TRANSPORT POVERTY DASHBOARD – GUIDE

Transport Poverty Spatial Accessibility Indicators Measuring Access to Opportunities and Essential Services

The spatial **Accessibility indicators** we provide in the dashboard are a first step to identify and quantify areas where people may experience transport poverty and face the risk of social exclusion. By using multimodal public transport and high-resolution road networks, we assess the **Availability dimension** of transport poverty and compare access to essential services and opportunities across regions via walking, cycling, driving, or public transport.

Our mission aligns with the EU's just transition goal of ensuring that no one is left behind, as exemplified by the proposed Social Climate Fund and the **Commission recommendations on transport poverty**.

Within the Transport Poverty Hub, you can interactively explore results from country level down to local level. These insights are designed to support analyses of decision-makers and researchers engaged in social climate planning. This Guide offers in-depth explanations of our data sources and analytical approaches, highlighting data limitations and providing help on how to use the Dashboard.

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READING THE DASHBOARD

The map can display three different types of transport accessibility indicators for five destination categories using four modes of transport, including walking, cycling, driving and public transport. Grey areas indicate data availability issues either on destinations or on public transport networks. Results are produced at a "1km^2 Grid" level, but are also available aggregated at NUTS and LAU administrative layers for all European countries. By default, the map shows access to opportunities (people) via public transport at NUTS 2 resolution for all Europe. Users can change the focus country, resolution, transport mode, destination, and other parameters using the filter selectors in the left-hand panel.

CREATING MAPS WITH THE FILTER SELECTOR

The filter selector in the left-hand panel allows you to choose which map layer is displayed in the map window. Filter options may depend on other filters but can be edited independently. Follow these steps to create your map:

Step 1 Select the country and resolution. Begin by selecting the country you want to focus on. Then, choose the desired resolution from the available options: NUTS 0/country, NUTS 1, NUTS 2, NUTS 3, LAU, sub-LAU, 1km^2 Grid.

Step 2 Select a transport mode among walking, cycling, public transport with short walks (7:30 a.m. – 10:00 a.m.) and driving (with congestion in the 7:00 a.m. – 9:00 a.m. time window).

Step 3 Select a destination. The categories include opportunities (with resident population used as proxy), primary school facilities, primary school enrolled students (as a measure of school capacity), healthcare facilities, healthcare beds (as a measure of healthcare capacity).

Step 4 Select the accessibility indicator of interest. Metrics are divided into three main categories: (i) number of reachable services, seats, or people within fixed travel time thresholds; (ii) travel time to the nearest facilities, seats, or people; (iii) squared accessibility poverty gap and FGT_2 indicators, which count individuals falling below a predefined sufficiency threshold of accessibility, weighted by the extent of their accessibility deficit when travelling for 40-50 minutes with the selected mode of transport.

Step 4 For administrative layer aggregations, choose the statistical aggregation method for your results. You can select from average, median, top 20th percentile, or bottom 20th percentile to suit your specific data analysis objectives.

When navigating the map, you can highlight specific areas by clicking on them to display exact indicator values, along with the region name if it is an aggregated administrative area. 1km^2 Grid results are currently not available for the "All (Europe)" geographical scope.

If present in the text box below the Filter Selectors, a sufficiency threshold has been used to either colour results (also noted in the indicator legend) or calculate the indicator. These thresholds are calculated as the median population-weighted number of destinations reached within a travel time of 10-20 minutes by driving, at either country or European level. The unit of measurement for the threshold corresponds to the 'Type of Destination' option selected.

ORIGINS AND DESTINATIONS

Spatial accessibility indicators are computed using the centroids of GISCO 2021 (16 June 2024 release) 1km^2 populated grid cells, which represent where people live, as origin points. For countries where resident population data was not available, such as the United Kingdom, Iceland, Albania, Bosnia-Herzegovina, Kosovo[1], Montenegro, North Macedonia, and Serbia, we complemented the dataset with GISCO 2018 data at the same geographical resolution. This high level of granularity allows for a detailed spatial pattern analysis, helping identify local and regional instances of poor transport accessibility that may be overlooked at broader geographic scales.

