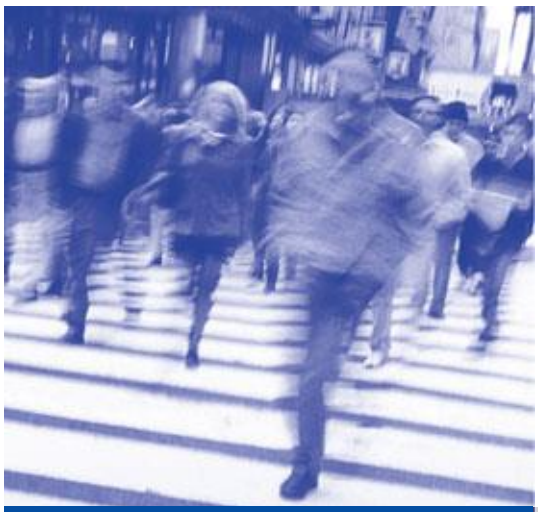


SUMP-PLUS

City Typology, for context-sensitive framework and tools development

Project Acronym:	**SUMP-PLUS**
Full Title:	
Sustainable Urban Mobility Planning: Pathways and Links to Urban Systems	
Grant Agreement No.:	814881
Deliverable no.	D1.1
Workpackage No.:	WP1
Workpackage Title:	
Conceptual Framework and Analytical Tools	
Responsible Author(s):	
Emilia Smeds, Peter Jones, UCL – Chapter 2 Ana Dragutescu, Marko Horvat, Elma Meskovic, ICLEI – Chapter 3 The other chapters have been jointly authored by UCL and ICLEI.	

2020 CiVITAS Cleaner and better transport in cities SUMP-PLUS

THE CIVITAS INITIATIVE IS CO-FINANCED BY THE EUROPEAN UNION

European Platform on Sustainable Urban Mobility Plans

Document control page

Programme	Horizon 2020
Grant Agreement no.	**814881**
Project Acronym:	**SUMP-PLUS**
Coordinator	City of Antwerp
Website	www.sump-plus.eu
Starting date	01.09.2019
Duration in months	36
Call identifier / Topic	H2020-MG-2018-TwoStages / LC-MG-1-3-2018
Deliverable no. and title	
Work Package no and title	
Status	Final
Date of issue	
Dissemination level	Public/

Version	Date	Modified by	Comments
	13.12.2019	Ana Dragutescu, Marko Horvat, Elma Meskovic (ICLEI)	First draft of Chapter 2 shared with UCL
	04.02.2020	Ana Dragutescu, Marko Horvat, Elma Meskovic (ICLEI)	Raw SUMPs-UP data shared with UCL
1.0	06.04.2020	Peter Jones and Emilia Smeds (UCL)	First draft outline shared with ICLEI, incorporating existing Chapter 2 content
1.0	26.04.2020	Peter Jones and Emilia Smeds (UCL)	Chapter 3 added.
2.0	12.05.2020	Ana Dragutescu, Marko Horvat, Elma Meskovic (ICLEI), and Peter Jones, Emilia Smeds (UCL)	Feedback integrated and outstanding chapters added.
3.0	22.05.2020	Ana Dragutescu, Marko Horvat, Elma Meskovic (ICLEI), and Peter Jones, Emilia Smeds (UCL)	Chapters updated based on feedback received during call on 12.05.2020
4.0	25.05.2020	Ana Dragutescu, Marko Horvat, Elma Meskovic (ICLEI)	Sent to FGM-AMOR for second review

5.0	29.5.2020	Claus Köllinger, Robert Pressl (FGM-AMOR)	Sent to ICLEI with feedback integrated
6.0	02.06.2020	Ana Dragutescu (ICLEI) Elma Meskovic (ICLEI)	Feedback integration of feedback / Typology test with the cities – enclose the final answers
7.0	15.06.2020	Ana Dragutescu (ICLEI)	Final version sent to the Coordinator

Disclaimer

Abstract

In order to better understand the factors that hinder SUMP development and address urban mobility challenges, CIVITAS SUMP-PLUS is working within six co-creation laboratories in six cities. Yet due to the varying circumstances and mobility contexts in the project's partner and (more generally) European cities, SUMP-PLUS determined the need for a city typology that enables the comparison of and the identification of differences between these varied city contexts. This report delivers an overview of the sources and methods used by different organisations, projects and other institutions when creating city typologies. Finally, this report sets out SUMP-PLUS's own mobility-focused city typology, whose development has drawn on the aforementioned city typologies.

List of beneficiaries

No	Name	Short name	Country
1	STAD ANTWERPEN	ANT	Belgium
2	MUNICIPALITY OF ALBA IULIA	ALBA IULIA	Romania
3	KLAIPEDOS MIESTO SAVIVALDYBES ADMINISTRACIJA	KLAIPEDA	Lithuania
4	COMUNE DI LUCCA	COMUNE DI LUCCA	Italy
5	DIMOS PLATANIAS	PLATANIAS CRETE	Greece
6	TRANSPORT FOR GREATER MANCHESTER	TR G MANCHESTER	United Kingdom
7	FONDATION NATIONALE DES SCIENCES POLITIQUE	Science Po	France
8	POLYTECHNEIO KRITIS	TECH UNIV CRETE	Greece
9	UNIVERSITY COLLEGE LONDON	UCL	United Kingdom
10	EUROPEAN INTEGRATED PROJECT	EIP	Romania
11	FORSCHUNGSGESELLSCHAFT MOBILITÄT – Austrian Mobility Reasearch FGM-AMOR gGmbH	FGM-AMOR	Austria
12	MEMEX SRL	MEMEX	Italy

13	SPACE SYNTAX LIMITED	SPACE SYNTAX	United Kingdom
14	VECTOS LIMITED	VECTOS	Germany
15	ICLEI EUROPEAN SECRETARIAT GMBH	ICLEI EURO	Germany
16	UNION INTERNATIONALE DES TRANSPORTS PUBLICS	UITP	Belgium

Table of Contents

List of Figures

List of Tables

1 Executive Summary

This deliverable sets out a city typology that not only benefits the six SUMP-PLUS partner cities, but other cities across Europe seeking to foster sustainable mobility and create efficient and green urban transport systems.

To achieve the goals of WP 1, which are to develop context-specific pathways, establish cross-sector links and develop new business models, it is important to recognise the similarities between cities and their context based on population size and modal share. This classification process should then be further refined using other parameters such as mobility culture (a country's attitude to personal mobility), the primary function of that city, the degree of local government autonomy, and spatial context. Collecting and comparing this information helps make measures scalable and replicable between similar cities.

This deliverable outlines the stages of development of the SUMP-PLUS city typology that will be used initially by the partner cities and then later on in the project by a Follower Cities Group. It is hoped that cities across Europe will make use of the typology following the project's conclusion. To understand the variables to use in creating the city typology, desktop research was conducted to find out how city typologies have been developed in past European projects, by other institutions, and in the research domain. This is elaborated on in the "Section 3: A review of existing typologies", which describes the methods used in finding the 15 sources and the sources themselves. When looking into sources, the authors were guided by these three questions: *Why was the typology developed?, How was the typology decided and why were the different categories chosen? and How did the authors plan to use the methodology?*

Following this initial desktop research, data from the needs assessment of CIVITAS SUMPs-Up was analysed. This surveyed 328 cities from across Europe on drivers for and barriers to SUMP development, their SUMP needs, and more. The assessment of the SUMPs-Up data is set out in "Section 4: Further analysis of the SUMPs-Up data". It looked into the cities' experience of SUMP development and the role played by different characteristics, such as population size and trend, spatial context, etc. This signals a shift away from a country-based approach to a city-level analysis (using the SUMPs-Up survey data).

Finally, findings from the desktop research and survey analysis in chapter 5 show that population size and modal split are two variables that depict the experience and status of sustainable urban transport planning. It was agreed to use these as the primary grouping variables. In the SUMP-PLUS city typology, they are labelled as the "Level 1" classification.

In the "Level 2" classification, more variables are set out that correlate with the SUMP planning experience of cities. Thus, further grouping is done by looking at cities' population density, their

GDP (or Purchasing Power Parity) per capita, and trend indicators for car modal share. These two levels of classification will be used in SUMP-PLUS in order to identify similarities between cities and help in the replication of measures.
Finally, a set of qualitative categories have been developed that characterise cities according to these indicators: main economic functions, sub-regional spatial context, mobility-related policy priorities, the degree of local government autonomy, and the degree of local authority planning capacity. Taken together, these Level 1, Level 2 and category indicators provide a city typology that will be used to group cities and select potential measures and activities developed in SUMP-PLUS for cities to follow or (attempt to) replicate.

2 Introduction

2.1 Aim of the deliverable

This deliverable has four primary aims:

1. To define the functional requirements of a city typology to be used within SUMP-PLUS (section 1.2).
2. To review previous efforts to develop city typologies at national, European and global levels, to identify their purpose and assess their relevance to SUMP-PLUS (Chapter 3).
3. To further analyse the SUMPs-Up survey database to identify the primary city characteristics that account for differences in experience with sustainable urban transport planning, stage of SUMP development, and existing modal split (Chapter 4).
4. To recommend a city typology for use by partners in SUMP-PLUS and other cities across Europe (Chapter 5); and to classify the SUMP-PLUS city partners within this typology (Chapter 6).

2.2 Purpose and requirements for the SUMP-PLUS city typology

The primary aim of SUMP-PLUS is to develop concepts and tools that will be of value to a wide range of cities across Europe and beyond. It is recognised that, while each city is unique, most will share some common characteristics with a subset of ‘similar’ cities, so that results from the individual cities within projects such as SUMP-PLUS are more likely to be transferable to some cities than others.

The Description of Work notes that a primary function of a new SUMP-PLUS city typology is that it sets out “...different conditions, requirements and capabilities” is to “feed into the development of the conceptual framework in Sub-Task 1.2.2” (i.e. ‘**Conceptual framework for transition pathways in different types of European cities**).

But the city typology is also likely to be helpful in positioning other SUMP-PLUS activities within particular urban contexts and so help to signpost their potential transferability:

- **‘SUMP-Lite’ for smaller European cities** (T1.3): the development of simplified procedures and analyses to enable small cities to produce a comprehensive set of policy interventions that will achieve their agreed and objectives, with example applications.
- **Cross-sector links** (T1.4): guidance and examples of how to ensure that the transport consequences (both passenger and freight) of decisions taken in other sectors are fully taken into account by non-transport sectors when they develop their strategic and local service delivery models and make their investment decisions.

- **New partnerships and business models** (T1.5): guidance and examples that will enable cities to obtain funding to implement their chosen policy package, with appropriate contributions from private sector partners.
- **Governance and capacity building** (WP3): providing advice and examples of how to adapt governance structures and enhance capacity building, in order to most effectively achieve desired policy outcomes.
- **Citizen and stakeholder engagement** (WP4): guidance and practical examples of proven methods to enhance professional stakeholder and citizen engagement.
- Examples of **specific policy interventions** that achieve specific policy objectives (T6.3) that provide good case studies for other cities.

- **Identification of Follower Cities** (WP7): these would draw insights from particular SUMP-PLUS cities CPLs, to establish transferability of methods and findings.

In order to fulfil these requirements, this suggests that the city typology should:

1. Capture factors that characterise:
    - The broad conditions found in the city, reflecting its demographic, geographical and mobility characteristics
    - The primary economic functions of the city
    - The requirements that a city needs to address in developing its mobility policies
    - The capacity to develop and implement sustainable mobility policies
2. Be flexible, adaptable and hierarchical (e.g. by distinguishing between primary characteristics and more detailed discriminators)
3. Ensure that the data required to map a city into the urban typology is readily available in most cities

These criteria will inform the selection of variables within the SUMP-PLUS city typology set out in Section 4.3.

3 A review of existing city typologies

3.1 Introduction

This overview of existing city typologies is a result of a desk research for the SUMP-PLUS project, *Sub-Task 1.1 Development of SUMP-PLUS European City Typology and SUMP and Sub-Task 1.1.2 Review of existing evidence on SUMP-PLUS cities*, intended to examine different sources and past EU projects to identify the various ways of classifying/clustering cities that were used, based on different parameters. This desktop research reviews city typologies focusing as much as possible on urban mobility indicators, but not being exclusively limited to that. The results of this desktop research will be used to inform the development of a SUMP-PLUS European city typology.

This section reviews, in turn, the main sources that provide different contexts for city classifications of potential interest for SUMP-PLUS city typology. A web link is provided to the original source.

Section 3.2 provides a clearer overview of the main typologies and indicators found during the desktop research, with slightly more explanation. There is also a supporting excel file.

3.1.1 Methodology used

To set the stage for the later development of a conceptual framework that sets out the main tasks necessary to implement a successful, context-sensitive transition pathway to SUMP/SULP implementation, it was pertinent to first develop a general typology of European cities.

Desk research into existing city classification schemes used by other European projects and international organisations or databases was carried out in the context of *Sub-Task 1.1 Development of SUMP-PLUS European City Typology* of Annex A of the SUMP-PLUS GA. This is a good starting point in the creation of the European City Typology to be used in SUMP-PLUS.

As the first step of the desk research, an examination of the EEA, World Bank, World Resources Institute, and Institute for Transportation and Development Policy websites was undertaken to identify any relevant city typologies used by these organisations. In addition, the websites of European projects familiar to the research team were examined for city typologies. While special interest during the research was given to mobility-related city classifications, the desktop research was extended to consider also city classifications with respect to a range of sectors and topic areas. In a second step, keywords, such as “city typology” and “European city classification”, were typed into the Google search engine to look for other projects, organisations, statistical databases, documents, or relevant reports that have used or referred to any kind of categorisation or classification scheme to compare cities on a European or even global scale. This helped to ensure the thoroughness of the desktop research as well as assured that as many city classifications as possible were accounted for. All potentially relevant typologies were documented in a Microsoft Word document, with a brief description of the city classifications. After the desk research was completed, the most relevant of the identified city typologies were revisited, studied in greater detail, and relevant information documented in a Microsoft Excel document. Within the Microsoft Excel sheet, information

pertaining to the city categories, category descriptions, city examples, indicators used, scale of study, and source links was specified for each typology. Overall, a total of fifteen relevant city classifications - Eurocentric as well as global, mobility-related as well as non-mobility focused - considered to be potentially useful for the development of the SUMP-PLUS European City Typology were ultimately included.

After a preliminary review of the findings from the literature, UCL and ICLEI agreed that it would be helpful to investigate the objectives behind the different typologies and the process that led to the respective city classifications. The various reports and documents of the selected typologies were reviewed once more, this time guided by three questions:

1. Why was the typology developed?
2. How was the typology decided and why were the different categories chosen?
3. How do the authors plan to use the methodology?

The responses for these questions contributed not only to a better understanding about how the identified typologies are relevant for SUMP-PLUS and which indicators may potentially be important to include in the SUMP-PLUS City Typology, but also contributed insight into what potential gaps the latter could fill. The detailed responses to these three questions are found in Annex F.

3.2 Overview of existing city typologies

3.2.1 NOVELOG – New cooperative business models and guidance for sustainable city logistics (here)

A poly-parametric typology was developed in the NOVELOG project and the grid methodology (image visible below) enables city comparison of selected measure performance of their experiences based on each city typology, with regards to sustainable urban logistics plan.

From WP7 – Deliverable 7.1 business models and guidance: “Cities can be distinguished based on six main criteria:

1. Economic activity, Infrastructure, Gross Domestic Product;
2. Degree of integration of freight-generating activity, such as the presence of a few large employers in a city;
3. Political culture;
4. Culture;
5. Degree of logistics sprawl;
6. Legal and regulatory framework.

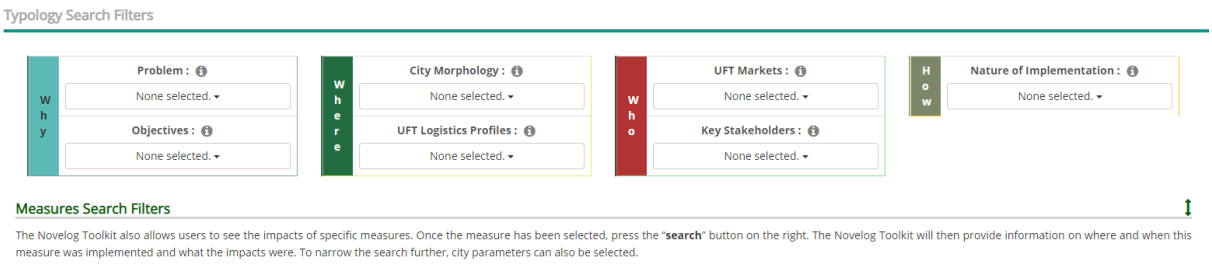


Figure 1: Typology search filters of NOVELOG
Source: NOVELOG web site http://www.uct.imet.gr/Novelog-Tools/Toolkit

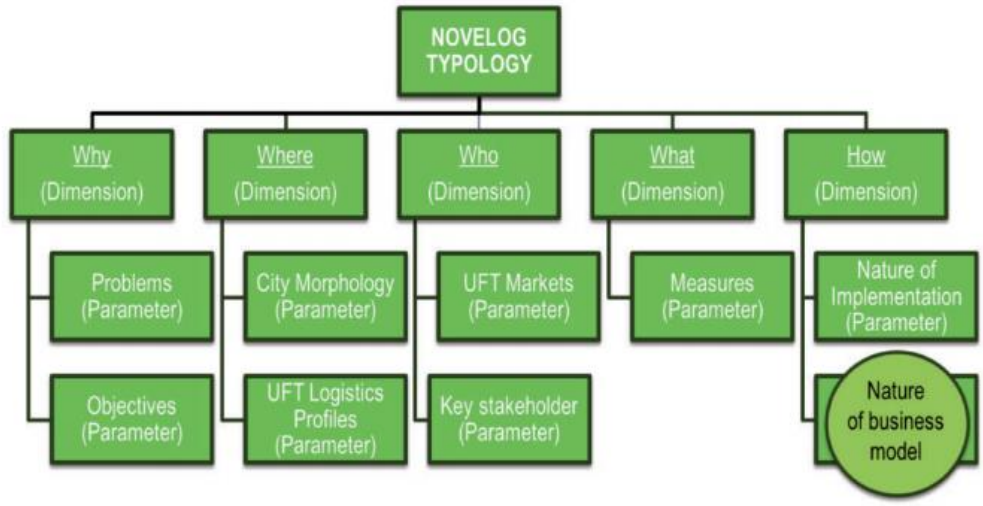


Figure 2: NOVELOG typology
Source: NOVELOG SULP guidelines http://novelog.eu/wp-content/uploads/2018/07/NOVELOG_SULP-Guidelines.pdf, pag.22

How could this be relevant for SUMP-PLUS?

One way the NOVELOG typology could be relevant for the SUMP-PLUS typology is to use the format of 5 main characteristics (in this case Why?, Where?, Who?, What? and How?) that would produce a poly-parametric typology. We can also expand and add characteristics that are relevant for SUMP-PLUS and replace the "logistics" characteristics with morphological questions, i.e. formation and transformation of urban settlements in the respective city.

One possible example could be:

- Economic activity (type of the city, main characteristics), GDP and population trend;
- SUMP situation (existing, adopted, planned, 2nd SUMP etc.);
- Modal split and motorisation rate and trend in motorisation trend;
- Political culture and support on local level; and
- Legal and regulatory framework.

3.2.2 EEA city typology classification (here)

This EEA typology is examining the Urban Green infrastructure (GI) in order to gain an insight on the city's environmental performance. To build the typology, a cluster analysis has been performed, and the clustering was based on 9 parameters: "Share of green urban areas (GUAs)", "Degree of soil sealing", "Distribution of GUAs", "Effective GI (urban hinterland)", "Hotspot ratio (hinterland)", "Terrestrial urban blue areas", "Low density areas" and "Share of urban forest and share of Natura 2000 sites". These 9 parameters were in turn used to build **8 clusters**: "Fragmented cities", "Green outskirts cities", "Natural cities", "Hotspot cities"," Green cities", "Green-grey sealed cities", "Forest cities", and "Natural blue cities".

How could this be relevant for SUMP-PLUS?

Even though these parameters and clusters are not exactly relevant for the SUMP-PLUS city typology, we can learn from a very good simplification and representation of the parameters that build the clusters. Even though there is not enough information on this source to

understand why and how the characteristics were selected and built, we could potentially use the similar approach in SUMP-PLUS to define the city typology, i.e. first identify the core characteristics and build clusters of cities depending on the characteristics.

3.2.3 Boosting Urban Mobility Plans – BUMP (webpage here) (slides here)

Funded under Intelligent Energy Europe (IEE) funding programme, BUMP aims to support local authorities, with a population between 400.000 and 350.000 in developing SUMP. The approach was made in four steps: (i) defining the support model based on the specific local context, (ii) training activities, (iii) multidisciplinary assistance and (iv) international promotion to support replication and capitalisation.

How could this be relevant for SUMP-PLUS?

