MINISTRY OF TRANSPORT AND COMMUNICATIONS OF LITHUANIA

Kurk LT

Creation of the Sustainable Mobility Index

Index Methodology document

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Introduction

Since 2015, Lithuania has provided national recommendations to municipalities for implementing Sustainable Urban Mobility Plans (SUMPs)[1] to advance national sustainability goals in line with the European Green Deal[2] and the United Nations Sustainable Development Goals[3]. SUMPs are a key pillar of European urban mobility policy, aimed at improving quality of life by addressing challenges such as traffic congestion, air pollution, climate change, road safety, and parking inefficiencies. They also foster innovation and support the integration of new mobility services[4].

The European Commission strongly encourages cities and towns across Europe to adopt the SUMP framework, and by 2027, it will be mandatory for all 431 urban nodes within the Trans-European Transport Network (TEN-T) - including Lithuanian cities such as Vilnius, Kaunas, Klaipėda, Šiauliai, and Panevėžys - to have SUMPs in place[5].

As of now, 24 out of 60 Lithuanian municipalities have adopted SUMPs. To support this transition and enhance mobility planning, Lithuania is implementing the **Sustainable Mobility Data Platform Project** to collect and centralize mobility data from all municipalities. This platform, developed in collaboration between the Ministry of Transport and the State Data Agency, aims to provide a comprehensive dataset for evaluating sustainable mobility at the national and local levels.

While this represents meaningful progress, the lack of a clear and consistent methodology for assessing sustainable mobility efforts remains a challenge[6]. To address this gap, the project includes the development of a **Sustainable Mobility Index** - a standardized framework that will integrate data from the Sustainable Mobility Data Platform to evaluate the performance of Lithuanian municipalities. This index will enable comparative analysis both within Lithuania and against other EU countries, supporting informed decision-making for policymakers, researchers, and the public. It will provide valuable insights into how municipalities are progressing toward sustainable mobility goals and inform strategies for infrastructure development, investment, and policy interventions.

[1] https://transport.ec.europa.eu/transport-themes/urban-transport/sustainable-urban-mobility-planning-and-monitoring_en
[2] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en
[3] https://sdgs.un.org/goals
[4] https://transport.ec.europa.eu/transport-themes/urban-transport/sustainable-urban-mobility-planning-and-monitoring_en
[5] https://interreg-baltic.eu/project-posts/sumps-for-bsr/revised-ten-t-regulation-strengthening-the-role-of-sump-how-are-cities-prepared-2/
[6] https://sumin.lrv.lt/lt/veiklos-sritys/darnus-judumas/darnaus-judumo-duomenys/

Creation of the Index

Features

To ensure the created index effectively measures sustainable mobility, we reviewed both Lithuanian and international best practices. We analyzed existing indexes from cities like Tallinn (Estonia)[7] and Copenhagen (Denmark)[8], as well as methods developed by private sector organizations such as Arcadis[9], CIVITAS[10], Oliver Wyman[11], and PwC[12]. These examples helped shape our approach to selecting indicators, designing the methodology, and integrating data.

We also considered national efforts that align with Lithuania's transport and climate goals. These included the Environmental Index[13] by the Ministry of Environment and the Municipal Life Quality Index[14] by the Ministry of Finance. Key elements from these initiatives were adapted to fit the Sustainable Mobility Index, ensuring it remains relevant for Lithuania.