Spatial accessibility indicators are available for access to the following destination categories:

- Resident population, as proxy for opportunities
- Primary schools
    - primary school facilities
    - primary school enrolled students, as a measure of school capacity
- Healthcare services
    - healthcare facilities
    - healthcare beds, as a measure of healthcare capacity

The population data at 1km^2 resolution, used to identify destination points, matches the data used for origin points. However, for Moldova, Turkey, and Ukraine, countries not included in the platform and for which GISCO data is not available, we use WorldPop 2020 data to represent resident population as possible destination points. These additional datasets are applied to the measure of walking, cycling and driving access to opportunities indicators. For public transport results, we currently restrict opportunities to destinations within national borders.

Geolocation and attributes of primary schools and healthcare services are retrieved from Eurostat GISCO. In the dashboard, we use the data for the year 2023 (2024 release), but estimates are also available for 2020. Although this information is extracted from official national registers, it may contain inaccuracies and gaps due to the heterogeneity of the input data. For further details, please refer to GISCO basic services.

While measuring access to opportunities is consistently feasible, contingent on network data availability, due to the existence of pan-European resident population data, measuring access to services may encounter data availability limitations. The table below illustrates the data availability (and data gaps) by country for measuring access to the four service destination categories you can find in the dashboard:

[1] This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

Table 1 – Geographical coverage of Eurostat GISCO 2023 basic services.

	Eurostat GISCO 2023			
COUNTRY	Primary School Facilities	Primary School Enrolled Students	Healthcare Facilities	Healthcare Beds
ALBANIA	No	No	Yes	No
AUSTRIA	Yes	Yes	Yes	Yes
BELGIUM	Yes	No	Yes	Yes
BOSNIA-HERZEGOVINA	No	No	No	No
BULGARIA	Yes	No	Yes	Yes
CROATIA	Yes	No	Yes	No
CYPRUS	Yes	No	Yes	No
CZECHIA	Yes	No	Yes	No
DENMARK	Yes	No	Yes	No
ESTONIA	Yes	No	Yes	No
FINLAND	Yes	No	Yes	No
FRANCE	Yes	No	Yes	No
GERMANY	Yes	Yes	Yes	Yes
GREECE	Yes	No	Yes	No
HUNGARY	Yes	No	Yes	No
ICELAND	No	No	No	No
IRELAND	Yes	Yes	Yes	No
ITALY	Yes (excluding Valle d'Aosta and Trentino Alto Adige)	No	Yes	Yes
KOSOVO	No	No	No	No
LATVIA	Yes	Yes	Yes	Yes
LIECHTENSTEIN	No	No	No	No
LITHUANIA	Yes	No	Yes	Yes
LUXEMBOURG	Yes	No	Yes	No
MALTA	No	No	Yes	No
MONTENEGRO	No	No	Yes	No
NETHERLANDS	Yes	No	Yes	No
NORTH MACEDONIA	No	No	No	No
NORWAY	Yes	No	Yes	No
POLAND	Yes	No	Yes	No
PORTUGAL	Yes (excluding Madeira and Açores)	No	Yes (excluding Madeira and Açores)	No
ROMANIA	Yes	No	Yes	Yes
SERBIA	No	No	Yes	Yes
SLOVAKIA	Yes	No	Yes	No
SLOVENIA	Yes	No	Yes	No
SPAIN	Yes (excluding Cataluña)	No	Yes (excluding La Palma)	Yes
SWEDEN	Yes	No	Yes	No
SWITZERLAND	No	No	Yes	No
UNITED KINGDOM	No	No	No	No

PUBLIC TRANSPORT AND ROAD NETWORKS

The accessibility results are based on detailed multimodal public transport and road networks. The available transport mode options in the dashboard include public transport, driving, walking, and cycling.

- PUBLIC TRANSPORT NETWORKS

To build the public transport networks we need for our models, we use relevant static timetable data from the National Access Points (NAPs). Established in 2013 as part of the Intelligent Transport Systems (ITS) Directive, NAPs serve as institutional one-stop platforms that should contain data on parking, road network conditions, public transport schedules, real-time data, and fares. The main aspects for the public transport parts of the NAPs are regulated according to the Multimodal Travel Information Services (MMTIS) regulation. According to the ITS Directive (2010/40/EU), MMTIS are "services providing information about, and interaction with, multimodal travel information services, both passenger and freight." Despite significant progress, not all Member States have fully integrated this information into their platforms yet.