The BUMP project did not list or produce in its lifetime any specific city typology. However, to build on its results and findings, after examining the reports we have found the recommendation about **the need for a city typology**. On the coordinators slide from the session 9 of the 1st European Conference on Sustainable Urban Mobility Plans, four questions regarding city typology have been raised:

1. Does typology and size of cities/towns matter?
2. Can we use the same methodological approach for 'larger' and 'smaller' cities?
3. Are there advantages and/or disadvantages when involving 'smaller' (with less than 100.000 inhabitants) cities/towns?
4. What do smaller cities/towns need to achieve effective and satisfactory mobility planning?

Further slides answer these questions without any concrete typology example, however, it serves as a checklist for building the SUMP-PLUS city typology, especially when considering the size of the cities, how the competence of local authorities to implement the plan depends on the country etc. They emphasise the need for different methodological approaches towards larger and smaller cities and why smaller cities should or should not be involved, and this is the key takeaway in this task.

3.2.4 World bank – Geography of growth (here)

This is an extensive document produced by the World Bank, titled: "Geography of growth; Spatial Economics and Competitiveness" and one of the main aims is to find out why some cities grow more than the others and what are the characteristics of the "successful" cities worldwide. Rather than on mobility, this document focuses on the population density levels, economic activity and holistically on urban transition and growth.
Focus in examining this document was put on chapter 2: "Urbanization of Typology of Space" that provides the classification of cities. As stated in the chapter: "Classifying cities by population size is a comprehensive way of identifying various types of cities", we looked at their classification method to understand if this could be a suitable typology for SUMP-PLUS. Classification is represented in the table below:

Size of city	Number of cities		Urban population (% of total population)	
	2009	2025[a]	2009	2025[a]
Mega	21	29	9.4	10.3
Large	32	46	6.6	7.1
Medium	374	506	21.9	22.1
Small	509	667	10.3	10.3

Source: UN 2010.
Note: Megacities = more than 10 million; large cities = between 5 million and 10 million; medium-size cities = between 1 million and 5 million; small cities = between 500,000 and 1 million.
a. Projection.

Figure 3: World Bank classification
Source: Nallari, Raj; Griffith, Breda; Yusuf, Shahid. 2012. Geography of Growth: Spatial Economics and Competitiveness. Directions in Development; infrastructure. World Bank. © World Bank. https://openknowledge.worldbank.org/handle/10986/6020 License: CC BY 3.0 IGO, pg 19.

How could this be relevant for SUMP-PLUS?

All these indicators, such as population density, economic growth, urbanisation etc are closely correlated with the need for urban mobility planning. Thus, the document is a valuable source of information about possible formation of indicators and could serve as a checklist when deciding upon city typology. As indicated on the table, the classification is using the population to classify the cities worldwide: small (less than 1 mil), medium (1 to 5 mil), large (5-10 mil), mega (more than 10). This is a possible city typology that could be used in SUMP-PLUS with some corrections, such as reducing significantly the range of population per category. For the need of classifying SUMP-PLUS cities and later on other European cities, represented intervals labelled “small, medium and large” will have to be re-established to smaller intervals, and it is possible that the “mega” classification will be omitted. When discussing the number of inhabitants and classifications of cities according to this variable, this heavily relates to spatial concentration and economy. Density is also very important in relation to this to understand how efficient a city is or could become in terms of trip dispersion or density of functions across a specific area.

3.2.5 World bank blog – New country classifications by income level: 2017-2018 (here)

Another classification by the World Bank classifies countries rather than cities into four income groups: low, lower-middle, upper-middle and high income. This is a yearly report produced by the World Bank and its aim is to update countries worldwide according to their income status, due to changing thresholds, as seen in the table below:

Threshold	GNI/Capita (current US$)
Low-income	
Lower-middle income	1,006 - 3,955
Upper-middle income	3,956 - 12,235
High-income	> 12,235

Figure 4: World Bank classification on income
Source: World Bank blog, https://blogs.worldbank.org/opendata/new-country-classifications-income-level-2017-2018.

How could this be relevant for SUMP-PLUS?

Even though this is a country ranking rather than a city ranking, it could be useful to understand how classification by income could be created, following this World Bank example. In order to apply similar classification, the currency should be euros (€) and the intervals should be adjusted.

Mobility is essential for participation in society and mobility-related discrimination prevents people not only from being mobile but also from taking part in societal processes. High income cities are in a good position to make transport in their cities more sustainable as the funding of measures is usually easiest for them. Even though this discourse fits best to Public Transport use, it's important to understand the level of wealth of the citizens.

3.2.6 World Bank – Competitive cities for jobs and growth (here)

This World Bank publication aims at discovering what makes a city competitive and explains that increasing the competitiveness of cities leads to eradicating poverty and increased shared prosperity. The focus here is on the world outlook, and this report contains much interesting data.

These are some of mobility related conclusions they mention:
- a coastal dormant city can become dominant with support of automotive factories etc.;
- or become an important tourist centre;
- a competitive city – fast in creating jobs, higher incomes and productivity of residents, can become a magnet for external investments.

How could this be relevant for SUMP-PLUS?

Even though this report offers many innovative and interesting conclusions, after examining it in relation to SUMP-PLUS city typology creation, we have concluded that it is not relevant at this stage. The document listed that they have used the following typologies for comparison purposes, without elaborating them: income based, sector, region, and industrial mix.

3.2.7 OECD and EC report: Cities in Europe: the new OECD definition (here) and (here)

This document was created jointly by OECD and EC in order to harmonise the definition of a "city", to be able to provide more credible and comparable analysis of the cities worldwide. Main focus is on the city core and the commuting zone of the city. The new definition of a city in this document was derived based on the high population density cells using a geographic information software. These highly dense cells are then clustered, and to define a "urban centre" population of 50.000 inhabitants was taken as the lowest value. This document lays out a general definition of a city. They classify cities by urban centre size:

- **S** between 50.000 and 100.000
- **M** between 100.000 and 250.000
- **L** between 250.000 and 500.000
- **XL** between 500.000 and 1.000.000
- **XXL** between 1.000.000 and 5.000.000
- Global city of more than 5.000.000

This document examines only the size element with a minimum population of 50,000, and differentiates a city into component parts: urban centre, communes, commuting zones, etc.
The second paper describes the EU-OECD method to define functional urban areas (FUAs). *Being composed of a city and its commuting zone, FUAs encompass the economic and functional extent of cities based on daily people's movements. This definition has been applied to 33 OECD member countries and Colombia, as well as to all European Union member countries.* (OECD, 2019).

How could this be relevant for SUMP-PLUS?

In examining this document, a very good insight was gathered in understanding how harmonisation matters in comparing cities and urban centres. Moreover, the document states that different cities have different definitions and that we need to pay attention on the city centre, suburban areas and commuting zones in order to produce a harmonised and comparable city typology (although it's minimum size cut-off is 50,000). This is a potential city typology to be used as a basis in defining SUMP-PLUS city typology. It can be relevant in case one of our parameters is the population and population growth, to see how they have done it. This is a very relevant typology as the European Commission always refers to this OECD typology when launching a call / tender that needs to consider the Functional Urban Areas and SUMP-PLUS will use it as a basis to define the spatial context of the cities.

3.2.8 McKinsey The future(s) of mobility: How cities can benefit (here)

This document focuses on the recent urban mobility trends, such as new technologies (big data analysis, autonomous driving etc.) and new services (shared mobility, ride hailing, MaaS etc.) available in the market. Overall, this publication focuses on the urban mobility trends and effects from an economic point of view. In order to produce forecasts and compare future scenarios until 2030 in terms of different mobility business models of the future, this document produced three city classification, depending on different characteristics, listed below:

- **Dense – developing cities**. Main characteristics: severe congestion due to inadequate road infrastructure and in disrepair, complex traffic patterns, heavy air pollution, rapid population growth drives demand for mobility

- **High income- low-density cities**. Main characteristics: sprawling, suburban style municipalities (Europe and North America) where residents rely on private cars. Residents spend a considerable amount of time on the road.
- **Dense, developed cities**. Main characteristics: good quality mass transit, cities are densely settled, citizens supplement their use of public transport with privately owned car or shared vehicles, e-hailing services expanding (as a part of advanced mobility: potentially AVs, peer to peer car sharing etc.)

How could this be relevant for SUMP-PLUS?

Even though this classification will not likely be used in defining SUMP-PLUS city typology, it provides inspiration and a possible source of knowledge on new mobility products and trends. Some of the main characteristics listed under the McKinsey classification above could be relevant for the SUMP-PLUS cities when considering the future of mobility services integration.

3.2.9 A novel global urban typology framework for sustainable mobility futures (here)

The motivation behind this document is that typologies relevant for sustainable urban mobility are few, outdated and not large enough in scope. This study identifies 9 urban factors and 12 indicators. Indicators used in this paper for clustering the cities are (sources on page 3):

- Population (multiple sources), land area, population density **(demographics)**
- Fleet size, fare, stations, system length, annual ridership **(for BRT)**
- GDP, poverty rate, life expectancy **(global urban indicators)**
- Gasoline price ($)
- Innovation score (based on certain index)
- Internet penetration, digital access (general internet stats)
- Urban indices: cost of living, rent, groceries, purchasing power, affordability, safety, pollution, traffic (time), inefficiency, emissions
- Circuity average, degree average, intersections, intersection density (per km2) street length (km), street length average (km), street length density (per km)self-loop proportion, highway proportion
- Smartphone penetration
- Congestion level: overall, morning peak, evening peak (%)
- Gini coefficient, CO2 emissions(metric tons per capita), unemployment, urbanization level
- Road traffic deaths.

There is a more comprehensive list of the loads that each variable has onto 9 factors. This is a long list of variables (page 6) and some of them could be useful for SUMP-PLUS, such as: bikeshare station number, modal shares or population delta/10 years.

There is another table in the document that summarises latent urban factors identified in this paper (Figure 5):

Factor	Key indicators
Metro propensity	Urban rail/metro (demand, supply, age)
BRT propensity	Bus rapid transit(demand, supply, fares)
Bikeshare propensity	Bikeshare (demand, supply), low cost of living
Development	Wealth, cost of living indices, innovation
Population	Growth, population change
Congestion	Congestion (various metrics), public transit mode share, low car mode share
Sustainability	Bike mode share, street length, safety, efficiency, low congestion
Sprawl	Road deaths, high car mode share, low gas price, CO_2 emissions, street length
Network density	High intersection density, high street density, low street length average, low circuity

Figure 5: Key indicators identified within the research

Source: Jimi B Oke et al 2019 Environ. Res. Lett. 14 095006, page 9

In the table below, the typology is further simplified, and the 12 typologies could be grouped into pairs.

Typology	No. cities	Features; major locations	Key example cities
Auto Innovative	14	Auto-dependent, wealthy, higher transit mode share, metro & population density; U.S., Canada	Washington DC, Boston, Chicago, San Francisco, Toronto
Auto Sprawl	51	Auto-dependent, wealthy, sprawling, lowest transit mode share; U.S., Canada, Middle East	Baltimore, Tampa, Raleigh, Kuwait City
BusTransit Dense	16	Large population, high BRT, fairly congested; South America	Bogota, Rio de Janeiro, Jakarta, Sao Paulo, Tehran
BusTransit Sprawl	47	Lower population, sprawling, fair public transit ; Latin America, Central Asia/Middle East	Mecca, Shiraz, Santa Cruz, Tripoli, Caracas
Congested Boomer	17	Rapid growth, congestion, moderate car mode share; Indian Subcontinent, Africa	Bangalore, Chennai, Delhi, Lagos, Manila
Congested Emerging	59	High growth, lower population, developing; Africa, S. Asia	Kumasi, Phnom-Penh, Port-au-Prince, Lucknow
Hybrid Giant	26	Mix of mode choices, dense networks, high population density; S./E. Europe, E. Asia	Busan, Lisbon, Sapporo, Santiago, Warsaw
Hybrid Moderate	20	Mix of mode choices, lower population; Central America, Middle East	Havana, Johannesburg, Montevideo, Panama City
MetroBike Emerging	27	Metro & bikeshare dominant, highway development, fairly wealthy; China	Ningbo, Zhengzhou, Shenyang, Harbin
MetroBike Giant	5	Metro & bikeshare dominant, large population; wealthy; China	Shenzhen, Guangzhou, Chongqing, Beijing
MassTransit Heavyweight	19	High mass transit usage and metro availability, high bikeshare; fairly high CO_2 emissions; Europe, S.E. Asia	Singapore, Madrid, Seoul, Berlin, London
MassTransit Moderate	30	Equitable, high bikeshare, moderate metro and BRT, low congestion; W. Europe, Israel	Antwerp, Tel Aviv, Turin, Liverpool

Figure 6: Summary of the urban typologies and their key cities
Source: Jimi B Oke et al 2019 Environ. Res. Lett. 14 095006, page 11

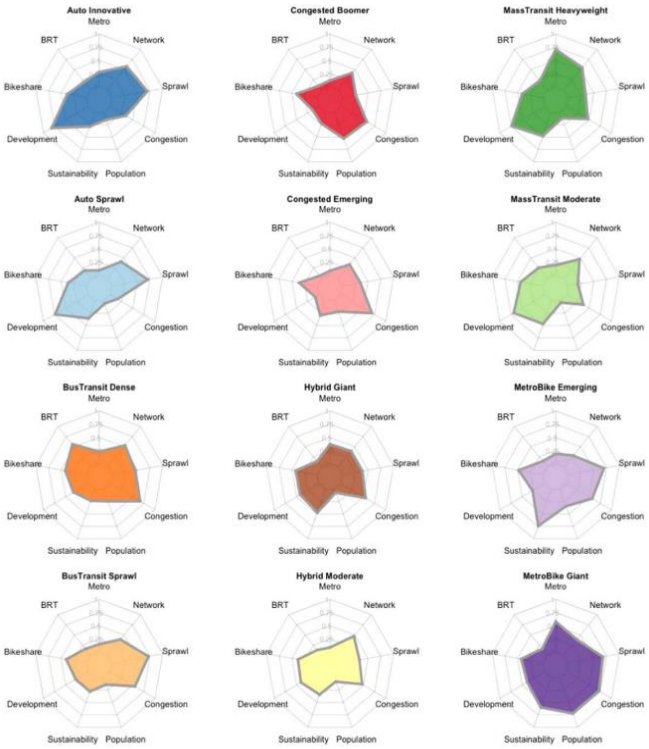


Figure 7: Spider plots indicating normalised factor scores averaged in each typology
Source: Jimi B Oke et al 2019 Environ. Res. Lett. 14 095006, pag.12

How could this be relevant for SUMP-PLUS?

This typology presents a very comprehensive set of indicators that could be relevant for SUMP-PLUS cities. It combines many economic, demographic and environmental indicators on the global scale, and surely SUMP-PLUS cities could relate to some of them. It is possible that this document will provide a checklist of different indicators when considering SUMP-PLUS city typology, although the indicators would in that case have to be broken down and simplified to fit the needs of smaller European cities.

3.2.10 Eurostat (here)

This source is the Eurostat interactive database and a visualisation tool of European countries and different mobility related statistics. Eurostat provides a wide range of statistics for transport, such as motorisation rate and people killed in road accidents (per city, country, etc), but most are at a national level only. In addition, it provides non transport related indicators as well, such as unemployment. In the transport category, 5 modes are covered: air, inland waterway, rail, road and maritime, and measurements are transport of goods, people, traffic and safety. In the “Main table” selection, where many data per transport mode could be found and selected per Member State.

How could this be relevant for SUMP-PLUS?

This is a valuable source of information for Member States where SUMP-PLUS cities are located, to compare national outlooks in the motorisation rate, road deaths and other macroeconomic indicators. However, this source is limited by these parameters, and since it does not provide any guidance on possible categorisation, it will not be directly used in the SUMP-PLUS city typology development.
A publication (2018) from the Eurostat is made available here, titled Energy, transport and environment indicators.
In chapter 2 (pag. 81): transport equipment, freight transport, passenger transport and transport safety indicators (per member states, not per city).

3.2.11 The Future of Urban Mobility (here)

This Arthur D. Little study assesses the mobility maturity and performance of 66 cities worldwide and looks into innovations that will help cities overcome their urban mobility challenges by 2050. In this report, they show best practices and future business models for mobility suppliers. In order to cluster and compare these 66 cities, this study used the following indicators for its global typology:

- Prosperity (determined by GDP per capita as of 2008, with those having a GDP per capita of more than US$ 25,000 defined as “mature” and those below that defined as “emerging”)
- Modal split (Cities with less than 50% of individual travel were categorised as “public mobility oriented cities” and those with more classed as “individual mobility cities”)
- City size (determined by the population of the city agglomerations as of 2010. Cities with more than 5 million residents were defined as “large” and those below, “small”.

On this basis, six clusters were developed:

1. Cluster 1: Public, small, mature - ex. Vienna

2. Cluster 2: Public, large, mature - ex. Hong Kong
3. Cluster 3: Public, large, emerging - ex. Beijing
4. Cluster 4: Individual, small, mature – Rome-type - ex. Atlanta
5. Cluster 5: Individual, large, mature – Los Angeles-type - ex. Toronto
6. Cluster 6: Individual, large, emerging – Kuala Lumpur-type - ex: Baghdad

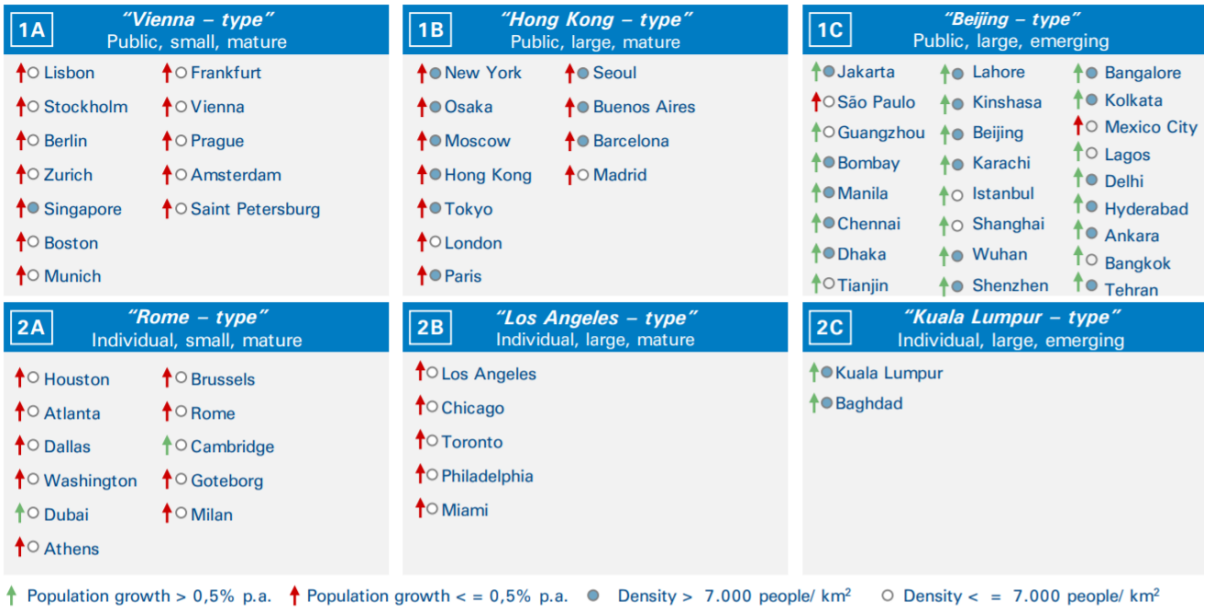


Figure 8: Arthur D. Little study - Image of the cluster produced in the study
Source: Arthur D. Little: "The Future of Urban Mobility; Towards networked, multimodal cities of 2050", page 7, Screenshot by author

How could this be relevant for SUMP-PLUS?

This study produced a complex index that is used to rank cities worldwide on a scale up to maximum 100 points. This serves as a very good reference point of what are the indicators used to determine an urban mobility index, in case there is a ranking approach needed in the SUMP-PLUS cities. This methodology will not be directly used in building the SUMP-PLUS city typology, this could serve as a checklist into defining a comparable index, should a need arise.

3.2.12 UITP report with Arthur D. Little (here)

The urban mobility index 2.0 is an updated version of the preceding 2011 urban mobility index report - "The Future of Urban Mobility" - and it assesses the mobility maturity and performance of 84 worldwide cities. The index score ranges from 0 to 100 (top 3 cities are: Hong Kong (58.2), Stockholm (57.4.) and Amsterdam (57.2). Europe achieves the highest average score of the six world regions studied.
There are 11 criteria on maturity + 8 on performance with different weights, as shown below (from Figure 5, page 13).