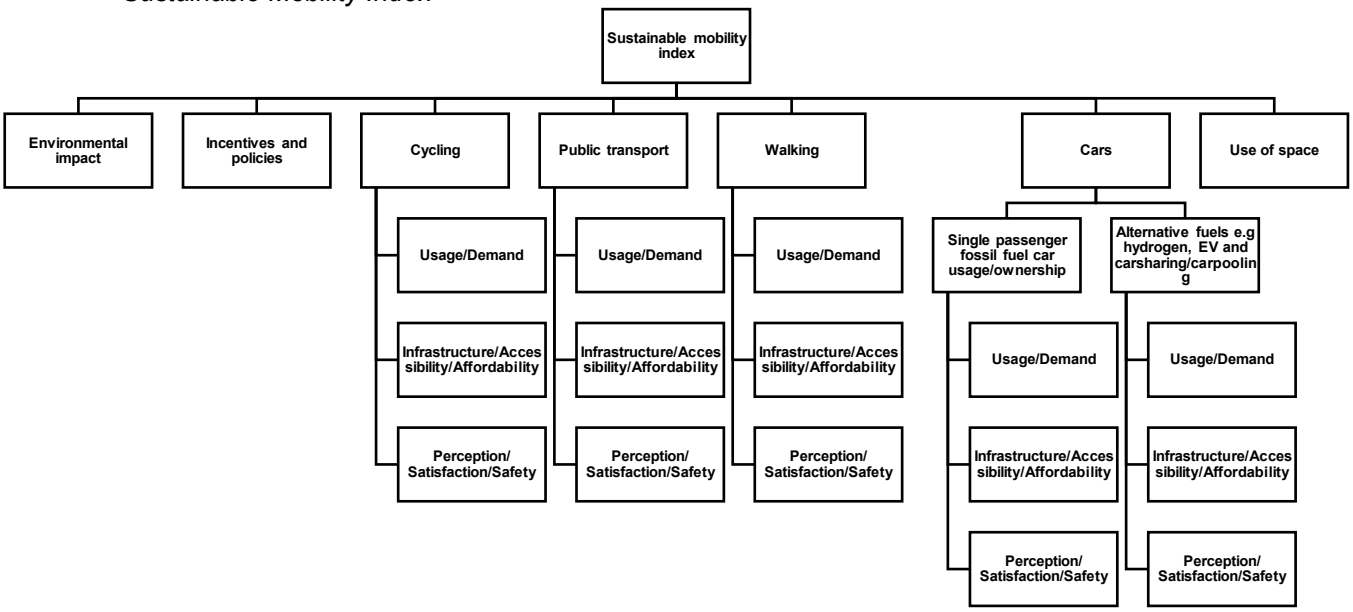
Moreover, the Index was intentionally designed to be reproducible and aligned with European Union data standards and reporting requirements. Particular attention was paid to the Trans-European Transport Network (TEN-T) policy framework and its 2027 monitoring obligations, including the requirement for Sustainable Urban Mobility Plans (SUMP) and the collection of Urban Mobility Indicators (UMIs) at the urban node level.

The Index incorporates specific indicators mandated by the TEN-T regulation and related EU mobility and climate action plans, with attention to accessibility, sustainability, and safety. It also reflects principles such as collaboration with local and regional authorities and encourages data disaggregation where possible by age, gender, and disability. This alignment ensures the Index not only assesses current performance but also supports long-term monitoring, strategic planning, and compliance with Lithuania's EU-level sustainability commitments[15]. The primary pillars of the index are shown in Figure 1. A full list of the features and indicators recommended for our index can be found in Appendix I.

[7] https://www.tallinn.ee/en/media/313030
[8] https://urbandevelopmentcph.kk.dk/mobility-cycling/mobility-how-we-get-around-in-the-city
[9] https://www.arcadis.com/en/insights/perspectives/global/sustainable-cities-index-2024
[10] https://civitas.eu/sites/default/files/civitas_capital_ag5_brochure_indicators_final.pdf
[11] https://www.oliverwymanforum.com/content/dam/oliver-wyman/ow-forum/template-scripts/urban-mobility-index-2024/PDF/Mobility-Index-Report.pdf
[12] https://cee.pwc.com/cee-smart-cities-mobility-index.html
[13] https://am.lrv.lt/lt/lietuvos-savivaldybiu-aplinkosaugos-reitingas-puslapis/lietuvos-savivaldybiu-aplinkosaugos-reitingas-2024/
[14] https://lietuvosfinansai.lt/en/lqi/
[15] https://transport.ec.europa.eu/document/download/cb890007-af95-46e8-8f9c-1a29c1efefac_en?filename=EGUM_SUMP_subgroup_SUMI_opinion.pdf

Figure 1.

