <https://doi.org/10.3390/urbansci3030066>

Marcus L, Heyman A, Hellervik A, Stavroulaki G (2019) Empirical support for a theory of spatial capital. Housing prices in Oslo and land values in Gothenburg, In: Proceedings of 12th International Space Syntax symposium, pp. 79.1-79-24.

Berghauser Pont Meta, Stavroulaki Gianna, Sun Kailun, Abshirini Ehsan, Olsson Jesper, Marcus Lars (2017), 'Quantitative comparison of the distribution of densities in three Swedish cities', in: ISUF 2017 XXIV international conference: City and territory in the globalization age, Valencia, 27-29/9/2017  
**DOI:** <https://doi.org/10.4995/ISUF2017.2017.5317>

If you have published anything based on these data, [please notify us](#) with a reference to your publication(s). If you are responsible for the catalogue entry, you can update the metadata/data description in DORIS.

### **Polygon (Lon/Lat)**

10.890588662791, 60.10648088151

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19.315579578488, 60.10648088151

10.890588662791, 60.10648088151

### **Accessibility level**

Access to data through SND

Access to data is restricted

### **Use of data**

[Things to consider when using data shared through SND](#)

### **License**

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### **Versions**

Version 1.0. 2020-11-16

### **Homepage**

[http://www.chalmers.se/en/projects/Pages/Spatial-Morphology-Lab-\\_-SMoLQ.aspx](http://www.chalmers.se/en/projects/Pages/Spatial-Morphology-Lab-_-SMoLQ.aspx)

<https://www.smog.chalmers.se/smol>

### **Contact for questions about the data**

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### **This resource has the following relations**

Is derived from <https://www.trafikverket.se/tjanster/system-och-verktyg/data/Nationell-vagdatabas/>

Is required by <smogapps.ace.chalmers.se/stepflow>

### **Related research data in SND's catalogue**

[Spatial Morphology Lab 01. International laboratory for comparative research in urban form. Street networks, Sweden - Non-Motorised network of Gothenburg](#)

[Spatial Morphology Lab 01. International laboratory for comparative research in urban form. Street networks, Sweden - Motorised network of Gothenburg](#)

[Spatial Morphology Lab 01. International laboratory for comparative research in urban form. Street networks, Sweden - Non-Motorised network of Stockholm](#)

[Spatial Morphology Lab 01. International laboratory for comparative research in urban form. Street networks, Sweden - Motorised network of Stockholm](#)

[Spatial Morphology Lab 01. International laboratory for comparative research in urban form. Street networks, Sweden - Motorised network of Eskilstuna](#)

[Spatial Morphology Lab 01. International laboratory for comparative research in urban form. Street networks, Sweden - Motorised network of Västra Götaland](#)

[GIS-based Time model. Gothenburg, 1960-2015](#)

[GIS-based Time model. Gothenburg, 1960-2016\\_2](#)

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