Arthur D. Little Urban Mobility Index 2.0 – Assessment criteria			
Maturity [max. 58 points]		Performance [max. 42 points]	
Criteria	Weight[1]	Criteria	Weight[1]
1. Financial attractiveness of public transport	4	12. Transport related CO_2 emissions	4
2. Share of public transport in modal split	6	13. NO_2 concentration	4
3. Share of zero-emission modes in modal split	6	14. PM_{10} concentration	4
4. Roads density	4	15. Traffic related fatalities	6
5. Cycle path network density	6	16. Increase of share public transport in modal split	6
6. Urban agglomeration density	2	17. Increase of share of zero-emission modes	6
7. Smart card penetration	6	18. Mean travel time to work	6
8. Bike sharing performance	6	19. Density of vehicles registered	6
9. Car sharing performance	6		
10. Public transport frequency	6		
11. Initiatives of public sector	6		

Figure 9: Arthur D. Little Urban Mobility Index 2.0 - Assessment criteria
Source: Arthur D. Little: Future of Urban Mobility 2.0 report, 2014, page 12

How could this be relevant for SUMP-PLUS?

If possible, perhaps we can use the UITPs model with our cities, however we would need to see how the questions looked like and how the grading system works.
After scoring each city, they classify them as: below average, average and above average.

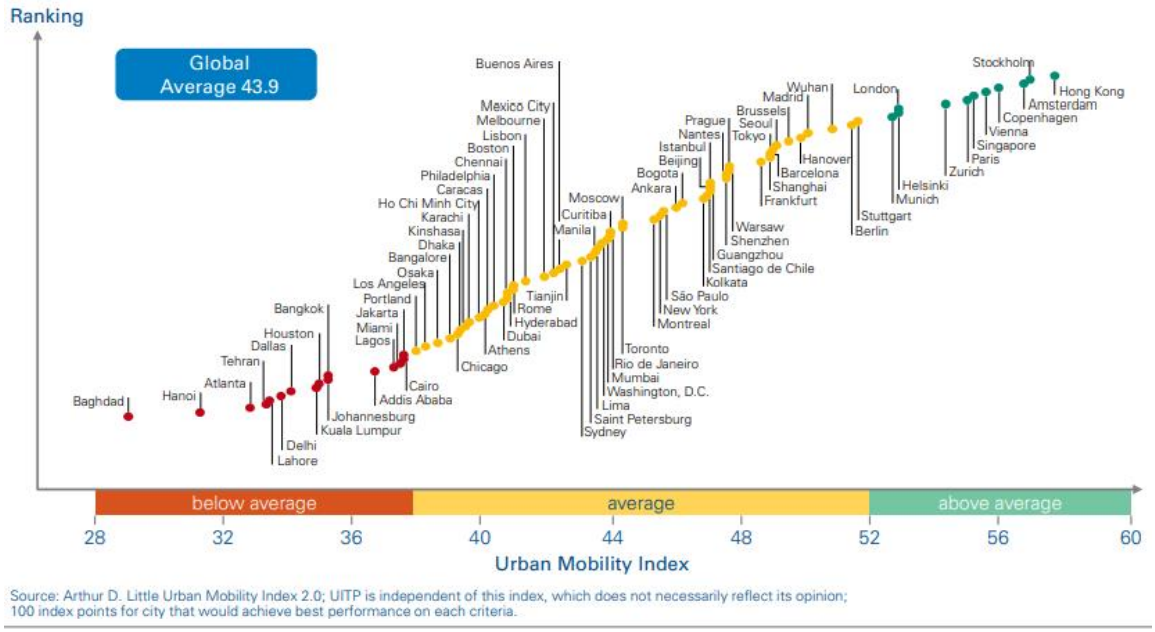


Figure 10: Arthur D. Little Urban Mobility Index 2.0
Source: Arthur D. Little: Future of Urban Mobility 2.0 report, 2014, page 14

3.2.13 SUMPs-Up project (here)

SUMPs-Up project set the foundation of SUMP in the small- and medium-sized cities throughout Europe and enabled many of the future SUMP related projects to learn how to approach cities, identify their specific needs and goals and ultimately help these cities in developing and implementing a SUMP. In the first stage of the project, one of the tasks was to create a city typology based on the city's local context, needs and knowledge level, in order to cluster cities and prepare a tailored approach for the cities applied for the training. The methodology used was an open survey (questions listed below) that enabled the classification of the cities applied for the SUMP-Up learning programme based on these parameters: SUMP experience level, Status of SUMP activities, City size and Share of private motorised traffic. Below is a table showing the SUMPs-Up classification and a list of possible questions from the SUMPs-Up survey that we could use in helping to determine the SUMP-PLUS typology. In this project, 3 types of cities are identified: starter, intermediate and expert.

	STARTER CITY	INTERMEDIATE CITY	EXPERIENCED CITY
SUMP experience	City is not yet familiar with sustainable urban transport planning.	City has already applied sustainable urban transport measures, but not systematically.	City has already conducted integrated sustainable urban transport planning
Status of SUMP activities	No activities Consider developing first SUMP Developing first SUMP	Finalised SUMP waiting to be adopted SUMP is adopted but not implemented Implementing the SUMP	Evaluation and revision of the previous SUMP Preparing 2nd/3rd generation SUMP
City size	Small (< 25 000 citizens)	Medium (100 000 – 500 000 citizens)	Large (> 500 000 citizens)
Share of private motorised traffic	High (> 60%)	Medium (45-60%)	High (< 45%)

Figure 11: SUMPs-Up classifications of cities according to different variables
Source: SUMPs-Up project, Deliverable 1.2 User needs analysis on SUMP take up, 2017 (link here), page 46. N.B. city size in "STARTER CITY" category is >25 000 citizens

The key questions that we looked into in a more detailed manner concerned the following city characteristics:

- City size (population);
- Modal split;
- Knowledge or experience with sustainable urban transport planning; and
- Aspects covered by a city's respective urban mobility plan.

The complete list of questions contained within the SUMPs-Up Needs Assessment Survey is found in Annex A.

How could this be relevant for SUMP-PLUS?

The work already done in the SUMPs-Up project can be a foundation for understanding what kind of city typology could be beneficial in this task. This classification gives very important insight into correlation between the size of a city, its capacity, experience and knowledge to

apply mobility planning tools and indicators and the level of help/involvement needed in order for them to develop and implement a SUMP. Another dimension this city classification enables is the progress tracking of the city, instead of a static image that does not enable cities to show the progress in the short term, such as population, GDP, motorisation rate etc. This enables measuring a city's progress throughout a project's lifetime, i.e. 3 years, and it is comparable between cities.

3.2.14 Dimensions of Urban Mobility Cultures – a Comparison of German cities (here)

This study focuses on the analysis of city specific context for its supply and use of transport systems. It compares the approaches between 44 German cities in order to identify strategies that are the most promising in establishing more sustainable urban transport, by looking at socio-technical concepts of urban mobility cultures. A set of 23 indicators (objective and subjective) from several sources were used. The indicators comprised:

Urban form indicators

- population size (no. of inhabitants)
- settlement density (no. of people living per sq.km of urbanised land [settlement and transport-related land uses]
- one- and two-family houses (share of one- and two- family houses in the building stock of a city

Socio-economic characteristics

- share of elderly (percentage of people, aged 65 years and older)
- household income per capita (average net monthly income of all households divided by number of inhabitants)
- share of single households (percentage of single households)
- unemployment rate (percentage of unemployed people)

Transport infrastructure and supply

- bike-related businesses (no. of entries for cycle-related businesses in local yellow pages per 1000 people)
- tramway (existence of a tramway system [binary variable] [criteria: surface-based, no light-rail or train-tram system]
- other than bus service (existence of a public transport system additional to bus services)
- price public transport season ticket (price for a season ticket for public transport)
- car-related businesses (no. of entries for car-related businesses in local yellow pages)

Transport demand indicators

- ADFC (aka General German Cycle Club) members per capita (no. of ADFC members per 1000 people)
- motorisation rate (registered card per 1000 people)
- high powered cars (share of high-powered cars)
- modal split (proportion of walking, cycling, public transport, and private car trips)

Mobility-related perception and evaluations

- cycling climate I – cycling is fun (is cycling fun? Average response)
- cycling climate II – all population groups cycle (Do all population groups cycle?)
- perceived quality of public transport (how big is the demand for improving public transport?)
- perceived quality of streets (how big is the demand for improving road network?

The study developed six clusters of the 44 German cities:

Cluster 1: Cycling cities

- Shows a strong and consistent propensity towards cycling among all analysed dimensions of mode orientation (infrastructure, travel behaviour, perceptions). There is a clear trade-off between cycling and public transport use, since all public transport indicators show under average values. Interestingly, these cities are smaller and less dense than average.

Cluster 2: Transit metropolises

- Characterised by high and consistent values for all public transport-related indicators in terms of infrastructure, travel behaviour, and perceptions. Remarkably, car use and cycling play a minor role in this cluster, whereas walking is slightly more popular than in the whole sample. The cities are bigger, denser, and more affluent than average.

Cluster 3: Auto-oriented cities

- Group shows above-average values in terms of car-related supply (car-related businesses) and car-use (motorisation rate and modal share car). For all other modes, the corresponding indicators show below average values in terms of supply, usage, and perception.

Cluster 4: Transit cities with multimodal potential

- Group shows above-average values for all dimensions of public transport orientation. Characterised by a very low-share of walking trips, whereas the proportions of cycling and driving are slightly above average.

Cluster 5: Walking cities with multimodal potential

- High share of walking trips as well as a low share of car trips. There is a potential for more public transport trips indicated by an above-average supply with high quality rail-based public transport service. Same is true for cycling. Rather dense and affluent.

Cluster 6: Transit cities

- The negative evaluation of the public transport system contrasts with the positive values for public transport supply and usage. This result is complemented by socio-economic attributes, such as a low household income per capita and a high unemployment rate. This points towards a population which is less affluent than the average and leads to the assumption that many of the public transport users are captive riders who would use other modes if they could afford them.

How this could be relevant for SUMP-PLUS

This classification of cities that is heavily weighted on the predominant mode of transport gives a very good picture when comparing cities within a certain country, in this case Germany. However, to compare cities from different European countries would not be the best type for the SUMP-PLUS city typology, or at least not the primary category.

A very comprehensive set of indicators has been developed that could be very useful in developing certain criteria in the SUMP-PLUS typology.

3.2.15 The European Urban Transport Roadmaps 2030 study (here)

The key output of the project is an online policy support tool that is aimed at the large number of small and medium sized cities in Europe who may not have the resource for major policy assessment and modelling work. The policy tools developed in this project will support city authorities across the European Union in the development of SUMPs. These tools are part of a wider framework that helps cities to define their own tailored transportation plans, focusing on the quantification of the potential costs and benefits of different policies or policy roadmaps.

The structure of the web-based tool consists of the following four modules: city type selection, policy selection, calculation framework and tool outputs.

The city type selection is an entry point of the tool and also of our focus. Thus, this tool offers the user to select the city type by following characteristics:

- "**City type**: Small city (<100,000 inhabitants), Small city with large historical cores, Medium city (100,000 – 500,000 inhabitants), Large city (500,000 to 1 million inhabitants) and very large cities (over 1 million inhabitants, in either monocentric or polycentric forms).
- **Country**: Country average national data is used to automatically set the initial values of parameters such as e.g. car ownership, vehicle fleet composition, car ownership taxes, energy mix for electricity generation, etc.
- **Population**: Population (total and by zone) at the base year and its trend.
- **Economy**: City economy type (e.g. relevance of the industrial sector, which influences freight traffic patterns).
- **City users**: Share of incoming trips with respect to internal trips, main transport mode used to enter the urban area, including multimodal trips (e.g. park & ride is also simulated within the tool).
- **City population distribution:** Share of inhabitants living in three area types: urban core, outskirts with good transit service and outskirts with poor transit service.
- **Relevance of non-car modes of transports**: Use of public transport, existence of tram and metro lines, use of bikes, use of motorbikes.
- **Road congestion level**."

Following these entry questions, there are also further customisable points to enter the city specific data, in order to get a better representation of the city. Also, there are other default data in the database that can complete the city typology:

- "Socio-demographic trends: population trend and sprawling trend;
- Average income level per capita;
- Transport trends: mode split trend, share of freight traffic and its trend,
- Availability of electric or fuel cell refuelling stations,
- Public transport fares and operating costs,
- Extension of reserved paths for bus/tram or bike,
- Extension of regulated parking and parking fares,
- Existence and level of service of park & ride,
- Existence and level of service of car sharing,
- Vehicle fleet composition by fuel type for car and bus"

Finally, there are other trends exogenous to the model that could be selected to finalise the city typology:

- **"Technology**: penetration of innovative vehicle technology in the fleet, trends of fuel Economy and polluting emission factors,
- **Energy and mobility**: fuel resource price, car ownership trend, trip rates trend, energy mix for electricity generation,
- **Policy** at the national or supranational level: fuel taxation, vehicle taxation".

The calculation framework consists of several components as shown in Figure 13 below. The components have different functions.

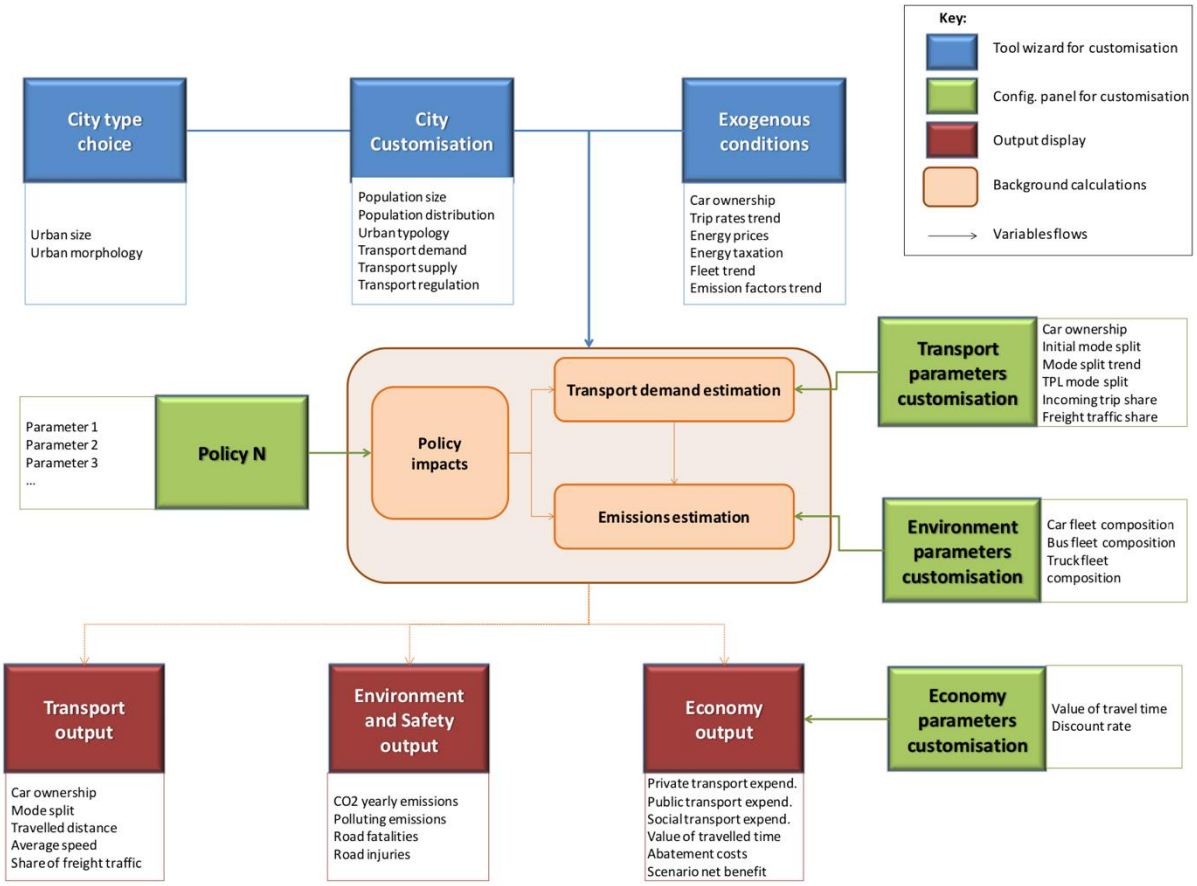


Figure 12: Design of the calculation tool
Source: https://www.eltis.org/sites/default/files/kollamthodi_urban_transport_roadmaps_0.pdf

How this could be relevant for SUMP-PLUS

In this tool, it is evident that the city type is firstly selected based on the population. This is similar to a couple of the previously examined sources, such as the OECD and EC report and SUMPs-Up questionnaire approach. This is a good indicator that the city population should be a heavily weighted factor in creating the SUMP-PLUS city typology. Furthermore, after selecting at city type, this tool offers to select the policy framework for the city/user, which could be beneficial in creating a SUMP-PLUS city typology, as it is laid out in task 1.1.3 that political priorities and the degree of governance interference will be factored in the typology.

4 Further analysis of the SUMPs-Up data set

4.1 Purpose and objectives

The purpose of the SUMPs-Up project was to study in-depth the uptake of the European Commission's SUMP concept and the development status of SUMPs in different European cities. An online survey was undertaken among European cities to understand these trends in different types of cities and assess the needs of cities for further EU support. 328 city responses from transport planners and related stakeholders in 27 European countries were collected.

The SUMP-PLUS project has undertaken further analysis of the survey data collected from European cities within SUMPs-UP, to inform the development of the SUMP-PLUS city typology. As noted in section 1.2, the purpose of this new typology is to feed into the conceptual framework for transition pathways in different types of European cities; and to assist in assessing the scope for transferability of the main SUMP-PLUS conceptual and technical outputs in different urban contexts.

There are two reasons for why the previous SUMPs-UP data analysis could not be directly used to inform SUMP-PLUS work:

1. In SUMPs-UP, the survey responses were weighted by country population to address the issue of a high proportion of responses from certain European countries. This was appropriate, given the emphasis in the SUMPs-UP analysis and reports on country-level comparisons.
2. The purpose of the SUMPs-UP analysis was a focus on a general check on SUMP status and the needs of cities. In contrast, the purpose of SUMP-PLUS is to analyse how, at a Europe-wide level, the degree of experience with sustainable urban transport planning varies in cities with different characteristics, including population size, population trend, relative location within an urban system, and geographic location.

SUMP-PLUS is focused less on country-level analysis, and more directly on city characteristics. The project needed to calculate a different set of cross-tabulations to those presented in the SUMPs-UP User Needs Assessment report.

It thus became clear to the SUMP-PLUS team in Autumn 2019 that access to the raw data from the SUMPs-UP survey would be the best way to meet this requirement. The Task 1.1 lead partner, ICLEI managed to facilitate UCL access to the raw data, after it had been fully anonymised in a way compliant with GDPR by the SUMPs-UP data controller, as ICLEI was also a partner in the SUMPs-UP project. UCL then performed the analysis of the data, as described here.

4.2 Methodology

The SUMPs-UP survey included 14 questions, which are listed in Appendix A along with comments on why certain questions (not all) have been subject to further analysis by the SUMP-PLUS team. Questions 1-4 focused on city characteristics: population size (Q1), population trend (Q2), location relative to other cities (Q3) and modal split (Q4). Questions 5-7 focused on experiences with sustainable urban transport planning: (Q5), detailed questions

relating to city's SUMP (Q5a-c), the status of SUMP development (Q6), whether cities have additional mode-specific plans (Q7), and tools and methods used in transport planning (Q8). The final section of the survey focused on the support needs of the cities (Q9-14). The SUMP-PLUS analysis focused mainly on Q1-Q6.

4.2.1 Data processing

The SUMP-PLUS team has carefully considered the SUMPs-UP survey analysis methodology (User Needs Assessment Analysis, pp. 14-15), and have adopted a partly consistent, partly diverging approach to processing of the survey data, with the details and justifications provided below. While there are small differences in the responses included in the dataset analysed by SUMPs-UP and SUMP-PLUS, these should not be significant, and the final total sample (N) only diverges by 8 responses.

Data processing steps: SUMPs-Up	**Data processing steps: SUMP-PLUS**
The initial/raw SUMPs-Up dataset contained 465 responses. The dataset contained many instances of multiple responses from the same cities. The dataset was modified so that each city as only represented once. In the first instance, if a city had two responses, the complete response (all questions) was kept while the incomplete response was deleted. For remaining cities with several complete responses, one of the responses was randomly selected to be kept in the data set, while the others were removed.	The raw dataset provided to SUMP-PLUS had 442 responses, which suggests that this data had not been pre-processed or 'cleaned' by the SUMPs-UP team. SUMP-PLUS replicated the same procedure for removing duplicates as in SUMPs-UP.
Responses from cities located outside of Europe were removed, whereas cities from European countries which are not EU Member States were kept.	Replicated.
Missing city names were determined by GPS coordinates delivered by the survey	Not replicated, as this information was anonymised by the Data Controller and not included in the raw data given to SUMP-PLUS team
Manual review of the city name variable (D5) to correct incorrect spelling	Replicated, including manual translation of city names in non-Roman script (e.g. Greek Cyrillic) to Roman script. This revealed additional duplicate city responses, which were again removed using the process outlined above.
Respondents who failed to complete the survey questions after Q5 were removed	All responses that failed to answer Q5 were removed (total of 1 response). The approach was not replicated, because the SUMP-PLUS team was primarily interested in Q1-

	Q5, and the decision was made to work with a different N for each question (the divergence from N=336 being relatively small). This is why the relevant N is marked on all individual graphs displayed below. The divergence on this processing approach explains the difference between the final sample size (N).
A variable based on country population from Eurostat was added to weight the results by country population.	Not replicated.
Final N = 328	**Final N = 336**

Table 1: Comparison of data processing approach adopted in SUMPs-Up and SUMP-PLUS

4.2.2 Characteristics of the sample and implications for analysis

Because the responses were not weighted by country population, the distribution of the total sample (N) across different city characteristics (Q1-Q3) is significantly different to that in the SUMPs-UP User Needs Assessment report (p.16). The total sample was reasonably evenly distributed across the variables of city population size, population trend and city location.