Sustainable Mobility Index



Ranking

The **Sustainable Mobility Index** is designed to support a nationwide shift in Lithuania toward cleaner, more efficient modes of transportation. Its central aim is to reduce reliance on high-emission private vehicles by promoting sustainable alternatives such as walking, cycling, and public transport. This transition requires more than encouragement - it demands infrastructure investment, effective incentives, and urban planning that prioritizes sustainable mobility.

The structure of the Index is built to reflect and reinforce these priorities. Its **weighting system** gives greater importance to indicators that support active and public transport over privately-owned, fossil fuel vehicles, rewarding municipalities that invest in sustainable infrastructure and forward-looking policies and penalizing those that over rely or incentivize private vehicle usage. As a result, the Index serves not only as a tool for measuring progress, but also as a practical framework for guiding municipal decisions and encouraging long-term, sustainable mobility development across the country.

Table 1.

Sustainable mobility index weights

Index primary pillars	***Given weights***
Environmental impact	5%
Incentives and policies	5%
Cycling	20%
Public Transport	20%

Walking	20%
Cars (Fossil Fuel: 20%; EV: 10%)	30%
Use of space	10%

Lithuanian Regional Groupings

Lithuania's 60 municipalities vary significantly in population size, density, infrastructure, and industry composition. Thus, a single index comparing all municipalities may risk. To address this, our index creates scores along two dimensions using the same scoring methods:

1. A national score, calculated across all municipalities using common min–max bounds.
2. A peer-group score, calculated across a defined set of comparable municipalities using common min-max bounds

This structure enables both national benchmarking and context-sensitive evaluation, ensuring that municipalities are assessed relative to their structural constraints, demographics, and local economies.

Municipalities are grouped into four peer categories based on a combination of population size, settlement density, commuting patterns, and tourism intensity. We closely follow the Lithuanian Quality of Life Indicators in choosing our categories[16]. Table 2 shows an overview of the peer groups below.

Table 2.

Geographical Classifications

Peer Group	Description	Example Municipalities
Metropolitan	Densely populated urban municipalities with complex transport systems	Vilniaus m., Kauno m. Klaipėdos m., Šiaulių m.
Suburban / Mid-sized	Municipalities with 15,000–90,000 residents or those within metro commuter belts	Kauno r., Jonavos r., Telšių r., Ukmergės r.
Resort Towns	Municipalities where tourism constitutes a significant share of local activity (≥30% overnight stays)	Palangos, Neringos, Druskininkų, Birštono
Rural	Remaining municipalities with lower population density and predominantly local transport needs	Zarasų r., Varėnos r., Kelmės r.

The peer-group structure informs both the selection and interpretation of indicators. Put another way, certain sustainable mobility features are only meaningful in particular contexts. For example, metrics related to trolleybuses are only relevant for certain metropolitan areas, while some smaller and more rural municipalities will inherently have less demand for micromobility options like scooters.

[16] https://lietuvosfinansai.lt/gki/

Additionally, evaluating municipalities relative to a relevant reference group means that geographies that inherently have less infrastructure due to geographical needs are not unfairly penalized. For example, suburban and rural areas are not penalized for lacking infrastructure that is exclusive to large cities.

All metrics are normalized using the same min–max approach but applied within each group. National scores use national bounds; peer scores use group-specific bounds. This approach ensures analytical consistency while enhancing interpretive accuracy and policy relevance.

The municipality level is the primary unit of analysis for the index. This scale was selected for several reasons. First, it aligns with the administrative level responsible for mobility planning and investment and as such, it is the smallest level for which most mobility-related data are available annually (e.g., traffic volumes, public transport service levels, emissions, road safety). Moreover, it allows for comparability with EU Urban Audit and SUMI datasets via Functional Urban Areas (FUA) and NUTS-3 regions where relevant. Lastly, air quality and environmental data that are only available at the county level are proportionally allocated to municipalities based on population and road network characteristics.

To provide comparisons at the EU-level, we simply apply the same max-min standardization level with the referent group being the relevant EU countries or cities. We evaluate this metric only on the 10 core indicators outlined in the EU's TEN-T regulations that require EU member states submit data on these core indicators by 2027.