The timetable reference dates and public transport services are selected to represent a typical weekday morning service provision relevant for the destination type. This selection also depends on the extraction date of the static schedule datasets, while the morning time window we use for the accessibility indicators is from 7:30 a.m. to 10:00 a.m. The data is formatted in either GTFS (General Transit Feed Specification) or NeTEx (Network Timetable Exchange), with GTFS being widely used for its simplicity and ease of integration, while NeTEx provides a more detailed and standardized approach. The morning time window is 7:30 a.m. – 10:00 a.m.

We use short geodesic walks at 5 km/h to connect the origins and destinations to the public transport network and for transfers between transport services. We set upper bounds of 2 km for initial connections and 1 km for the transfers.

The table below shows the geographical coverage limitations and other relevant information for the multimodal public transport networks we use in the analyses.

Table 2 – Public transport networks' geographical coverage and modelling details.

	Public Transport Network Data			
COUNTRY	National Coverage (and format used)	Timetable Reference Date	School buses	Known limitations in the included datasets (if any)
ALBANIA	No	-	No	Missing data
AUSTRIA	Yes (GTFS)	Thu, 06-03-2025	No	-
BELGIUM	Yes (GTFS)	Thu, 16-05-2024	No	-
BOSNIA-HERZEGOVINA	No	-	No	Missing data
BULGARIA	No	-	No	Missing data
CROATIA	No	-	No	Some regional data available – not processed/included yet
CYPRUS	Yes (GTFS)	Thu, 02-11-2023	No	-
CZECHIA	No	-	No	NeTEx data available – not processed/included yet
DENMARK	Yes (GTFS)	Thu, 20-03-2025	No	-
ESTONIA	Yes (GTFS)	Wed, 15-01-2025	No	-
FINLAND	Yes (GTFS)	Thu, 13-03-2025	limited	-
FRANCE	Yes (GTFS)	Thu, 23-11-2023	Yes	-
GERMANY	Yes (GTFS)	Wed, 08-05-2024	No	-
GREECE	No	-	No	Missing data
HUNGARY	Yes (GTFS)	Thu, 13-02-2025	No	Data from some operators might be missing (we have about 80% coverage)
ICELAND	Yes (GTFS)	Wed, 11-10-2023	No	-
IRELAND	Yes (GTFS)	Thu, 16-05-2024	No	-
ITALY	Yes (NeTEx) – with regional limitations	Thu, 06-02-2025	No	**Missing regions**: Basilicata, Molise, Sicilia, Umbria, Valle d'Aosta; **Additional missing provinces**: Padova, Rovigo, Treviso, Vicenza
KOSOVO	No	-	No	Missing data
LATVIA	Yes (GTFS)	Wed, 15-01-2025	No	-
LIECHTENSTEIN	No	-	No	Missing data
LITHUANIA	Yes (GTFS) – with network limitations	Wed, 15-01-2025	No	Missing rail services
LUXEMBOURG	Yes (GTFS)	Thu, 16-05-2024	No	-
MALTA	No	-	No	Missing data
MONTENEGRO	No	-	No	Missing data
NETHERLANDS	Yes (GTFS)	Thu, 16-05-2024	No	-
NORTH MACEDONIA	No	-	No	-
NORWAY	Yes (GTFS)	Thu, 09-11-2023	Yes	-
POLAND	No	-	No	Some regional data available – not processed/included yet
PORTUGAL	Yes (GTFS) – with regional limitations	Thu, 16-03-2023	No	**Missing regions**: Alentejo, Açores, Centro Portugal, Madeira, Norte Portugal, Oeste e Vale do Tejo.
ROMANIA	No	-	No	Missing data
SERBIA	No	-	No	Missing data
SLOVAKIA	No	-	No	Missing data
SLOVENIA	Yes (GTFS)	Thu, 09-11-2023	No	-
SPAIN	Yes (GTFS) – with regional limitations	Wed, 29-01-2025	No	**Missing regions**: Albacete, Cuenca, El Hierro, Gran Canaria, La Gomera, La Palma, Lanzarote, La Rioja, Zamora **Additional missing provinces**: Badajos, Ceuta, La Costa del Sol, Lorca, Melilla, Ponferrada, Sanlúcar de Barrameda, Utrera
SWEDEN	Yes (GTFS)	Thu, 16-11-2023	No	-
SWITZERLAND	Yes (GTFS)	Thu, 14-11-2024	No	-
UNITED KINGDOM	Yes (GTFS)	Thu, 09-11-2023 (UK, GB) Thu, 16-05-2024 (UK, NI)	No	-