City characteristics		Responses	%
City population size (Q1) N=336	Less than 25,000	46	14%
	25,000 to 50,000	52	15%
	50,000 to 100,000	68	20%
	100,000 to 250,000	73	23%
	250,000 to 500,000	43	13%
	500,000 to 1 million	26	8%
	More than 1 million	23	7%
Population trend (Q2) N=335	1: Growing	69	21%
	2	85	25%
	3	99	20%
	4	56	17%
	5: Shrinking	26	8%
City location (Q3) N=334	In a rural area	38	11%
	Close to a city with 25,000 to 100,000 inhabitants	45	13%
	Close to a city with 100,000 to 500,000 inhabitants	48	14%
	Close to a city with more than 500,000 inhabitants	17	5%
	Largest city in the catchment area	168	50%
	Other	18	5%

Table 2: Distribution of total sample across city characteristics

The survey dataset had a highly uneven number of responses from different countries (see Appendix B), with 19% of responses from Spain and a total of 50% of responses from four countries (Spain, Greece, France and Romania). The SUMPs-UP project thus weighted city responses by country population (so that the number of participating cities from each country changed) to achieve a picture representing the situation in Europe as a whole. SUMPs-UP then analysed unweighted responses at the country level.

For the purposes of analysis within SUMP-PLUS, the team was more interested in getting an accurate picture of the correlation between sustainable transport planning experience (Q5 and Q6) and different city characteristics, for which unweighted data would need to be used. **Unweighted data is presented in this report for analysing correlations for the total sample, but because the data is heavily skewed by country, the results need to be interpreted with caution and indeed the influence of this country distribution is highlighted in the discussion of the findings throughout.**
The SUMP-PLUS team classified countries into different country groups/ geographical regions of Europe (see Appendix C), to examine the distribution of responses. The finding was that, despite the skewed distribution per country, the distribution of responses across different regions of Europe was more even (Fig. 14). **Thus the SUMP-PLUS team has analysed survey responses at the level of regions of Europe, rather than at country level.** Responses from cities in non-member states (6%) are included in the overall sample/dataset, but not subject to analysis based on regional groups of countries.

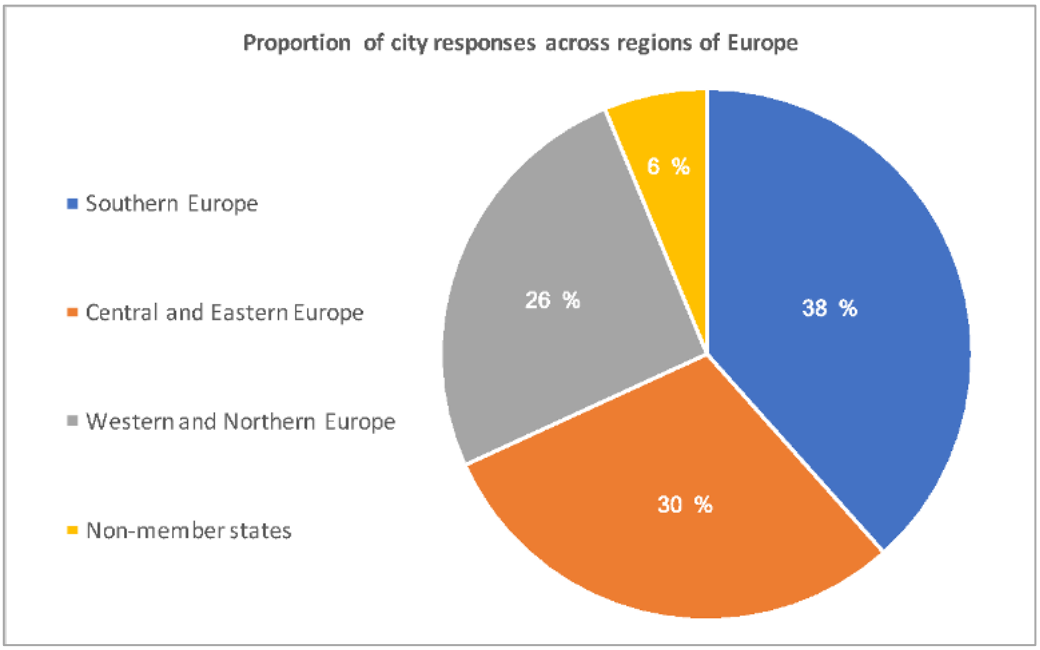
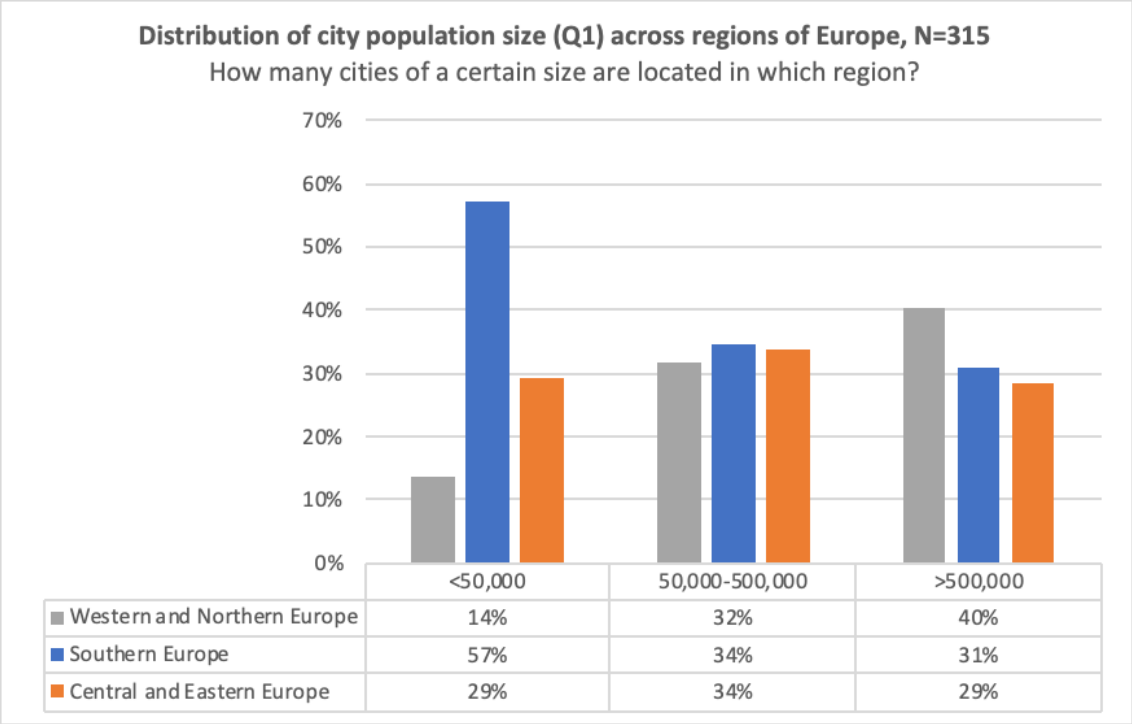


Figure 13: Proportion of city responses across regions of Europe

A cross-tabulation of the SUMP-PLUS regional classification of countries with city population size (Fig. D1, Appendix D) revealed that responses from cities with less than 100,000 inhabitants were heavily skewed by region of Europe. Figure 15 displays this trend with city population size grouped in three categories.

- Cities with a population less than 100,000 were disproportionately located in Southern Europe and the Central and Eastern Europe
- 63% of all responses from cities with <25,000 inhabitants were from Southern Europe countries and 50% from cities with 25,000-50,000 inhabitants

Again, this means that the cross-tabulations for the total sample (cities in all regions of Europe) must be interpreted with caution, whereas region-specific analysis is appropriate.



	<50,000	50,000-500,000	>500,000
Western and Northern Europe	14%	32%	40%
Southern Europe	57%	34%	31%
Central and Eastern Europe	29%	34%	29%

Figure 14: Distribution of city population size across regions of Europe

4.2.3 Quantitative analysis

The analysis of the SUMPs-UP survey data was an additional, substantial task that the SUMP-PLUS has carried out – it was not included in the SUMP-PLUS proposal or in the original task descriptions. Thus the team had limited resources available, and for this reason a decision was made to run a 'rapid' analysis of the data using simple techniques in MS Excel, rather than in statistical software such as SPSS that was used by the SUMPs-UP consortium. A series of cross-tabulations between responses to the different survey questions were undertaken using the Excel PivotTable function, followed by the calculation of percentage proportions relative to the total sample (N responses to that particular question).

4.3 Description of findings

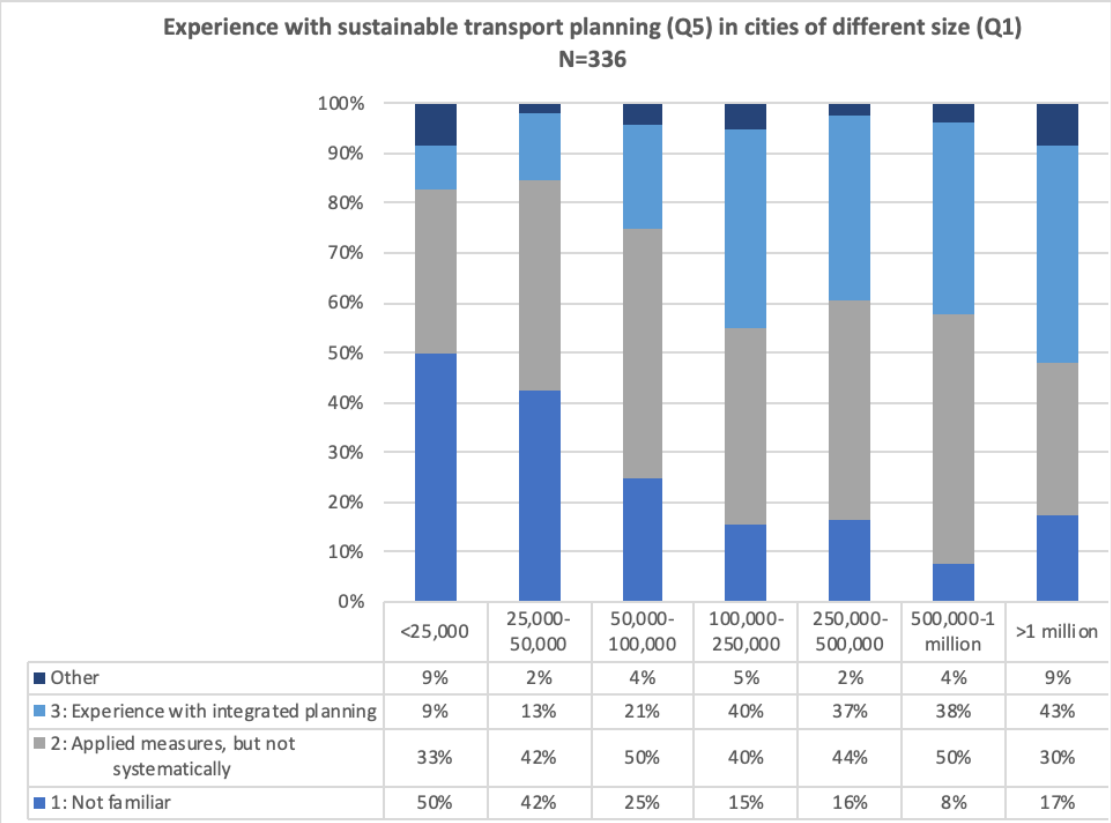
4.3.1 City population size

Experience with sustainable transport planning

The main findings of cross-tabulating Q1 and Q5 responses were that:

- Smaller European cities have less experience of sustainable urban transport planning. This was revealed by the first graph below (Fig. 16), on the basis of which the three size categories displayed in the second graph below (Fig. 17) were developed. This was one of the clearest findings of the analysis. **Findings of the analysis are presented using this grouping of city population size categories into three categories, rather than seven, in the rest of this deliverable (graphs with seven category breakdown are available in Appendix D, for reference)**;

- 46% of cities with a population of less than 50,000 inhabitants are not yet familiar with sustainable urban transport planning, compared to 19% of cities with a population between 50,000-500,000;
- Experience with integrated sustainable urban transport planning grows with city size: whereas only 11% of cities <50,000 have experience with integrated planning, this increases to an average of 32% among cities with a population of 50,000-500,000 and 41% for cities with a population over 500,000;
- Cities have applied sustainable urban transport measures in an unsystematic way – there is no significant variation among cities of different size.



	<25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000-500,000	500,000-1 million	>1 million
Other	9%	2%	4%	5%	2%	4%	9%
3: Experience with integrated planning	9%	13%	21%	40%	37%	38%	43%
2: Applied measures, but not systematically	33%	42%	50%	40%	44%	50%	30%
1: Not familiar	50%	42%	25%	15%	16%	8%	17%

Figure 15: Experience with sustainable transport planning in cities of different population size (7 categories)

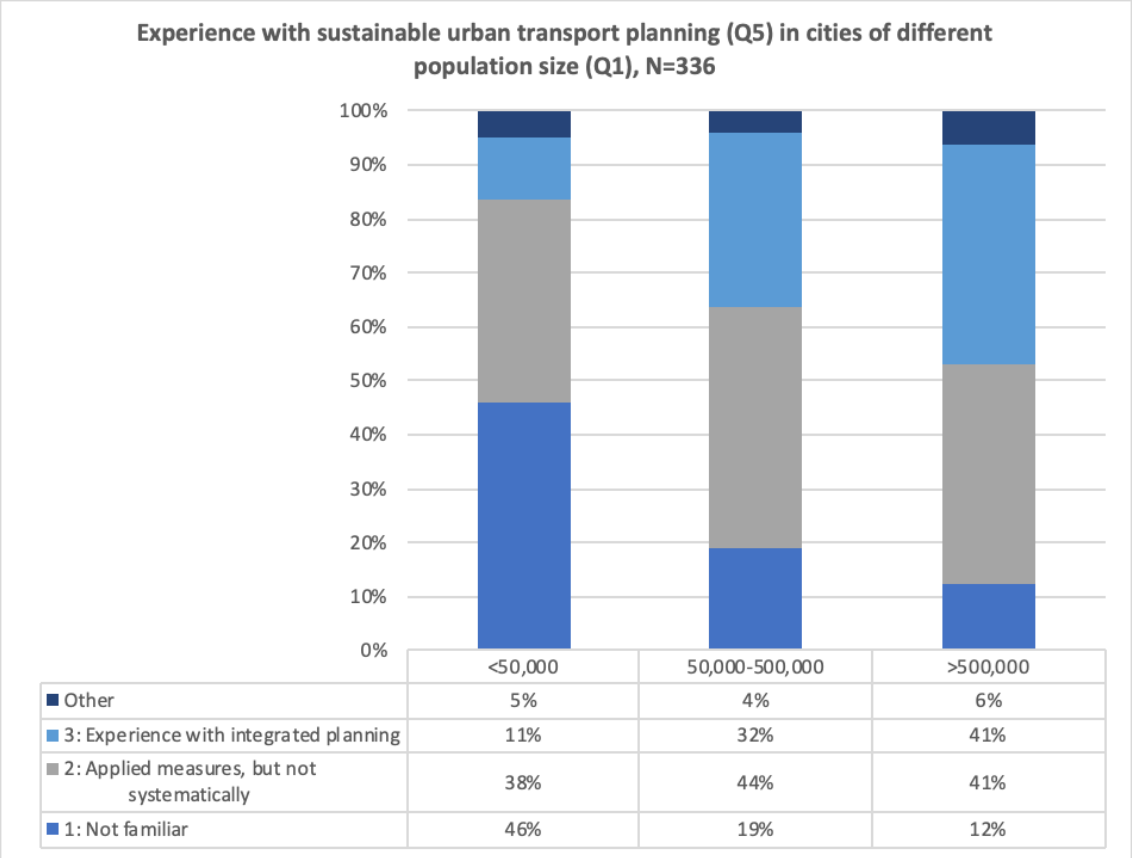


Figure 16: Experience with sustainable transport planning in cities of different population size (3 categories)

SUMP status

To analyse the responses to Q6 regarding the status of SUMP development, the response categories used in the SUMPs-Up project were aggregated. Two new groupings were created, one with 7 categories (I) and the other with 4 categories (II).

SUMPs-Up Q6 categories	SUMP-PLUS Q6 categories (I)	SUMP-PLUS Q6 categories (II)
No activities	No activities	Do not yet have a SUMP that has been adopted: 'No adopted SUMP'
Considering to develop our first SUMP	Considering to develop SUMP	
Developing our first SUMP	SUMP under development/not adopted	
Finalised SUMP waiting to be adopted		
SUMP is adopted but not implemented	SUMP adopted but not implemented	Have a SUMP that has been adopted, but not implemented: 'Adopted, not implemented'
Implementing the SUMP	Implementing SUMP	Have a SUMP that has been implemented: 'Adopted + implemented'
Evaluation and revision of the previous SUMP	Revising SUMP	

2nd or 3rd generation SUMP is being prepared		
Other	Other	Other

Table 3: Response categories used in the SUMPs-Up

The main findings were:

- There is no clear, linear relationship between city size (Q1) and detailed categories of SUMP development (Q6); this is discernible from analysis using the (I) categories (Fig. D2, Appendix D);
- Using the smaller number of (II) categories for Q6, as well as grouped categories for Q1, the second cross-tabulation (Fig. 19) illustrates a strong and clear relationship between city size and the status of SUMP development;
- Larger cities are more likely to have a SUMP that has been adopted and that they are implementing, whereas 73% of cities with a population less than 50,000 did not have a SUMP at the time the survey was conducted;
- The low proportion of cities responding that they have a SUMP that has been formally adopted but is not being implemented, suggests that once the SUMP has secured a degree of political commitment, cities of all sizes are able to proceed to some extent with implementation.

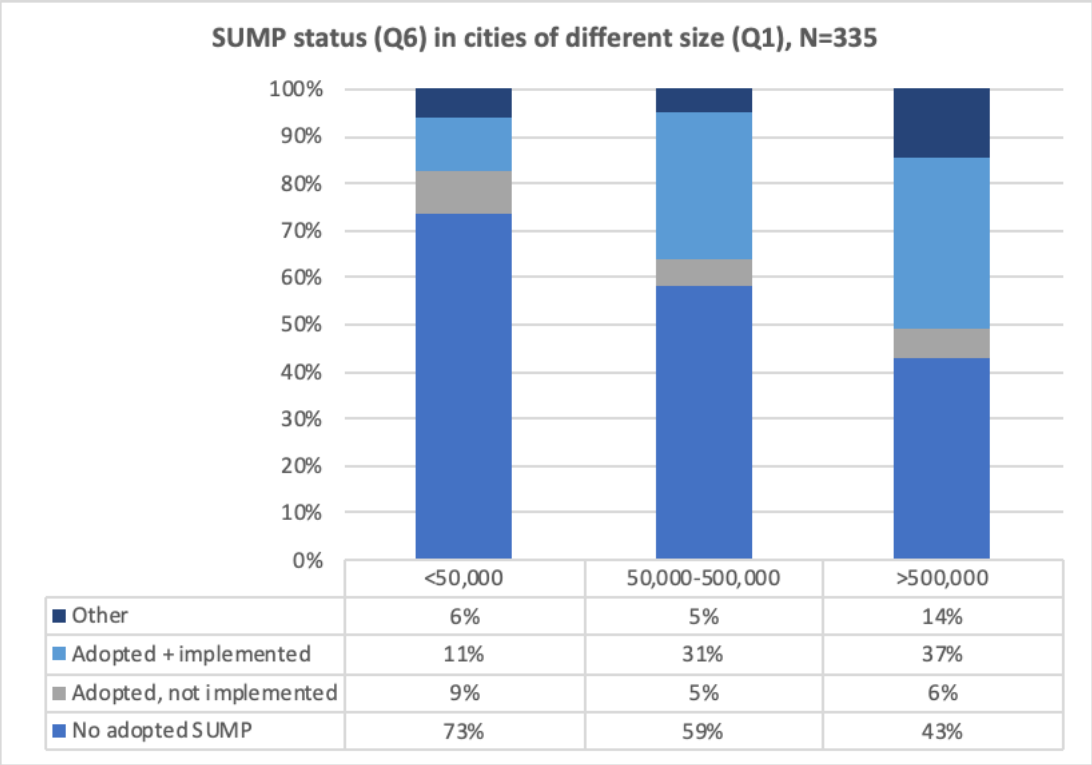


Figure 17: SUMP status in cities of different size

Drivers for developing a SUMP

A cross-tabulation was also undertaken for Q1 and Q12, which asked cities about what the drivers for developing a SUMP were in their city, with respondents asked to rate 'legal requirement to develop SUMP', 'access to funding', 'political will' and 'SUMP seen as a solution to transport challenges' as important/not important/do not know, choosing one of the options for each of the four drivers. However, this analysis revealed no trend, with cities of all size

categories rating most of the four drivers as important (see Fig. E1, Appendix E).