Technical Methodology

Min-max approach

To enable meaningful comparisons across municipalities and across metrics with different units and scales, we apply min–max normalization to all quantitative indicators. This method rescales each metric to a standard 0–100 scale, where:

- 0 represents the lowest (worst) observed value,
- 100 represents the highest (best) observed value,
- and all other values are distributed proportionally in between.

This approach ensures that all indicators contribute comparably to composite scores, regardless of their original units (e.g. kilometers, percentages, emissions in tons).

Formula

For indicators where higher values are better (e.g. % of trips by bicycle):

$$\text{Normalized Score} = \frac{x_i - x_{min}}{x_{max} - x_{min}} \times 100$$

For indicators where lower values are better (e.g. CO_2 emissions per capita):

$$\text{Normalized Score} = \frac{x_{max} - x_i}{x_{max} - x_{min}} \times 100$$

Where:

- x_i = the raw value for municipality *i*
- x_{min}, x_{max} = the minimum and maximum values observed across the comparison group (either all municipalities or peer group)
- The resulting score ranges from 0 to 100

Application

- Normalization is applied separately for each metric, using the observed min and max values within the selected comparison group (either all municipalities or a specific peer group).

- If all values for a metric are equal (i.e. x_max = x_min), a fixed score (e.g. 100) is assigned to all municipalities to avoid division by zero.
- If a municipality does not have a corresponding value in a specific metric, it is omitted from that metric.

Why min-max approach?

We selected the min–max approach because it is:

- Intuitive: A score of 85 clearly implies better performance than a score of 40.
- Transparent: The transformation is easily understood and replicable.
- Flexible: It can be applied across a wide variety of metrics and adjusted to use either national or peer-specific bounds.

After transforming each variable into min-max normalized format, we then take the average score across variables within each sustainable mobility category. Lastly, we apply our weights to calculate a weighted sum that will give each municipality a score. This approach allows us to see which municipalities are doing the best overall, and which municipalities lead on each subindex.

Example

Since we currently do not have full data availability and coverage in the Sustainable Mobility Data Platform, we generated synthetic data to simulate the calculation of the Sustainable Mobility Index. Results of our methodology applied to these data are shown below, for proof-of-concept purposes.

Figure 2.

Example of Top 5 Municipalities with the Highest Sustainable Mobility Index

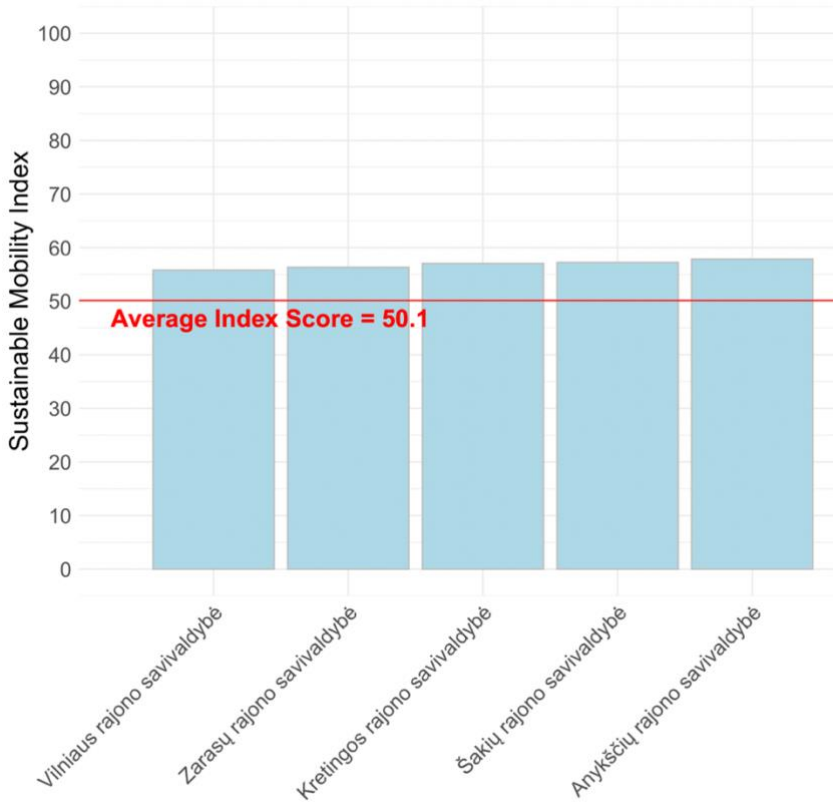


Figure 3.