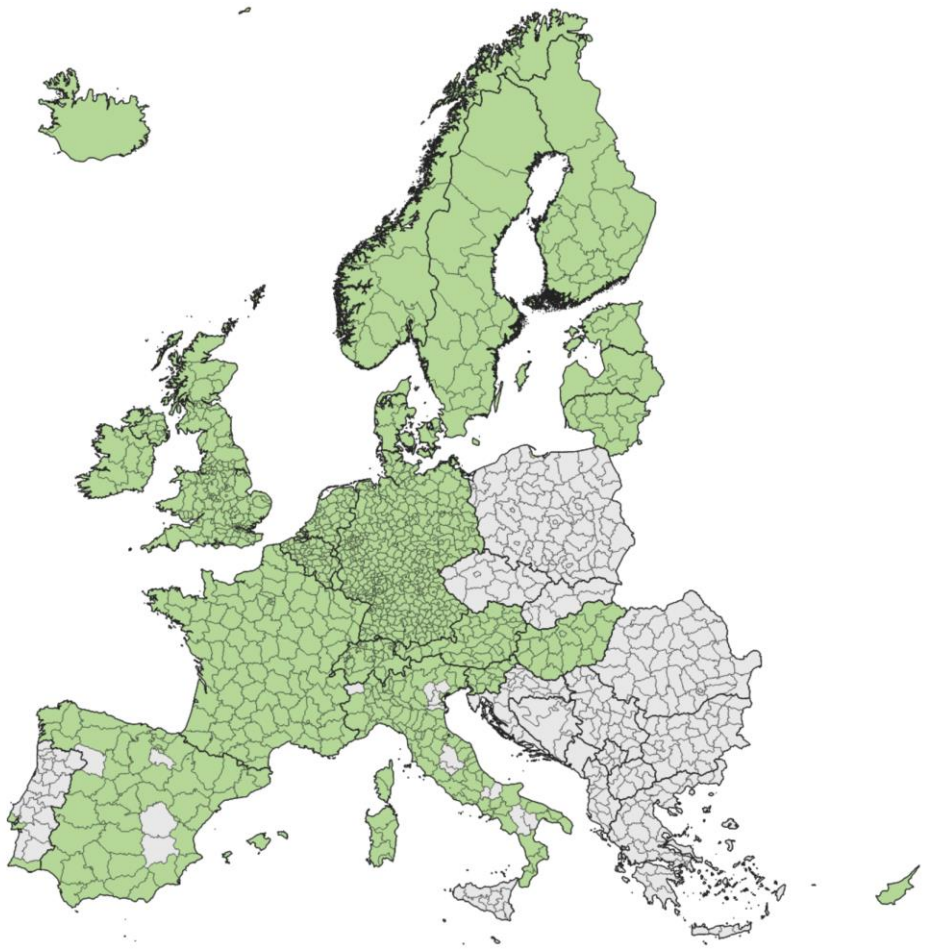

Figure 1 – Public transport networks' geographical coverage map (NUTS 3 detail).

- ROAD NETWORKS

The road network includes all roads from TomTom MultiNet 2023, a comprehensive commercial dataset detailing segments from main highways to local and pedestrian roads, covering the entire European territory. We extract three different configurations to develop the walking, cycling, and driving networks, removing network components with fewer than 1,000 nodes to ensure connectivity.

To connect origins and destinations to the network, we use the closest five junctions within a 4 km radius, linking them at fixed cruising speeds of 15 km/h for driving, 7.5 km/h for cycling, and 2.5 km/h for walking.