Organisation developing the SUMP

A cross-tabulation between Q1 and Q5c was undertaken to see whether there was a relationship between city size and the use of consultants in developing the city's SUMP. However, **since the number of responses to Q5c was low at N=91 or 27% of the total sample of responses, the analysis is not particularly meaningful and firm conclusions cannot be drawn.**

However, the data does suggest that smaller cities are less likely to develop their SUMP themselves, than larger cities.

Number of responses across city size categories (Q1)							
Response to Q5c	**<25,000**	**25,000-50,000**	**50,000-100,000**	**100,000-250,000**	**250,000-500,000**	**500,000-1 million**	**>1 million**
No response	45	45	54	47	27	16	14
Consultant(s) have taken over all parts of the SUMP	2	3	3	5	4	1	1
Parts of the SUMP have been done by consultant(s)	2	2	7	18	6	5	4
The city administration on their own	0	1	1	2	1	1	1
Other	0	1	1	2	1	1	1
Total responses	**49**	**52**	**66**	**74**	**39**	**24**	**21**

Table 4: Analysis between relationship and size and use of consultants in developing the city's SUMP

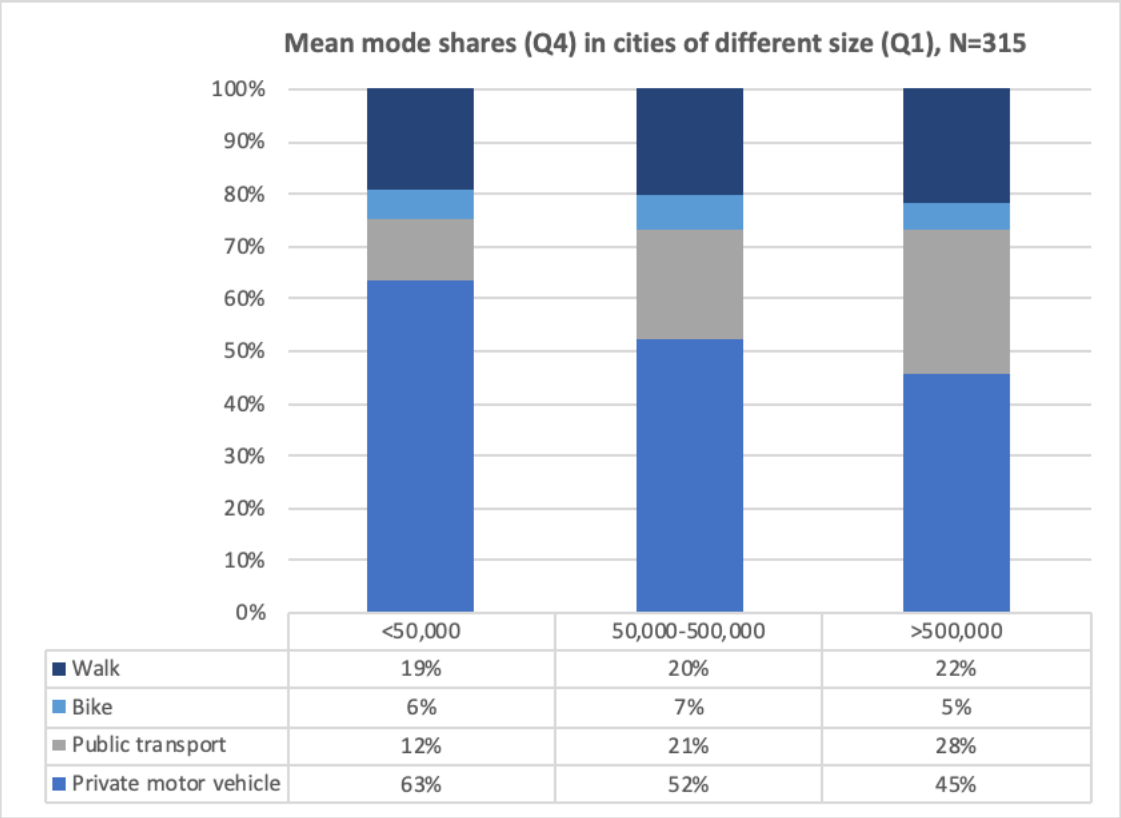
Mode share

Q4 asked respondents to provide their city's mode share of private motor vehicle use, public transport use, walking and cycling. Respondents also had to indicate whether they numbers they provided were based on their own assessment, or formal traffic counts. Both types of responses are analysed here. However, in both cases **the data quality was relatively poor** with a lot of clearly incorrect figures; some responses thus had to be removed, arriving at a slightly lower N=315 for Q4. Even so**, the analysis should be interpreted with caution**. The Q4 responses were then cross-tabulated with Q1. For each city size category, the mean of all four mode share figures provided by all responses in that category was calculated.

The findings (Fig.19) suggest that:

- There is a relationship between city size and mean mode shares for private vehicle use and public transport use.

- On average, larger cities indicated a lower mode share for private vehicles and a higher mode share for public transport. This is expected and reflects better quality and quantity of public transport supply in large versus small European cities, and more restraints on car use (e.g. through parking controls).
- However, it must be noted that many cities with a small population appear to be municipalities located within wider city-regions or close to large cities, rather than small rural municipalities (see discussion below). This would be expected to weaken the correlation between mode share and population size, as public transport services might well be provided at a regional level



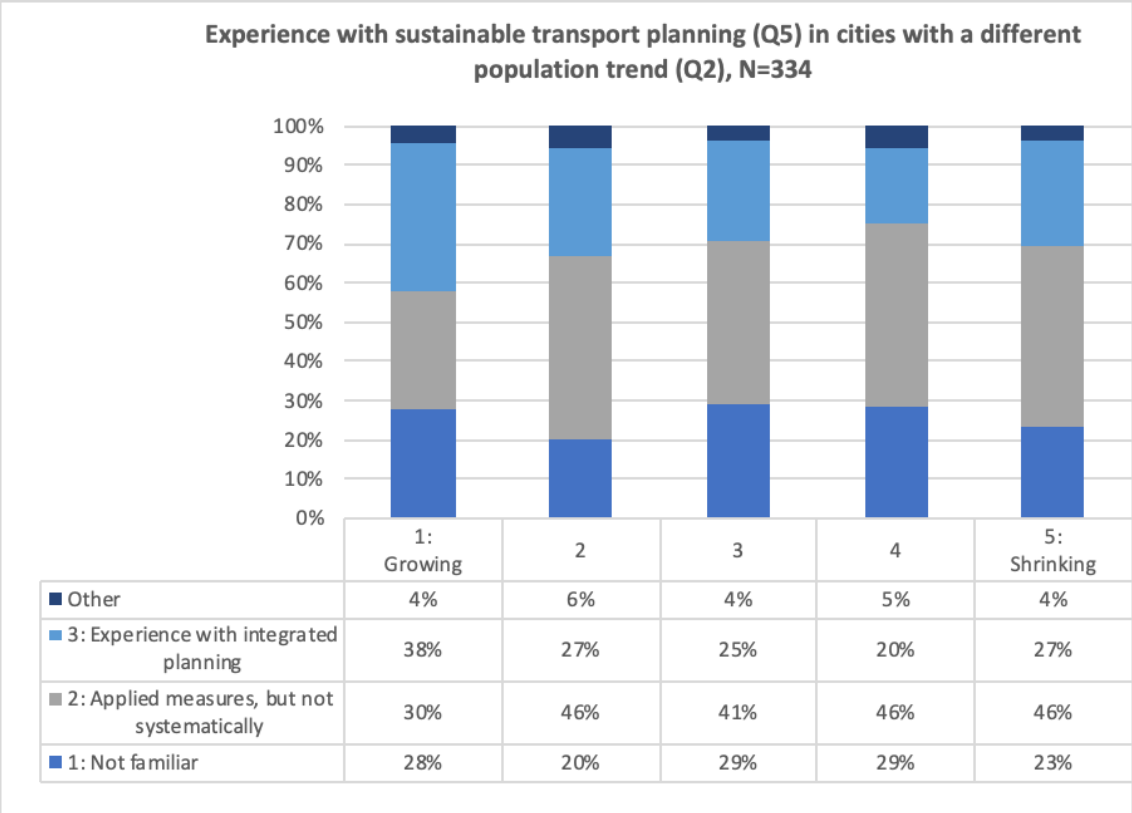
	<50,000	50,000-500,000	>500,000
Walk	19%	20%	22%
Bike	6%	7%	5%
Public transport	12%	21%	28%
Private motor vehicle	63%	52%	45%

Figure 18: Mode shares in cities of different size

4.3.2 City population trend

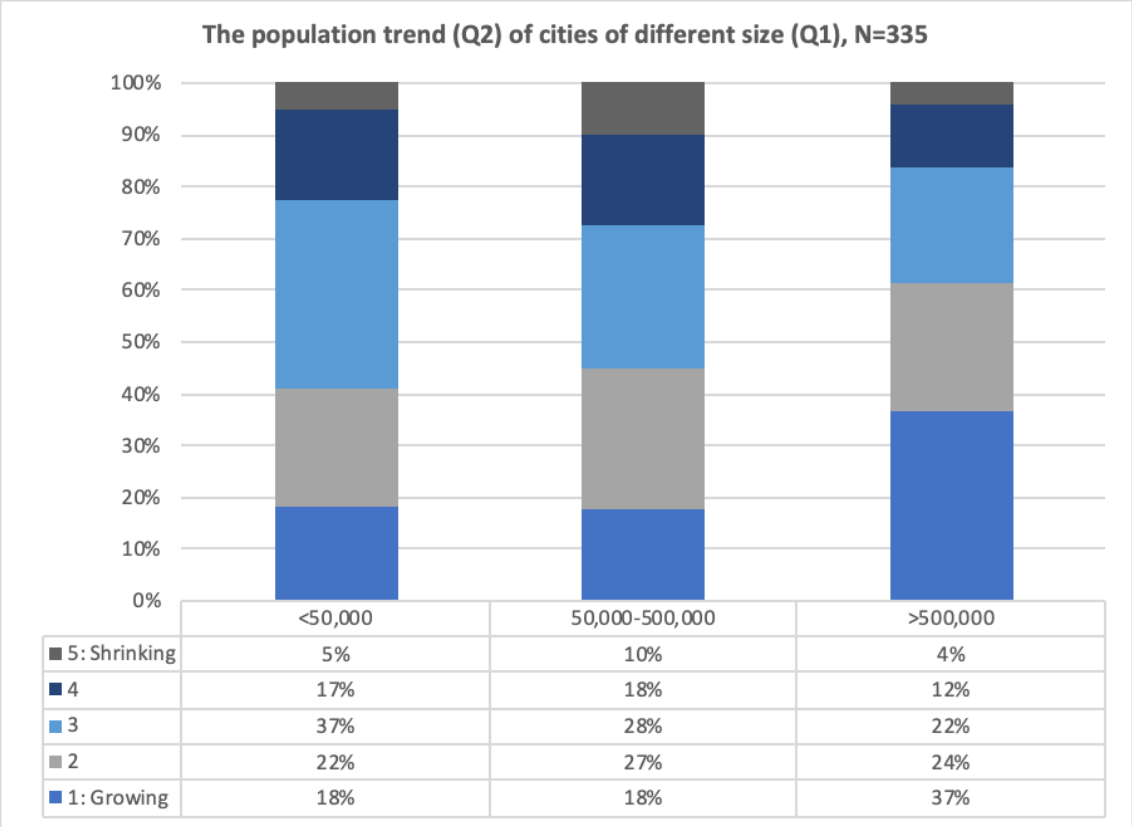
Q2 asked cities to define their population trend from 1: Growing to 5: Shrinking and three categories in between. The main findings were that:

- Cross-tabulation of Q2 (city population trend) and Q5 (experience with sustainable urban transport planning) indicated no significant relationship between the two (Fig. 20)
- The only link that can be noted is that growing cities (1) have more experience with integrated sustainable transport planning (Fig. 21). This is because cities with the most experience with integrated planning had a population greater than 500,000; and these cities also represent the largest proportion of strongly growing (1) cities, as displayed in the second Figure below. City size, city population trend and experience with sustainable urban transport planning are thus linked indirectly for larger cities.
- Analysis indicated no significant relationship between city population trend (Q2) and mean mode shares (Q4) (Fig. E2 in Appendix E).



	1: Growing	2	3	4	5: Shrinking
Other	4%	6%	4%	5%	4%
3: Experience with integrated planning	38%	27%	25%	20%	27%
2: Applied measures, but not systematically	30%	46%	41%	46%	46%
1: Not familiar	28%	20%	29%	29%	23%

Figure 19: Experience with sustainable transport planning in cities with a different population trend



	<50,000	50,000-500,000	>500,000
5: Shrinking	5%	10%	4%
4	17%	18%	12%
3	37%	28%	22%
2	22%	27%	24%
1: Growing	18%	18%	37%

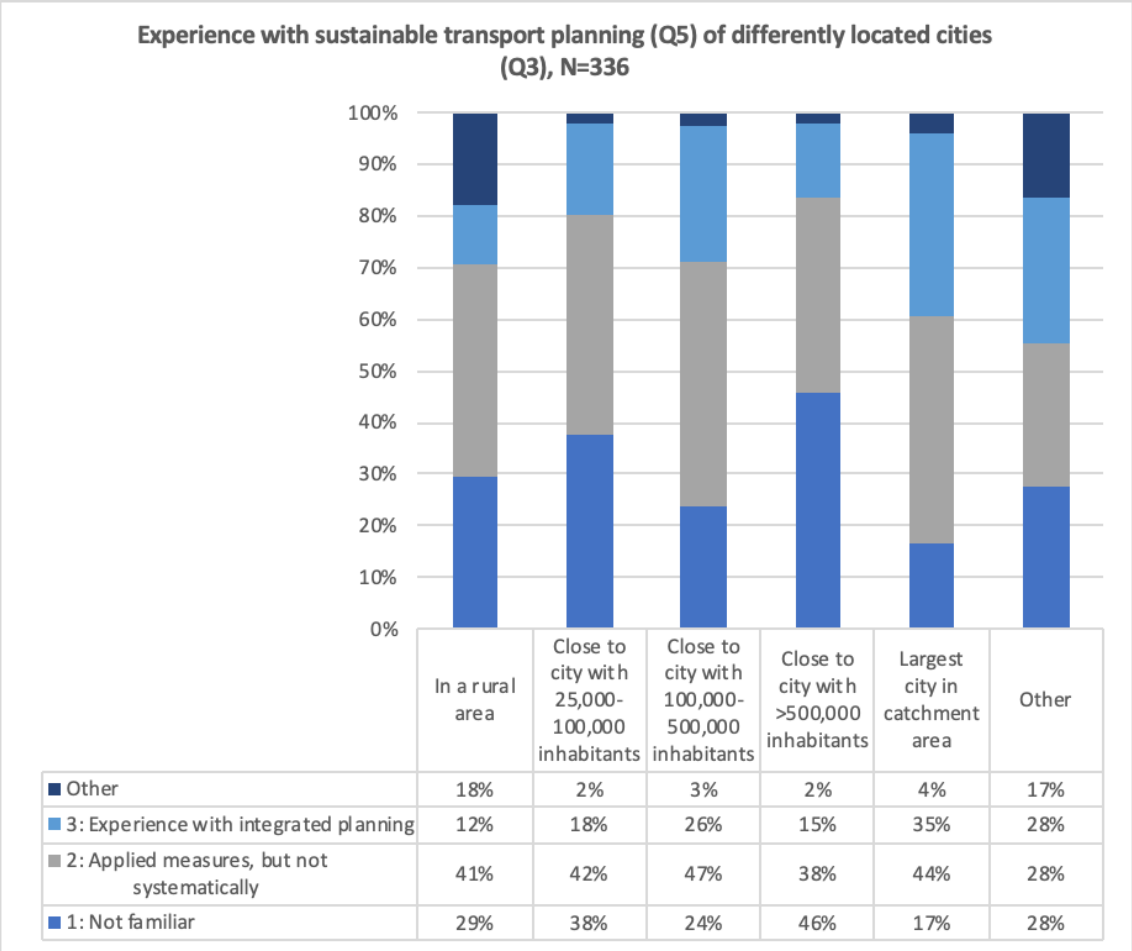
Figure 20: The population trend of cities of different size

4.3.3 City location

Q3 asked respondents to identify the relative location of their city to other cities of different population sizes. This indicates whether a small municipality (small population) is in a rural area or part of a larger city-region, which can be expected to affect mobility patterns significantly. It must be noted that the data quality for Q3 was a little lower than for Q5 and Q6, since a high proportion of cities responded 'Other' rather than choosing one of the given response categories.

The main results were that:

- Cross-tabulation of Q3 with Q5 indicates no clear trend, except for the fact that cities that are the largest city in a catchment area have the greatest experience with sustainable urban transport planning, which is to be expected given the correlation between Q1 and Q5 (Fig. 22);
- A regional analysis (Q3 with Q5) was done for cities in Southern Europe to test for a regional trend, but this did not reveal any significant difference (see Appendix E).

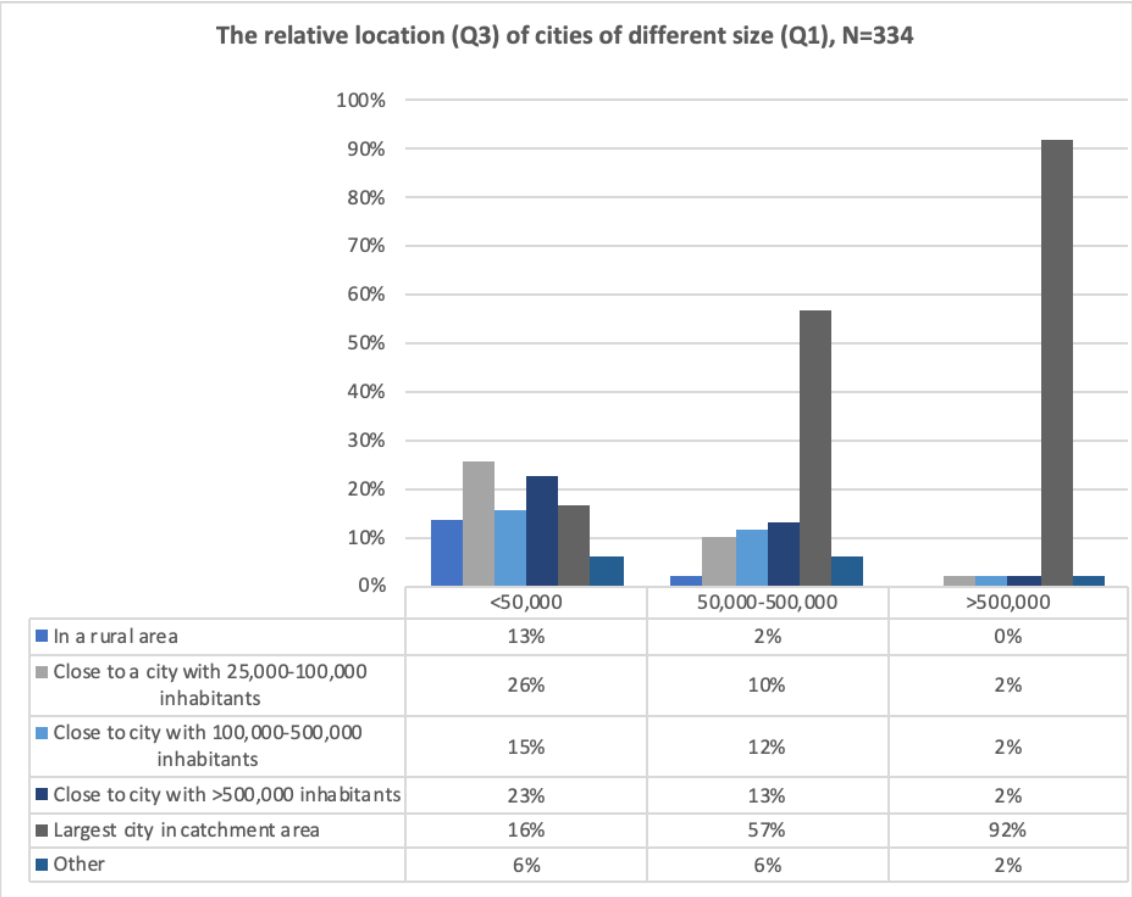


	In a rural area	Close to city with 25,000-100,000 inhabitants	Close to city with 100,000-500,000 inhabitants	Close to city with >500,000 inhabitants	Largest city in catchment area	Other
Other	18%	2%	3%	2%	4%	17%
3: Experience with integrated planning	12%	18%	26%	15%	35%	28%
2: Applied measures, but not systematically	41%	42%	47%	38%	44%	28%
1: Not familiar	29%	38%	24%	46%	17%	28%

Figure 21: Experience with sustainable transport planning of differently located cities

- However, a cross-tabulation of Q3 with Q1 (city population size) revealed a very strong trend in the data (Fig. 23)
- An important additional finding is that small cities (less than 50,000 inhabitants) are diverse in terms of their location – 38% are close to another city with a population of 100,000-500,000 or over >500,000 inhabitants. This suggests that many of the responses may be from suburban municipalities or municipalities integrated into a wider city-region. Only 13% of cities smaller than 50,000 inhabitants were located in a rural area.