Example of Top 5 Municipalities with the Lowest Sustainable Mobility Index

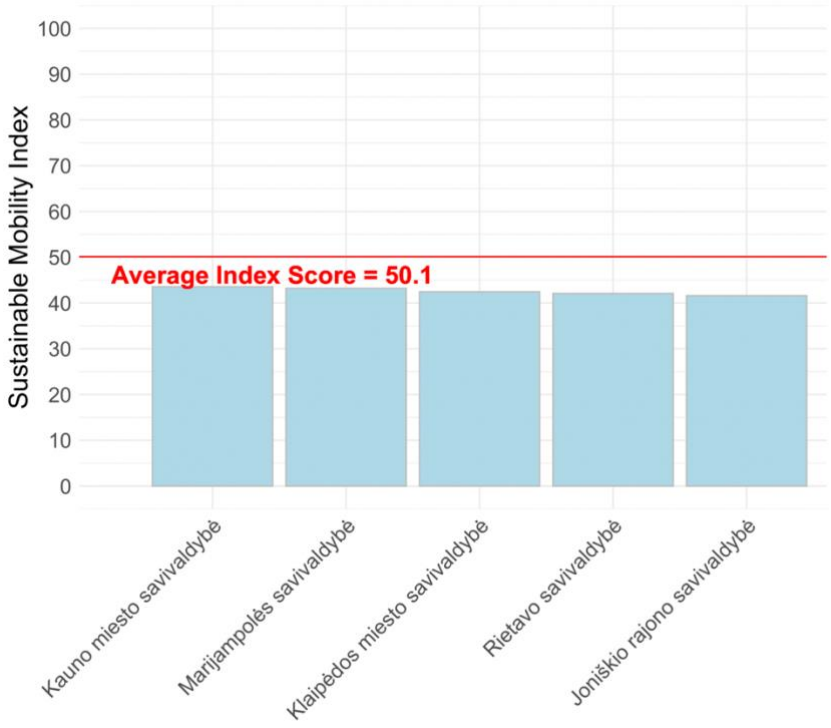


Figure 4.

Example of Top 5 Municipalities with the Highest Cycling Index Score

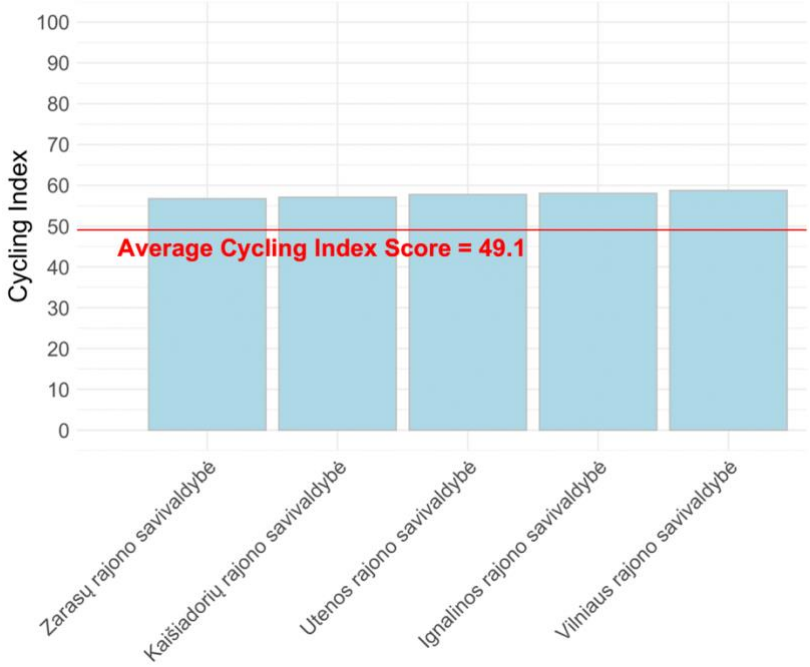


Figure 5.