For driving, all road categories are included, except those closed to traffic. Driving speeds are adjusted according to traffic conditions on a typical weekday morning from 7:00 a.m. to 9:00 a.m., sourced from the information available on TomTom MultiNet.

For cycling and walking, non-cyclable and non-walkable roads are filtered out while ensuring network connectivity. We also incorporate cyclable and walkable roads closed to car traffic, such as cycle lanes and stairs. The effects of topography on cycling and walking speeds are considered, using data from the Copernicus EEA-10 Digital Elevation Model dataset. This dataset offers detailed elevation information at a 10-meter resolution, which impacts travel speeds and hence accessibility for these modes of transport.

Administrative Layers

For aggregating the 1km^2 Grid data, in addition to country-level aggregation, we use the Territorial Units for Statistics (NUTS) 2024 and the Local Administrative Units (LAU) 2023, both provided by Eurostat GISCO. For more information on geographical extent and administrative meaning of NUTS 1, NUTS 2, NUTS 3 and LAU—which vary by country and have evolved over time—please refer to the Eurostat dedicated page.

Sufficiency Thresholds

The definition of sufficiency thresholds serves as a reference point for assessing transport poverty and should originate from political debate. These thresholds are calculated as the median population-weighted number of services or opportunities reached within a travel time of 10-20 minutes by driving at country level. European-level thresholds are used to display the "All (Europe)" Country selector results and for the "European-squared accessibility poverty gap" indicators. The unit of measurement for the thresholds corresponds to the 'Type of Destination' option selected.

Methodology and Accessibility Indicators

Our methodology for calculating accessibility indicators encompasses two main models, one for public transport routing and one for the walking, cycling and driving road routings. Each application of the models has its own characteristics and parameters to capture relevant factors that may impact how people navigate the networks, but they all use Dijkstra-based algorithms to solve earliest arrival problems.

To measure public transport accessibility, we use our in-house developed model, VelociRAPTOR. The model leverages static timetable network data and incorporate short walks for connecting origins and destinations to the network, as well as for transfers. VelociRAPTOR is specifically designed to solve the complex all-pairs routing problem, enabling detailed analysis across large network instances.

We use short geodesic walks at 5 km/h to connect the origins and destinations to the public transport network and for transfers between transport services. We set upper bounds of 2 km for initial connections and 1 km for the transfers. VelociRAPTOR efficiently processes multiple public transport modes in pre-determined time windows of about two to three hours, from the search of the service to the arrival at destination. Our model allows for up to four transfers in the routing, which in our results is equivalent to assuming "unrestricted" number of transfers. This assumption is reasonable for a generic individual profile, though transfer restrictions might apply to specific groups, such as older people or children.

In addition to public transport, our road accessibility analysis leverages detailed data to assess walking, cycling, and driving networks. This holistic approach ensures that all modes of transport are considered, providing a nuanced understanding of accessibility across different contexts.

For road transport, we use commercial data from TomTom MultiNet.

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Legends

Colouring

Max and non-linearity

Meaning of "not enough data"

- Destination data
- Network data
- Pop at origin not available for aggregated layers
- Average statistical aggregations for "time to nearest X destinations" indicator

Interpreting number of destinations within fixed travel time thresholds and relevance of 40-50 and 55-65 thresholds for transport poverty

Interpreting Travel time to nearest X destinations

Interpreting FGT_2 type of indicator between 0 and 1

Access to school results for FI, FR, NO include school buses, while these services are excluded for the calculation of the other indicators with public transport.

Metrics are based on a generic individual profile, and are divided into three main categories: (i) number of reachable services, seats, or people within fixed travel time thresholds; (ii) travel time to the nearest one to five facilities, or predetermined levels of seats or people; (iii) squared accessibility poverty gap and FGT_2 indicators, which count individuals falling below a predefined sufficiency threshold of accessibility, weighted by the extent of their accessibility deficit when travelling for 40-50 minutes with the selected mode of transport.

GLOSSARY

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FURTHER READINGS AND DATA RESOURCES

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REGIO-JRC

OECD

ESTAT

JRC

Papers

SUPPORT

For suggestions on indicators to include in future releases or issues you are experiencing when using the platform, please contact jrc-c6-tnet@ec.europa.eu