- Among cities with a population between 50,000-500,000, 57% were the largest within their catchment area. For >500,000, this rises to 92%. This reinforces the finding that for cities in the SUMPs-UP survey sample, 50,000 inhabitants thus appears to be an important 'cut-off' point in terms of different contexts.



	<50,000	50,000-500,000	>500,000
In a rural area	13%	2%	0%
Close to a city with 25,000-100,000 inhabitants	26%	10%	2%
Close to city with 100,000-500,000 inhabitants	15%	12%	2%
Close to city with >500,000 inhabitants	23%	13%	2%
Largest city in catchment area	16%	57%	92%
Other	6%	6%	2%

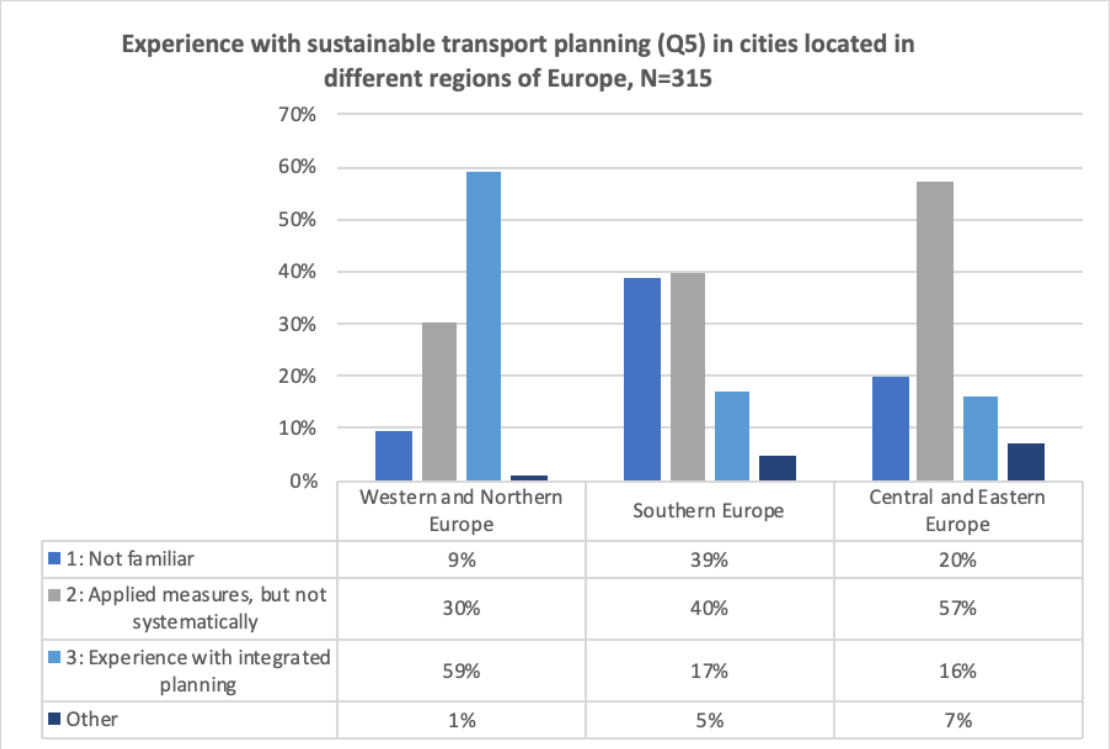
Figure 22: The relative location of cities of different size

4.3.4 Comparing European regions

The countries of survey cities were classified into three regions of Europe: Western and Northern Europe, Southern Europe and Central and Eastern Europe, as well as Non-member states; the latter is excluded from the regional analysis, thus bringing the total sample here to N=315. Cross-tabulations were conducted between this new 'European Region' variable for each city response to Q5, Q6 and Q4, with the following results:

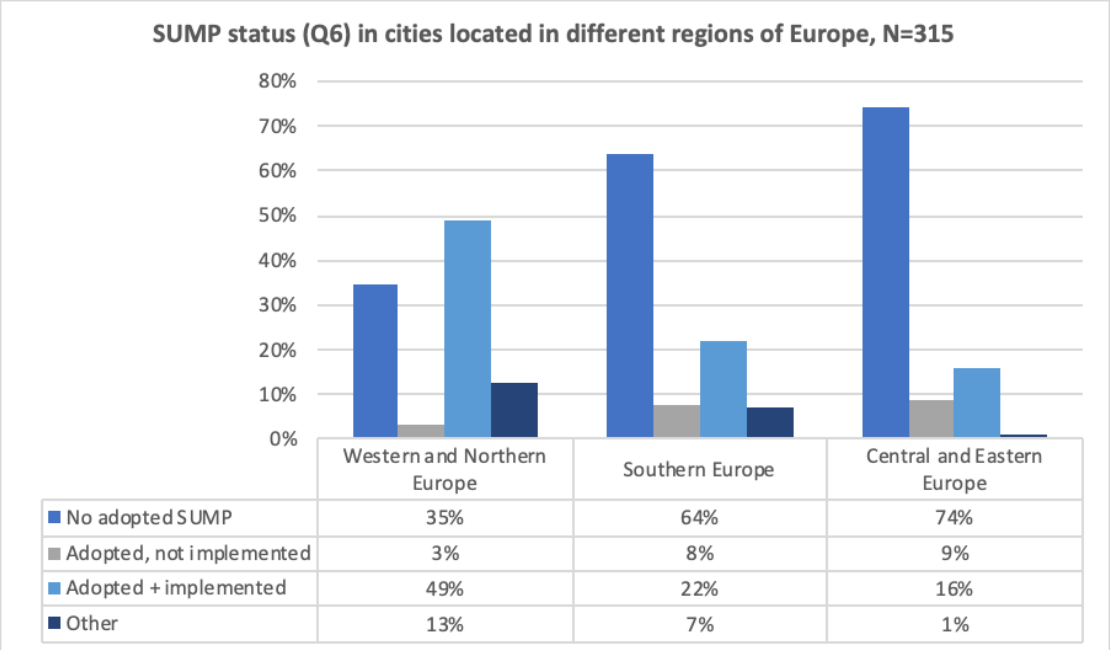
- Cross-tabulation of Q5 and European Region suggests that cities in Central and Eastern Europe and Southern Europe have less experience with sustainable urban transport planning compared to cities in Western and Northern Europe, which are much more experienced with integrated planning (Fig. 24);
- The cross-tabulation of Q6 and European Region demonstrates an even stronger trend – with approximately double the proportion of cities in Southern and Central and Eastern Europe not having a formally adopted SUMP, compared to Western and Northern Europe;
- Whereas the largest proportion of cities not yet familiar with sustainable urban transport planning were in Southern Europe, the largest proportion of cities with no adopted SUMP were in Central and Eastern European countries;

- These findings strongly indicate that the three categories representing different, broad regions of Europe created for the purpose of this SUMP-PLUS analysis are meaningful in relation to the differing experience with sustainable mobility planning in European cities;
- However, **the exact proportional figures for both Q5 and Q6 must be interpreted with caution**, because a high proportion of city responses from Southern Europe were from small cities with a population less than 50,000 inhabitants, and this translates into less experience with sustainable urban transport planning/less advanced SUMP development.



	Western and Northern Europe	Southern Europe	Central and Eastern Europe
1: Not familiar	9%	39%	20%
2: Applied measures, but not systematically	30%	40%	57%
3: Experience with integrated planning	59%	17%	16%
Other	1%	5%	7%

Figure 23: Experience with sustainable transport planning in cities located in different regions of Europe



	Western and Northern Europe	Southern Europe	Central and Eastern Europe
No adopted SUMP	35%	64%	74%
Adopted, not implemented	3%	8%	9%
Adopted + implemented	49%	22%	16%
Other	13%	7%	1%

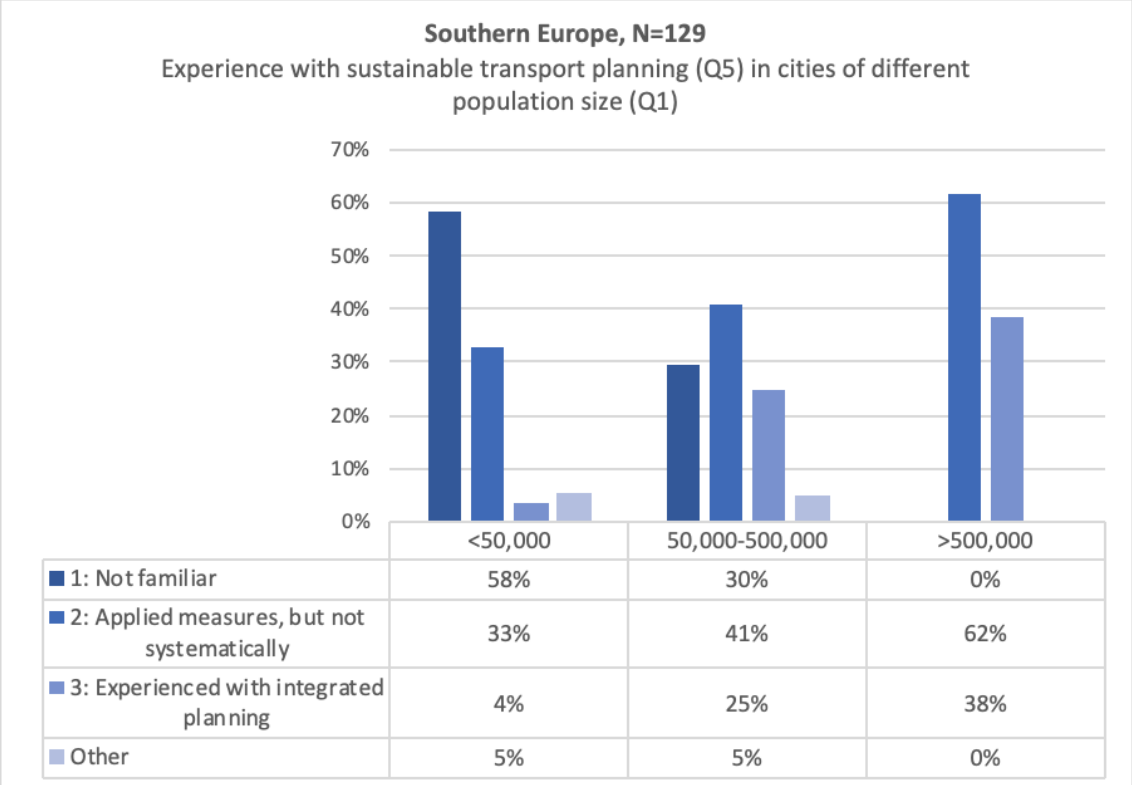
Figure 24: SUMP status in cities located in different regions of Europe

The cross-tabulations between the city responses to Q1 and Q5 were then disaggregated per region of Europe, with the resulting conclusions:

- The region-by-region analysis broadly supports the overall trends and findings described above. Especially when broken down into three categories of city size, the relationship between city size, Q5 and Q6 is clearly illustrated in the Figures below.
- Some additional nuance related to differences in the effect of city size is discussed here on a region-per region basis.

Southern Europe

- In Southern Europe, more than half of cities with less than 50,00 inhabitants are not familiar with sustainable urban transport planning, but also significant proportions of cities with a population between 50,000-500,000 (Fig. 27)
- All Southern European cities with a population greater than 500,000 have some experience with sustainable urban transport planning (Fig. 26)
- In Southern Europe, SUMP status appears to be strongly related to city size, with 73% of cities with a population less than 50,000 having not having an adopted SUMP in place, while 46% of cities with a population greater than 500,000 had a SUMP that had been adopted and was being implemented (Fig. 27)
- Analysis of mean mode share (Q4) indicates that smaller cities had a slightly higher share for private vehicle use, while public transport use increases with city population size (Fig. 28)



	<50,000	50,000-500,000	>500,000
1: Not familiar	58%	30%	0%
2: Applied measures, but not systematically	33%	41%	62%
3: Experienced with integrated planning	4%	25%	38%
Other	5%	5%	0%

Figure 25: Southern Europe - Experience with sustainable transport planning in cities of different population size

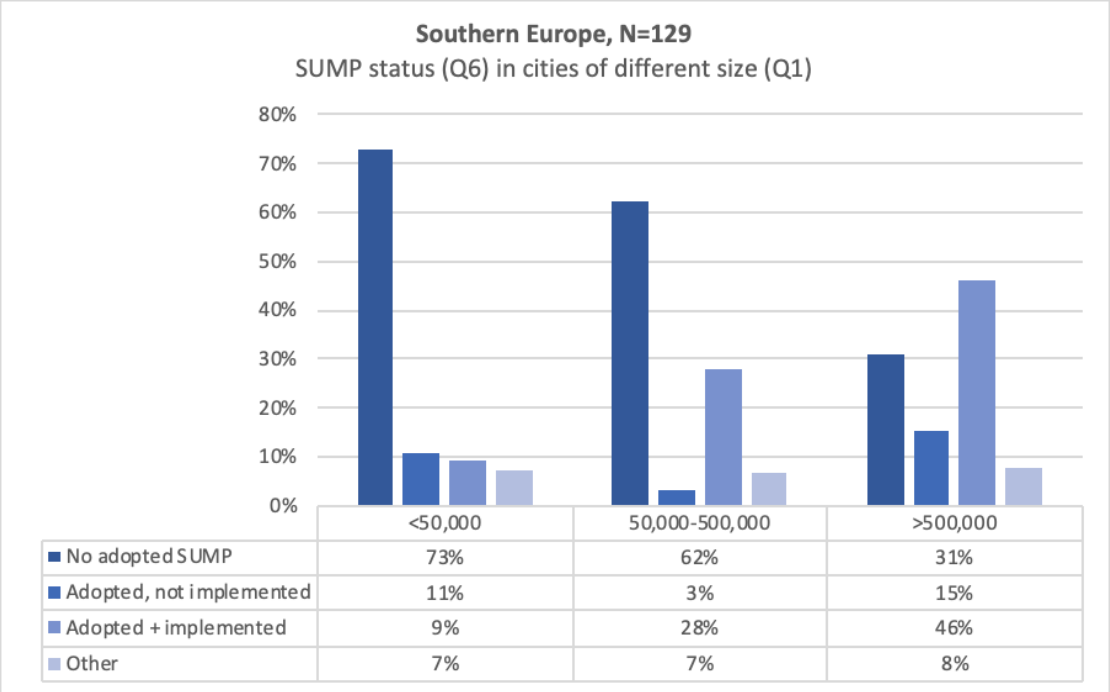


Figure 26: Southern Europe - SUMP status in cities of different size

Figure 26 and 27. Number of responses for cross-tabulation of Q1 vs. Q5 and Q6				
	<50,000	**50,000-500,000**	**>500,000**	**Total**
N	55	61	13	129

Table 5: Number of responses for cross-tabulation of Q1 vs. Q5 and Q6

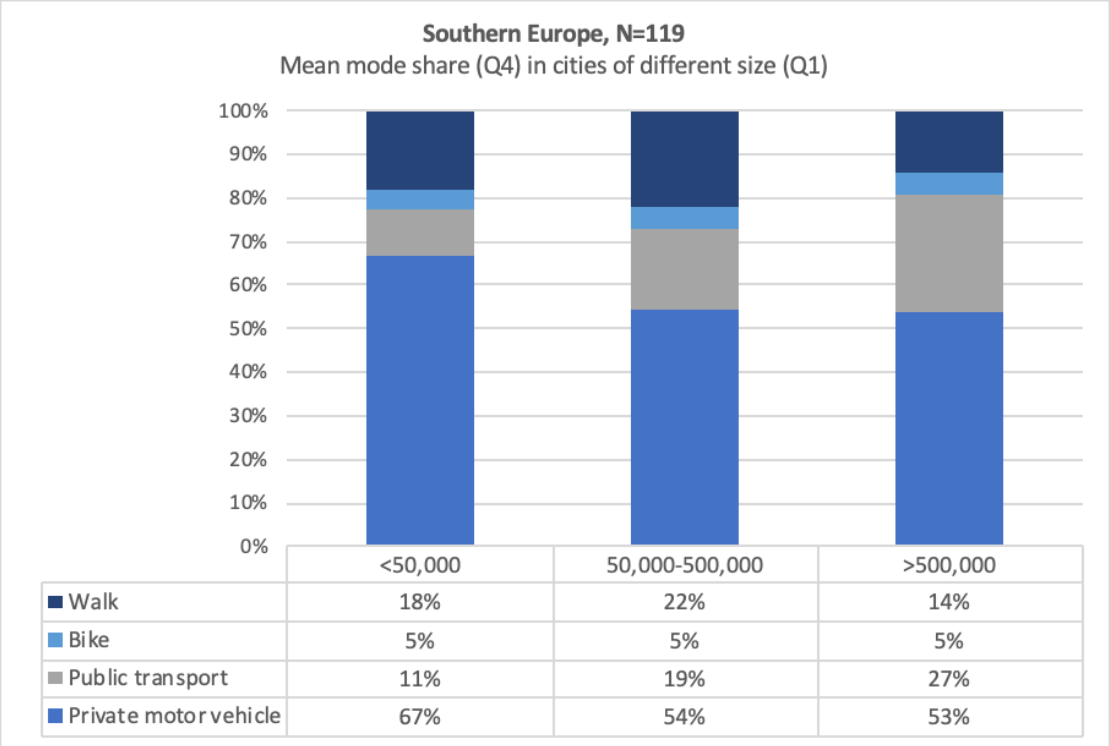


Figure 27: Southern Europe - Mean mode share in cities of different size

Figure 28. Number of responses for cross-tabulation of Q1 vs. Q4				
	<50,000	**50,000-500,000**	**>500,000**	**Total**
N	53	56	10	119

Table 6: Number of responses for cross-tabulation of Q1 vs. Q4

Central and Eastern Europe

- In Central and Eastern Europe, 32% of cities with less than 50,000 inhabitants are not familiar with sustainable urban transport planning (Fig. 29);
- A large proportion of cities of all sizes in Central and Eastern Europe have applied some sustainable transport measures (Fig. 29);
- There is a relatively low degree of experience with integrated planning across city size categories (Fig. 29);
- Analysis of SUMP status (Q6) reveals that of the 100 Central and Eastern European cities that responded to the survey, the vast majority of cities of all population sizes did not have a SUMP that has been adopted. While this may well be valid for smaller cities, Likewise, 72% cities with a population greater than 500,000 did not have an adopted SUMP, however this is likely due to the small number of cities in this size category that answered Q6;
- Analysis of mean mode shares (Q4) indicates a clear trend, with public transport use increasing and private vehicle use decreasing with city size (Fig. 31).