Example of Sustainable Mobility Index by Class

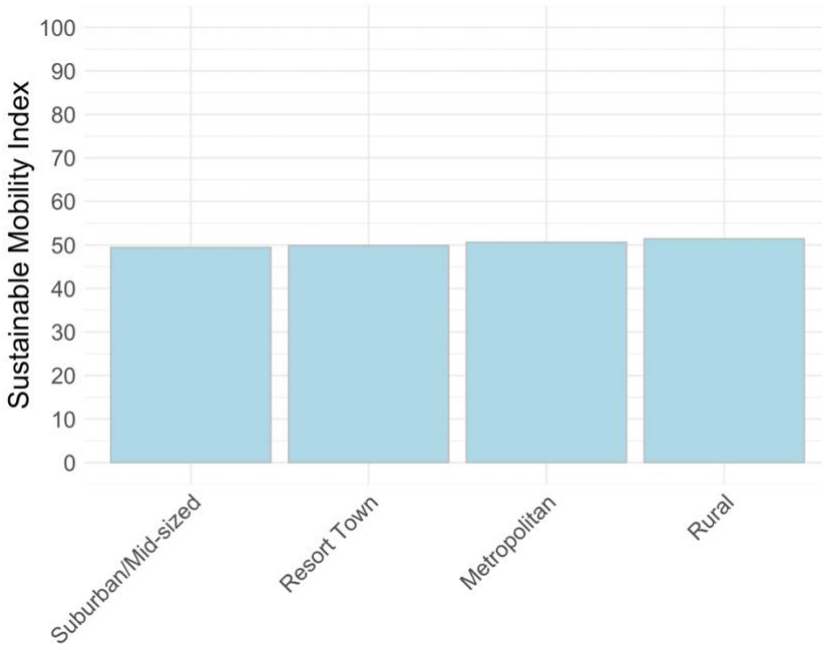
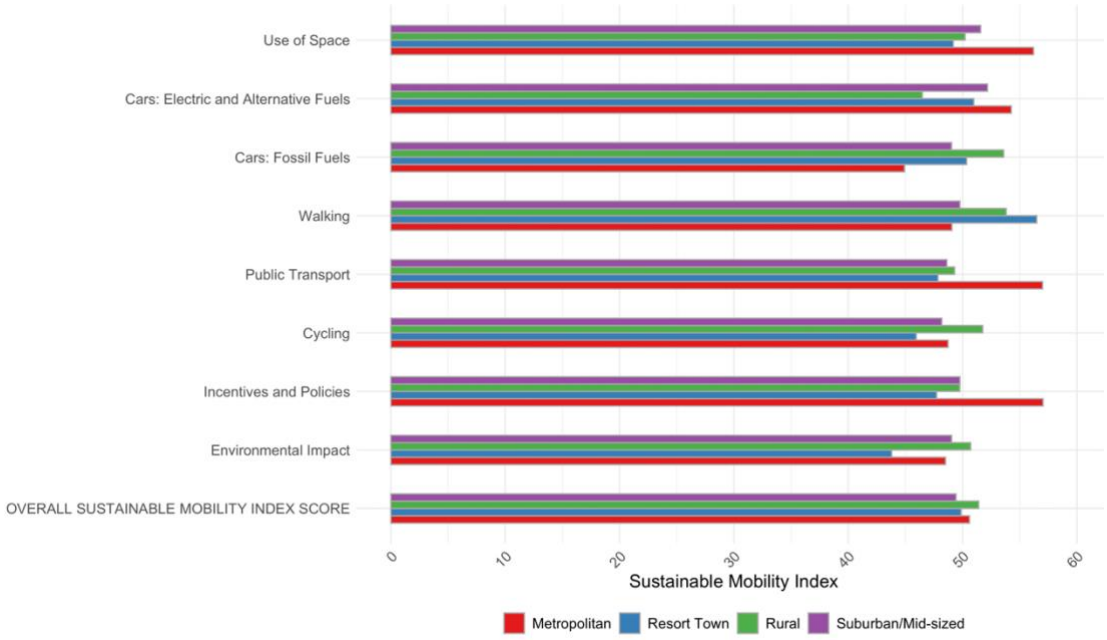


Figure 6.