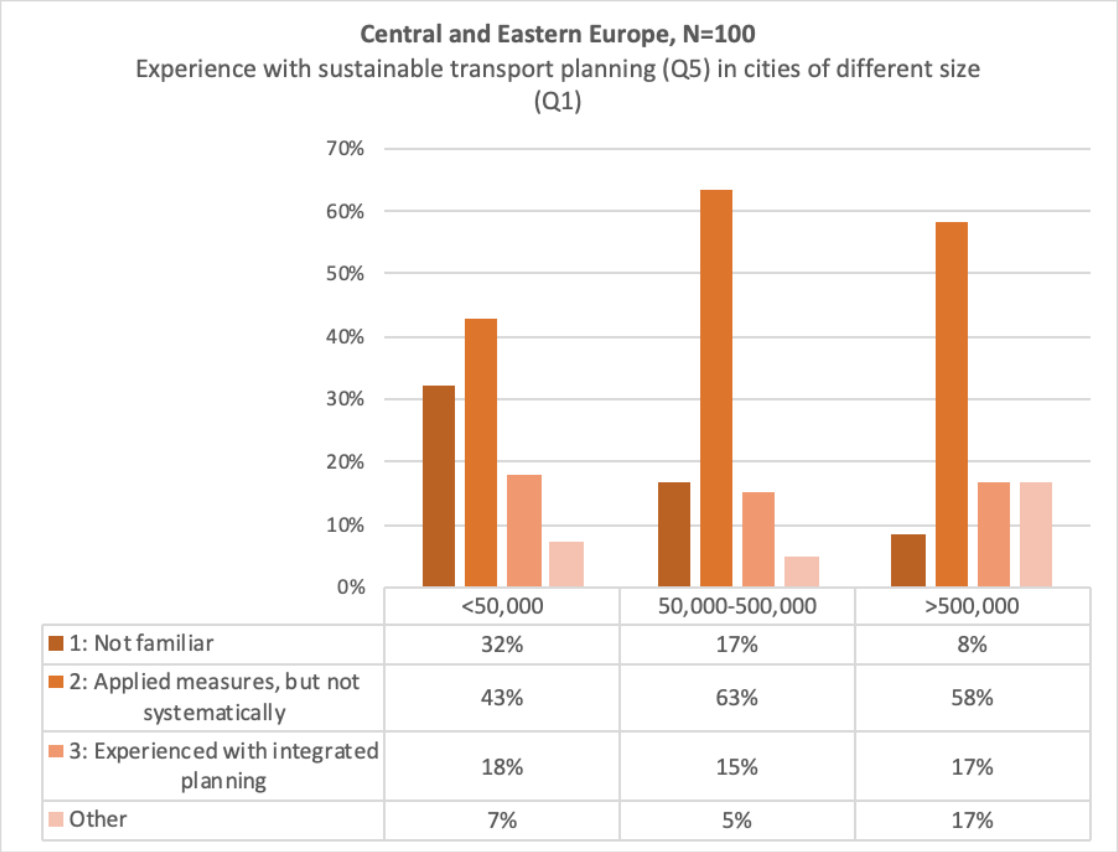


Figure 28: Central and Eastern Europe - Experience with sustainable transport planning in cities of different size

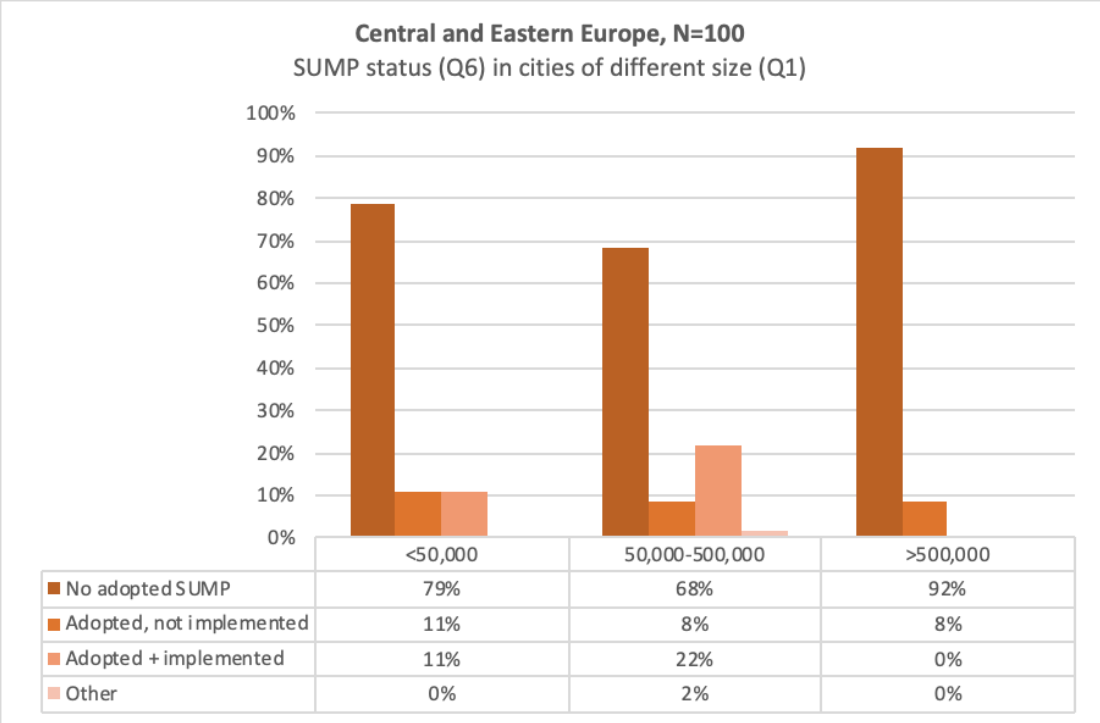


Figure 29: Central and Eastern Europe - SUMP status in cities of different size

Figure 29 and 30. Number of responses for cross-tabulation of Q1 vs. Q5 and Q6				
	<50,000	**50,000-500,000**	**>500,000**	**Total**
N	28	60	12	100

Table 7: Number of responses for cross-tabulation of Q1 vs. Q5 and Q6

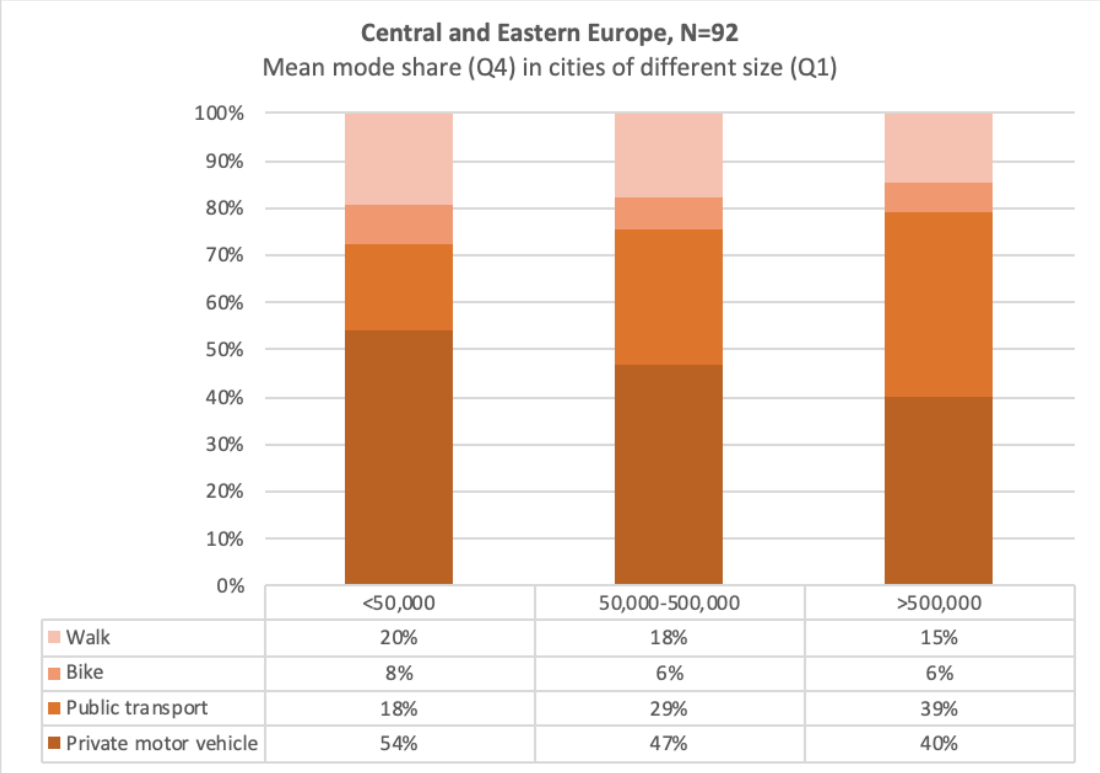


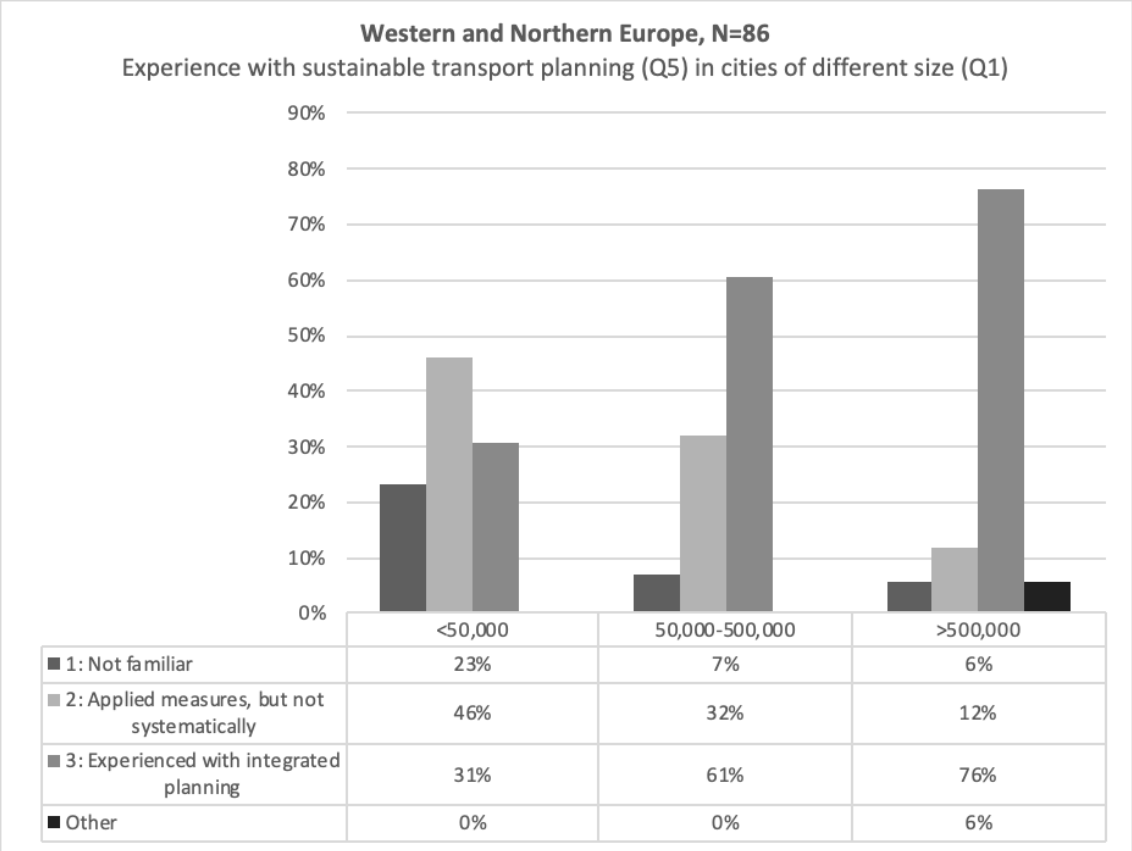
Figure 30: Central and Eastern Europe - Mean mode share in cities of different size

Figure 31. Number of responses for cross-tabulation of Q1 vs. Q4				
	<50,000	**50,000-500,000**	**>500,000**	**Total**
N	27	55	10	92

Table 8: Number of responses for cross-tabulation of Q1 vs. Q4

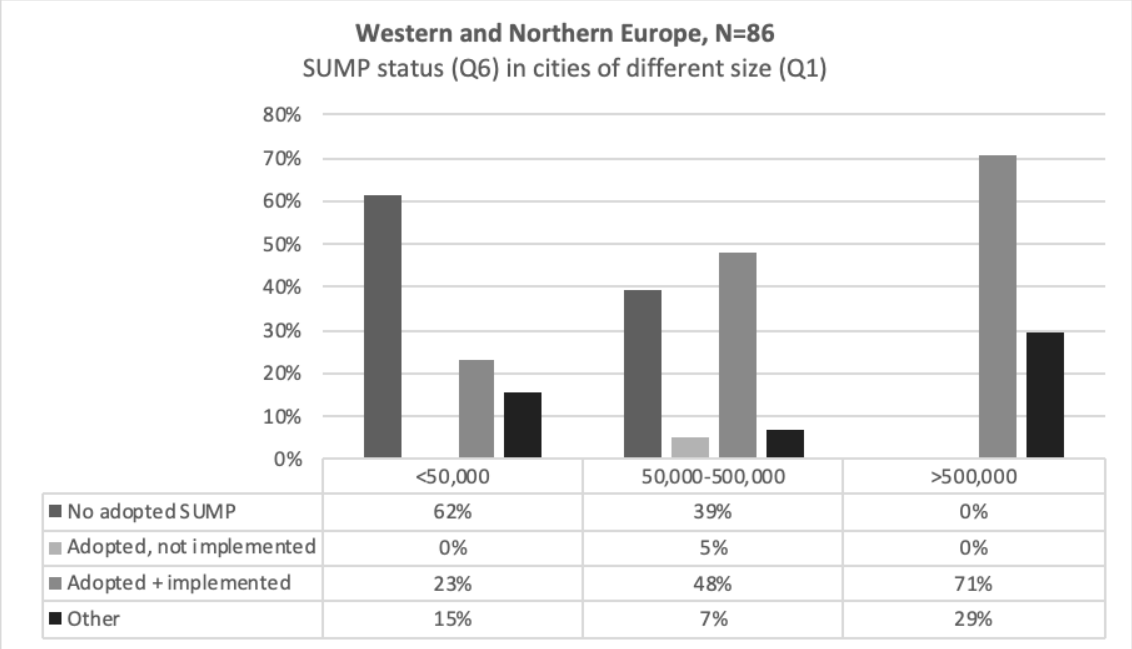
Western and Northern Europe

- For Western and Northern Europe, the total sample size is significantly lower (N=86) with a much smaller number of responses for cities with less than 50,000 inhabitants (N=13), thus the trends illustrated below are not likely to be as clear or significant
- The data indicates that the majority of Western and Northern European cities of with a population greater than 50,000 have experience with integrated sustainable urban transport planning. However, a large proportion of cities with a population smaller than 500,000 have only applied measures in a non-integrated, unsystematic way (Fig. 32)
- Although the sample size for cities with a population less than 50,000 is very small (N=13), the analysis suggests that such cities in Western and Northern Europe do share the challenges of comparable cities elsewhere in Europe, in that they are less likely to have experience with sustainable urban transport planning (Fig. 32)
- Alike other regions of Europe, the analysis suggests that larger cities are more likely to have an adopted SUMP that is being implemented. Among cities with a population between 50,000-500,000, 48% are implementing a SUMP, which is significantly higher compared to the other regions. However, 39% of these cities did not have an adopted SUMP, which indicates that the SUMP concept is not universally adopted in Western and Northern Europe either (Fig. 33)
- Analysis of mean mode shares (Q4) suggests that alike other regions of Europe, private vehicle use decreases and public transport use increases with increasing city population size. However, the public transport mode share for cities with a population between 50,000-500,000 is the lowest of all three regions of Europe. (Fig. 34).



	<50,000	50,000-500,000	>500,000
1: Not familiar	23%	7%	6%
2: Applied measures, but not systematically	46%	32%	12%
3: Experienced with integrated planning	31%	61%	76%
Other	0%	0%	6%

Figure 31: Western and Northern Europe - Experience with sustainable transport planning in cities of different size



	<50,000	50,000-500,000	>500,000
No adopted SUMP	62%	39%	0%
Adopted, not implemented	0%	5%	0%
Adopted + implemented	23%	48%	71%
Other	15%	7%	29%

Figure 32: Western and Northern Europe – SUMP status in cities of different size

Figure 32 and 33. Number of responses for cross-tabulation of Q1 vs. Q5 and Q6				
	<50,000	**50,000-500,000**	**>500,000**	**Total**
N	13	56	17	86

Table 9: Number of responses for cross-tabulation of Q1 vs. Q5 and Q6

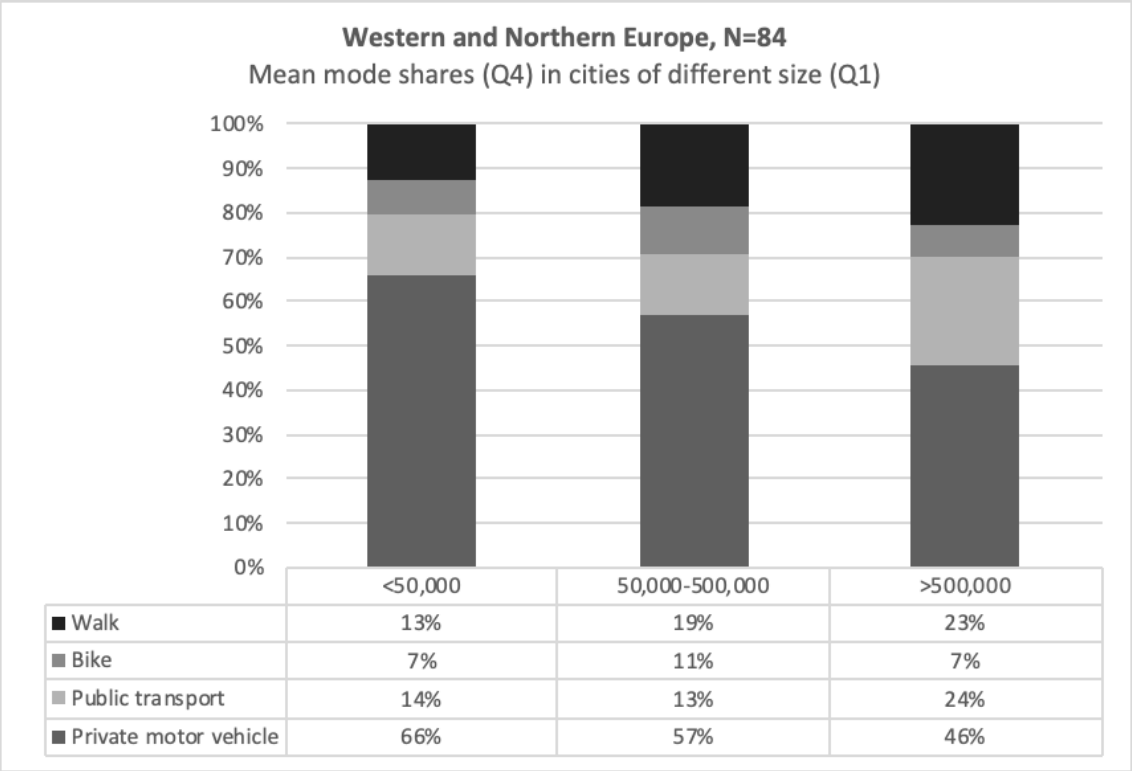


Figure 33: Western and Northern Europe – Mean mode shares in cities with different size

Figure 34. Number of responses for cross-tabulation of Q1 vs. Q4				
	<50,000	**50,000-500,000**	**>500,000**	**Total**
N	13	55	16	84

Table 10: Number of responses for cross-tabulation of Q1 vs. Q4

4.4 Summary of findings

4.4.1 City size confirmed as a significant contextual factor

The analysis of the SUMPs-UP survey data demonstrates that city (population) size is strongly related to experience with sustainable urban transport planning and status of SUMP development in European cities. Across cross-tabulations between Q1 and Q5, Q6, Q4, Q2 and Q3, <50,000, 50,000-500,000 and +500,000 emerged as meaningful groupings of population size for which significant variation could be discerned.

There is evidence of some European cities of all sizes having “already applied sustainable mobility measures, but not systematically”. However, almost half (46%) of cities with a population of less than 50,000 inhabitants do not yet have any familiarity with sustainable urban transport planning and only 9% had experience with integrated planning; whereas over 41% of cities with more than 500,000 inhabitants had experience with integrated planning. Larger cities are also more likely to have a SUMP that has been adopted and that they are implementing, whereas 73% of cities with a population less than 50,000 did not have a SUMP that had been adopted at the time the survey was conducted.

The mode share data (Q4) also indicated a relationship between mean mode shares and city population size. On average, larger cities indicated a lower mode share for private vehicles and a higher mode share for public transport. This is expected and reflects public transport supply in large versus small European cities, with public transport quality typically the highest in large cities.

These results support the findings of SUMPs-Up and the foundational assumption of SUMP-PLUS that small European cities (population-wise) have greater challenges in developing policies for sustainable mobility transitions and would thus benefit from guidance regarding how to develop a simplified SUMP and integrate respective mobility policies in general city development strategies as well as context-specific transition pathways. In EU projects and policy, often small and mid-sized cities are grouped together, however. An important added nuance in this regard, is that the analysis indicates that it is very small cities with a population less than 50,000 inhabitants that face the greatest challenges, and so need to be separately identified in analyses.

4.4.2 The geography of Europe matters for sustainable mobility transitions

For the purpose of analysis by the SUMP-PLUS team, a new European Region variable was added to analyse the SUMPs-UP survey data, with European cities divided into three broad geographies: Western and Northern Europe, Southern Europe and Central and Eastern Europe. Comparing responses to Q5 and Q6 for cities located in these three regions supported the use of this categorisation. A clear divergence in context is clear in the data, with respect to experience with sustainable transport planning and SUMP development.

Whereas the largest proportion of cities not yet familiar with sustainable urban transport planning (Q5) were in Southern Europe, the largest proportion of cities with no adopted SUMP were in Central and Eastern Europe. The divergence between Western and Northern Europe and the two other regions was very significant (although the non-representative total survey sample, in terms of city size and country distribution, means that this conclusion must be interpreted with caution).