Example of Average Sustainable Sub-Index by Class



Appendix I

Main Category	Sub-category	Metric
Environmental impact	-	Annual CO_2-equivalent emissions from road transport in the city/FUA (Functional Urban Area)
Environmental impact	-	PM10 amount in excess of EU standards
Environmental impact	-	PM2.5 amount in excess of EU standards
Environmental impact	-	NOx amount in excess of EU standards
Environmental impact	-	Percent of population expose to noise >55 db(A) daytime and >50 db(A) nighttime
Incentives and policies	-	Municipality investment in charging station / Share of municipality investment in charging stations out of the whole budget / Municipality investment in charging stations per population
Incentives and policies	-	Municipality investment in public transportation / Share of municipality investment in public transportation out of the whole budget / Municipality investment in public transportation per population
Incentives and policies	-	Municipality investment in the mobility sharing economy / Share of municipality investment in mobility sharing economy out of the whole budget / Municipality investment in mobility sharing economy per population
Incentives and policies	-	Road user charging/congestion pricing programs (Number of programs / total amount of investments / investments per population / Programs per population)
Incentives and policies	-	Direct electric vehicle incentivization in municipality (Number of programs / total amount of investments / investments per population / Programs per population)
Incentives and policies	-	Carsharing incentive policies (e.g., free or discounted parking for carsharing services) (Number of programs / total amount of investments / investments per population / Programs per population)
Incentives and policies	-	Presence of climate targets and degree of commitment
Incentives and policies	-	Bike incentivization policies (by government or firms) (could measure by number of policies or policy usage per year)
Incentives and policies	-	Is there a low-emission zone established?
Incentives and policies	-	Does the municipality have a sustainable mobility plan?
Cycling	Usage/Demand	Average number of usable bikes per household
Cycling	Usage/Demand	Share of people whose main mode of transport to work/school is by bike
Cycling	Usage/Demand	Average one-way distance traveled by bike per weekday for those whose main mode of travel to work/school is by bike
Cycling	Infrastructure/Accesibility/Affordability	Total length or share of the road network equipped with physically separated and protected cycling lanes or tracks
Cycling	Infrastructure/Accesibility/Affordability	Total length or share of the road network that has a cycle track or lane that is NOT physically separated by a barrier or other protection (e.g., curb)
Cycling	Infrastructure/Accesibility/Affordability	Share of cycle tracks renovated/reestablished in the last year (km)
Cycling	Infrastructure/Accesibility/Affordability	Bicycle parking spaces built (number per year) or bicycle parking spaces per population
Cycling	Infrastructure/Accesibility/Affordability	Per capita bike-sharing bikes and stations (number)
Cycling	Infrastructure/Accesibility/Affordability	Total length and share of bicycle paths (unprotected + protected) in the total road network

Cycling	Perception/ Satisfaction/Safety	General satisfaction with bike parking (%) or other bike infrastructure
Cycling	Perception/ Satisfaction/Safety	Number of persons fatally or seriously injured per population
Cycling	Perception/ Satisfaction/Safety	Number of fines per population
Cycling	Perception/ Satisfaction/Safety	Perceived safety of Cycling
Public Transport	Usage/Demand	Number of passengers or km on public transport / Number of passengers or km on public transport per population
Public Transport	Usage/Demand	Share of people whose main mode of transport to work/school is by public transport
Public Transport	Usage/Demand	Change in public transport passengers
Public Transport	Usage/Demand	Share/change of public transport that is CO2 neutral/uses alternative fuel sources
Public Transport	Infrastructure/Accesibility/Affordability	Percent of population within 300 meters of a PT stop that runs ≥1 service/hour (%)
Public Transport	Infrastructure/Accesibility/Affordability	Average delay time at stops
Public Transport	Infrastructure/Accesibility/Affordability	Average length of walk to public transit
Public Transport	Infrastructure/Accesibility/Affordability	Average public transit operating hours
Public Transport	Infrastructure/Accesibility/Affordability	Percent change in the regularity/frequency of bus services (%); e.g., percent change in number of bus/train routes, number of buses/trains,
Public Transport	Infrastructure/Accesibility/Affordability	Number of daily departures from all stops per total city population
Public Transport	Infrastructure/Accesibility/Affordability	Percent of public transit services arriving ≤5 minutes late at key stops (%)
Public Transport	Infrastructure/Accesibility/Affordability	Standard monthly public transport fare by category (e.g., student, normal, elderly, etc.) as a % of monthly GDP per capita (or a relative comparison of monthly ticket cost to average or median income)
Public Transport	Infrastructure/Accesibility/Affordability	Price of a monthly PT ticket relative to fine
Public Transport	Perception/ Satisfaction/Safety	General satisfaction with public transportation
Public Transport	Perception/ Satisfaction/Safety	Perceived safety of public transportation
Walking	Usage/Demand	Share of people whose main mode of transport to work/school is by walking
Walking	Usage/Demand	One-way distance traveled by walking per week day for those whose main mode of travel to work/school is by walking
Walking	Infrastructure/Accesibility/Affordability	Percent of total walkable routes that are off-street
Walking	Infrastructure/Accesibility/Affordability	Share of road network designated as car-free or pedestrian zones * fraction of week/month/year it is car free
Walking	Perception/ Satisfaction/Safety	Number of pedestrians fatally or seriously injured (Detailed by age category, vehicle type, accident type etc.)
Walking	Perception/ Satisfaction/Safety	Perceived safety of walking
Walking	Perception/ Satisfaction/Safety	Percentage of people who rank improvements to cycling and pedestrian infrastructure in their top 3 improvements that would make them walk or cycle more
Cars - fossil fuel	Usage/demand	Share of people whose main mode of transport to work/school is by fossil fuel car / EV / Hybrid (3 separate metrics for each)
Cars - fossil fuel	Usage/demand	One-way distance traveled by fossil fuel car / EV / hybrid vehicle per weekday among those whose main mode of transport to work/school is by fossil fuel car/ EV / hybrid vehicle (3 separate metrics for each)

Cars - fossil fuel	Usage/demand	Share of zero-car households
Cars - fossil fuel	Usage/demand	Number/share of passenger cars by type
Cars - fossil fuel	Infrastructure/accessibility/affordability	Cost of a Bolt/taxi journey for specified distance
Cars - alternative fuels	Usage/demand	Electric vehicle market share
Cars - alternative fuels	Usage/demand	Share of new registered vehicles that are EV
Cars - alternative fuels	Infrastructure/accessibility/affordability	Number of electric charging points and/or hydrogen filling stations
Cars - alternative fuels	Infrastructure/accessibility/affordability	Number of electric charging points and/or hydrogen filling stations / population (Density)
Use of space	-	Number of parking spaces per square meter of floor area by building type
Use of space	-	Number of parked cars to number of legal parking spaces
Use of space	-	Percent of total urban area allocated to parking/number of parking spaces/sq. km of parking
Use of space	-	Distribution of area between city houses by type (sidewalk/bikepath/pedestrian-only; greenspace; roads for cars; bike paths)
Use of space	-	Share of road network designated as car-free or pedestrian zones
Use of space	-	Percent of total street length that is <= 30km/h or entirely car free
Use of space	-	Percent of total walkable routes >=50km that are off-street (e.g., pedestrian only paths, through green space, etc.)
Use of space	-	Percent of roads >= 40km/hr that have segregated or parallel cycle lanes
Use of space	-	Percent of time lost to traffic compared to free-flow conditions