When disaggregating the analysis and running cross-tabulations with the sub-sample of cities within each region of Europe, the findings support the overall trends and conclusions – i.e. the relationship between city size, Q5 and Q6. The findings suggest that, in the Southern European context, the situation faced by very small cities of less than 50,000 inhabitants is particularly challenging, with 58% of respondents not at all yet familiar with sustainable urban transport planning. It can be noted that the survey sample contains a large number of responses from small Spanish and Greek cities. On average, approximately a quarter of Southern European cities with a population between 50,000-500,000 have experience with integrated planning. In Central and Eastern Europe, less cities are completely unfamiliar with sustainable transport planning, but a lower proportion of cities – including larger cities - have experience with integrated planning.

A foundational assumption of the SUMP-PLUS project was that Central and Eastern European cities may be in particular need of context-specific transition pathways to address challenges of policy development and implementation. While the findings support this, e.g. pointing to the lack of integrated planning, the analysis also points to the context-specific challenges faced by (small and mid-sized) cities in Southern Europe.

4.4.3 City population trend and city location – findings provide additional nuance

The analysis revealed no significant relationship between city population growth/decline trend (Q2) and experience with sustainable transport planning/SUMP status (Q5/Q6), modal shares (Q4); nor a significant relationship between city location (Q3) and Q5, Q6 or Q4.

However, the analysis of Q2 and Q3 does point to some nuance regarding cities of different population size. Small cities (<50,000 population) in the SUMPs-UP survey are not predominately located in rural areas, but are rather located near larger cities, suggesting that they might be small municipalities forming part of a suburban belt or larger city-region. Smaller cities (<50,000 population) were also less likely to have a growing population and more likely to have a shrinking population. Cities with a population of >500,000 were significantly more likely to be growing and 97% of these cities were also the largest cities in their catchment areas.

These findings are meaningful for further interpreting the challenges seemingly faced by small cities within the SUMPs-UP survey sample, rather than a reflection on the structure of urbanisation across Europe as a whole. Shrinking and rapidly growing populations, and the location of cities within functional urban areas/wider urban systems, are well-established as important factors affecting urban mobility systems and policy.

The findings highlight the well-established fact that, within the context of economic agglomeration, large and 'core' cities have strong institutional capacity compared to smaller, spatially peripheral cities – which also affect their ability to conduct and implement sustainable urban mobility planning. The analysis suggests that simplified SUMP processes and context-specific pathways would be especially valuable for small municipalities (population <50,000), taking into account the different relative locations across the rural-urban spectrum.

4.4.4 Interpreting quantitative trends as differences in local context

Quantitative analysis of the SUMPs-UP survey data points to clear trends, but the question is how we can interpret the findings discussed in Section 3.4.3. Why is it that the region of Europe and city population size, in particular, matter for the capacity of European municipalities to develop a sustainable mobility vision and implement it?

Path-dependencies:

- The different regions of Europe are affected by different historical legacies
- At the macro-level, Western and Northern Europe, Southern Europe and Central and Eastern Europe have had different trajectories of economic development. There are still large differences in per capita GDP at the national level. There is a well-proven relationship between GDP per capita and car ownership.
- Mass motorisation in Western and Northern Europe began in the 1950s, in Southern Europe slightly later from the late 1960s to the 1980s. In Central and Eastern Europe, mass motorisation has only started in the post-socialist period. This is related to policy and cultural factors, such as the time-lag for policy-makers to acknowledge and address the externalities of car-dependent mobility and the subsequent shift towards sustainable transport policies. Cultural aspirations for car ownership among the population also affect policy-making.
- An additional factor is the spread of sustainable transport policy concepts, tools and the change of the transport planning profession over time – this has changed over time.

Varying degree of municipal capacity:

- Having said this, analysis at the level of different regions of Europe and even countries can hide significant variation within both, which is illustrated by the strong relationship between city population size and experience with sustainable urban transport planning.
- A growing or shrinking population affects mobility patterns and volumes, as well as the municipal resource base and local tax revenues
- There are significant disparities in per capita GDP at the regional and municipal level, within countries, which is related to the resources a municipality possesses to develop a SUMP and work towards a sustainable mobility transition. The size of a municipal administration in terms of staffing affects the ability to manage transport policy development and implementation, and particularly more technical types of analysis requires software and skills that are resource-intensive.
- The cost-efficiency of investing and operating public transport services means that cities with a smaller population typically see underinvestment in such services, compared to larger cities.
- However, this also depends on the location of cities within functional urban areas (commuting areas) or in relation to larger administrative areas (e.g. metropolitan area). As discussed in the analysis of the SUMPs-UP data, the context between very small municipalities in rural areas or adjacent to mid-sized or large cities will differ significantly.

5 SUMP-PLUS typology of European cities

5.1 Drawing on findings from the international literature review

The reasons for developing a city typology are many and vary from one study to another. For example, some of the main reasons behind the development of the typologies referenced in this deliverable are the following:

- Typologies can illustrate as well as lead to a better understanding dynamic of cities;
- Better coordinate policies for mobility and develop effective pathways to sustainability, by accounting for city dynamics and their heterogeneity;
- Allow for the identification and selection of suitable transport solutions for implementation, that take into account the specific needs of a given city and that are compatible with agreed stakeholder goals;
- Propose different ways forward in meeting the urban mobility challenge for cities that are at varying stages of development and based on their local context;
- Provide mobility decision makers and stakeholders with reflections, guidance, and recommendations when it comes to creating sustainable strategies required to meet the mobility challenges facing their cities and achieve the objective of networked mobility;
- Unearth and highlight any links between the level of maturity and experience in sustainable urban mobility planning of cities and their local context/circumstances;
- Identify city-specific variations when it comes to the supply and utilisation of urban transport systems, which lends itself as a promising approach for finding potential strategies for the purpose of establishing more sustainable transport systems and mobility patterns;
- Match projects and opportunities for innovation to the specific circumstances of cities, as cities vary and there is no single solution that would address all of them; and
- Be able to compare and cross-analyse cities at a national, continent, or global level.

For a more detailed explanation behind the development of each of the identified typologies, please refer to Annex D.

Interestingly, while the city categories were quite different across the identified typologies, several variables appeared across the different studies and were referred to in the development of several of the typologies. The table below provides an overview of some of the variables that appeared more than once among the identified typologies.

Variable	# of times used	City Typologies
Mode share - of any mode. Modal split is a vital indicator and among those most commonly used for assessing the urban transport system of a particular city, as it highlights the share of individuals that are using a specific mode of transport within the overall transport	5	IOPScience: A novel global urban typology framework for sustainable mobility futures; Arthur D. Little: No.1 - Future of urban mobility; Arthur D. Little and UITP - Future of urban mobility 2.0 urban mobility index; SUMPs-Up Users' Needs Assessment; Journal of Transport Geography: Dimensions of urban mobility cultures - a comparison of German Cities;

usage of a particular city.[1] Modal share can be calculated based on a variety of units, including passenger-km and number of trips.		The European Urban Transport Roadmaps 2030 study.
Population size Population size is another important indicator since a relationship between city size and the urban transport system has been identified. More specifically, as the findings of the SUMPs-Up Needs Assessment Survey have shown, there is a correlation between city size and mean mode share, as well as between city size and sustainable urban transport planning and SUMP development.	4	IOPScience: A novel global urban typology framework for sustainable mobility futures; Arthur D. Little: No.1 - Future of urban mobility; SUMPs-Up Users' Needs Assessment; Journal of Transport Geography: Dimensions of urban mobility cultures - a comparison of German Cities; OECD – EC report; The European Urban Transport Roadmaps 2030 study; World Bank: Geography of growth.
Population density Population density, referring to the number of people living per square kilometre of a particular area, is one of the indicators most often referred to when it comes to examining spatial influence on mobility. Some studies have identified and highlighted a positive correlation between population density and public transport use and walking.	4	IOPScience: A novel global urban typology framework for sustainable mobility futures; Arthur D. Little and UITP - Future of urban mobility 2.0 urban mobility index; Journal of Transport Geography: Dimensions of urban mobility cultures - a comparison of German Cities; McKinsey
GDP per capita GDP is an important indicator as it is related to and indicates the level of resources a city possesses in order to develop a SUMP and transition towards a more sustainable urban transport system. The GDP per capita variable needs to be clearly defined as per own resources only – it doesn't include options for support instruments and external funding sources (like EBRD;	3	IOPScience: A novel global urban typology framework for sustainable mobility futures; Arthur D. Little: No.1 - Future of urban mobility; McKinsey

[1] Source used: "Mobility indicators put to test – German strategy for sustainable development needs to be revised" (Julia Gerlach, Nadja Richter, Udo J. Becker)

etc.). It is also important to place this variable in the national context, since there are European cities with a high GDP per capita that are nonetheless not able to finance a complex planning process and expensive measures themselves.		

Table 11: Variable common across several city typologies

5.2 Clustering cities based on the SUMPs-Up data

Analysis of the SUMPs-UP data indicates that the population size of a city and what region of Europe a city is located in has a relatively strong influence on its: 1) level of experience with sustainable urban transport planning, 2) likelihood of having an adopted SUMP in place, 3) its mode share for public transport and private vehicle use. Stratification of the SUMPs-UP data allowed for the identification of nine clusters of different types of cities with discrete characteristics, presented in Table Y (next page), as a first step to identifying elements of a new city typology.

This clustering is strongly supported by the SUMPs-UP data, based on the following variables:

- **Population size**. Three city size categories proven to meaningfully correlate with the degree of sustainable urban transport planning experience
- **Geography**. Three categories of geographical regions within Europe proven to meaningfully correlate with the degree of sustainable urban transport planning experience
- **Relative location**
  - The term ‘very small municipalities’ is used to indicate that these settlements of less than 50,000 inhabitants are really very small (i.e. probably not classified nationally as cities) and many of them are not ‘free-standing’ settlements in rural areas, but also suburban and small urban settlements strongly integrated into a wider city-region;
  - The term ‘large cities and city-regions’ reflects the fact that many responses to the SUMPs-UP survey were from metropolitan-scale administrations.

	Very small municipalities (<50,000)	**Small and mid-sized cities (50,000-500,000)**	**Large cities and city-regions (>500,000)**
Southern Europe	Platanias	Lucca	
Central and Eastern Europe		Klaipeda Alba Iulia	
Western and Northern Europe			Antwerp Manchester

Table 12: Classification of SUMP-PLUS cities within the city clusters

	Very small municipalities (<50,000)	**Small and mid-sized cities (50,000-500,000)**	**Large cities and city-regions (>500,000)**
Southern Europe	N(336)= 16% Q5 Experience with integrated planning: 4% Q6 Adopted + implemented SUMP: 9% Q4 Average mode share (private car): 67% Q4 Average mode share (PT): 11%	N(336)= 18% Q5 Experience with integrated planning: 25% Q6 Adopted + implemented SUMP: 28% Q4 Average mode share (private car): 54% Q4 Average mode share (PT): 19%	N(336)= 4% Q5 Experience with integrated planning: 38% Q6 Adopted + implemented SUMP: 46% Q4 Average mode share (private car): 53% Q4 Average mode share (PT): 27%
Central and Eastern Europe	N(336)= 8% Q5 Experience with integrated planning: 18% Q6 Adopted + implemented SUMP: 11% Q4 Average mode share (private car): 54% Q4 Average mode share (PT): 18%	N(336)= 18% Q5 Experience with integrated planning: 15% Q6 Adopted + implemented SUMP: 22% Q4 Average mode share (private car): 47% Q4 Average mode share (PT): 29%	N(336)= 4% Q5 Experience with integrated planning: 17% Q6 Adopted + implemented SUMP: 0% Q4 Average mode share (private car): 40% Q4 Average mode share (PT): 39%
Western and Northern Europe	N(336)= 4% Q5 Experience with integrated planning: 31% Q6 Adopted + implemented SUMP: 23% Q4 Average mode share (private car): 66% Q4 Average mode share (PT): 14%	N(336)= 17% Q5 Experience with integrated planning: 61% Q6 Adopted + implemented SUMP: 48% Q4 Average mode share (private car): 57% Q4 Average mode share (PT): 13%	N(336)= 5% Q5 Experience with integrated planning: 76% Q6 Adopted + implemented SUMP: 71% Q4 Average mode share (private car): 46% Q4 Average mode share (PT): 24%

Table 13: Clustering of European cities based on analysis of the SUMPs-UP data

5.3 Proposed SUMP-PLUS City Typology

5.3.1 Justification for each component of the typology

INDICATOR / CATEGORY	DESCRIPTION AND RATIONALE
	To meet future urban mobility challenges, cities will benefit from sharing experiences and drawing on lessons learnt from the pathways that more mature cities have followed. The SUMP-PLUS city typology captures the different context of cities, based on demographic, geographic and socio-economic data, and enables comparison and progress tracking against other European cities in their adoption of mobility measures. This typology helps cities to benchmark their progress against comparable European cities and, thus, to facilitate the follower cities' involvement in the replication process.

In order to fully reflect the complex nature of the functioning of European cities, indicators, grouped into levels and categories, need to be incorporated into this new city typology, to allow for clear identification of each city's readiness level and opportunities for developing mobility transition pathways. Each European city is unique in many ways, but groups of them share certain characteristics that enable fruitful comparisons and sharing of experiences. Drawing on a comprehensive international literature review and a further analysis of the SUMPs-UP European city survey data, the following two-level city typology has been developed, based on quantitative indicators, supplemented by a set of largely descriptive categories. These two levels describe a hierarchical approach: population size and region of Europe that provide a high-level framing of identifiable urban characteristics, within which GDP, density and car mode share locate cities more precisely – and the categories described below, even more so.

Level 1 indicators: City population size and location within regions of Europe.
The population size of a city is a crucial differentiator in the European cityscape. Whether small, medium or large, cities within each cluster tend to face a similar scale of problems and types of solutions that might be appropriate.
Differentiating cities by regions incorporates the dimension of mobility cultures and lifestyles, capturing broad mobility behaviours and attitudes towards certain policy interventions and trends, as well as reflecting their stage of economic development.

Level 2 indicators: population density, GDP (PPP) per capita and car modal share and historical trend.
Denser cities afford their citizens better local access to jobs, goods and services, on foot and by bicycle, and are more likely to support high-frequency public transport services, competitive with the private car; leading to less delays for most journeys and fewer carbon emissions. GDP per capita (purchasing power parity adjusted) represents the level of municipal resources available to provide for the basic and complex needs of its citizens, including mobility needs.

Car modal share, and whether this is increasing or declining, provides a good indication of a city's situation on the path to promoting sustainable urban mobility.

The **Categories** add a further level of qualitative variables that characterise cites in terms of their main economic functions, sub-regional spatial context, their mobility-related policy priorities, degree of local government autonomy and degree of planning capacity. This helps to fine-tune the likely transferability of experiences between one city and another, in relation to Transition Pathways, Cross-sectoral Links, and New Solutions & Business Models.

	LEVEL 1
CITY SIZE (POPULATION)	Population size is an important, first-order indicator when comparing cities across Europe. It serves as a proxy for the scale of mobility demands and movement patterns, range/scale of land use provision, the intensity of mobility-related problems to be addressed and the scale and types of mobility solutions that might be appropriate.
REGION OF EUROPE	The region of Europe is the second level-one indicator that broadly reflects different mobility cultures across Europe. "Mobility cultures" are defined as "specific socio-cultural settings consisting of travel patterns, the built environment and mobility related discourses, i.e. they are defined by both the material and the socially-constructed dimension of the transport system." (Haustein & Nielsen, 2016). Issues like social attitudes toward public transportation and cycling, or the social stats tied to car ownership, represent potential barriers that could be acutely challenging for transportation planners. This indicator also reflects the skills and technical capacity in a city, and historical legacies such as level of economic development, timing of the onset of mass motorisation and the introduction of a sustainable urban mobility policy paradigm.

	LEVEL 2
POPULATION DENSITY	The indicator describes the number of inhabitants per km^2 of municipal land area. It correlates with the intensity of land use provision; and with the practical and financial feasibility of providing good walking/cycling and public transport facilities. Higher population density is associated with improved accessibility to local jobs, goods and services and more strategic access to high-quality public transport services. It can also affect traffic congestion and the level of urban greenhouse gas emissions.
GDP / CAPITA **(Adjusted regional GDP/capita)**	This measures GDP per inhabitant at a regional level (NUTS2 or NUTS3), adjusted for purchasing power. (For example, Purchasing Power Standard, derived from Eurostat table [nama_10r_3gdp]). It represents the income level and purchasing power of the local population and is a proxy for municipal government resources. The indicator enables the users of this typology to compare the economic and financial power of cities. According to the World Bank, more than 80% of global GDP is generated in cities, with urban

	transportation being the lifeblood that makes them function, allowing people and goods to move around in ways that create economic value (Fielden, 2019).
MODE SHARE: PERCENTAGE OF RESIDENT TRIPS BY CAR, AND HISTORIAL TREND	Car modal share provides a simple measure of the extent to which a city's mobilty is built around sustainable modes of transport, with the mix of car and non-car mode shares varying greatly from one city to another. It is likely to correlate with traffic congestion, air quality and CO2 emissions; and provides an indication of the scale of change that would be required to achieve a high sustainable transport modal share. It is also important to know the trend in car modal share: a low value could both reflect a city where car ownership is low, but growing rapidly, and a city where car ownership and use are in decline. The kinds of policy interventions required would be very different in these two cases.

	CATEGORY
FUNCTION(S) OF THE CITY	This describes the primary economic sector(s) and user groups within the city, such as tourism, agriculture, industry. A city might be defined by two or more such functions. These functions will affect travel patterns in the city and the main mobility demands that need to be met (e.g. volume of freight flows). They may also provide an indication of any constraints that will affect measure implementation (e.g. narrow streets in historic towns).
SPATIAL CONTEXT	Describing the location of the city in relation to its wider Functional Urban area (FUA), this metric captures the sub-regional role of a city and its proximity to other larger or smaller cities, that affect the size of the commuting zone beyond the city. Depending on the local context, the FUA might be a city and its surrounding peri-urban area, an entire polycentric region, or another constellation of municipalities. It is important to take this wider context fully into account when developing an SUMP. The indicator is based on "population density to identify urban cores, and on travel-to-work flows to identify the hinterlands whose labour market is highly integrated with the cores". Being composed of a city and its commuting zone, FUAs encompass the economic and functional extent of cities based on daily people's movements.
CREATE STAGES	Political and public acceptability for different kinds of policies was captured in the CREATE H2020 project three-stage characterisation. Cities could find themselves predominantly operating in one of three different stages: • Stage 1 - planning for motor vehicles (building roads and investing in parking) • Stage 2 - planning for person mobility (investing and improving cycling and public transport service) • Stage 3 - planning for liveability and public places (promoting healthy street life, reducing car presence, building places for people)

LOCAL AUTONOMY	Grouped into three categories, this indicator draws on a standardised score representing the degree of local government autonomy, at country level in the Local Autonomy Index (Ladner et al. 2015).The Index gives all EU member states a theoretical score from 0-37, although actual values range between 12-30 (see Appendix). The Index reflects the discretion that municipal decision-makers have with respect to policymaking as well as fiscal autonomy – in essence, a broad indicator of the power of a municipality relative to regional and national administrations. This captures the governance context in which different European cities attempt to transition towards sustainable mobility.
PLANNING CAPACITY	This describes the demonstrated capacity a city has for integrated sustainable transport planning, as indicated by adoption of SUMP or other strategic mobility vision and action plan. The indicator reflects how well equipped the city planning authorities and mobility practitioners are with regard to skills and knowledge that they need to develop and implement SUMPs.

Region / City population size	less than 50.000	between 50.000 and 500.000	more than 500.000
Northern and Western Europe	.....	.....	.....
	.....	.....	.....
	.....	.....	.....
Central and Eastern Europe	.....	.....	.....
	.....	.....	.....
	.....	.....	.....
Southern Europe	.....	.....	.....
	.....	.....	.....
	.....	.....	.....

Level 1 indicators:	Level 2 indicators:		
City population size	Population density	GDP (PPP) per capita	Car modal share and trend
Region of Europe			

Table 14: Level 1 and Level 2 indicators – table to be used by cities when filling in their typology

F	S	C	L	P
Function(s) of the city	Spatial Context	CREATE stages	Local Autonomy	Planning Capacity
Main economic sectors and user groups that define the city.	*Location of the city in relation to Functional Urban Area and interdependence of movement patterns*	*Political and public acceptability for different kinds of policies according to the CREATE H2020 project categorisation.*	*Local autonomy is a highly valued feature of good governance. It is the ability of local governments to have an independent impact on the well-being of their citizens.*	*Capacity for integrated sustainable transport planning, as indicated by adoption of SUMP or other strategic mobility vision and action plan.*
Administrative	**Free-standing urban core**	**Car-based**	**High:** score of 26-30 on Local Autonomy Index	**High - Fully integrated planning** - the administration has now experience with SUMP and it has been through at least one development and implementation process
Agricultural	**Polycentric**	**Sustainable mobility-based**	**Medium:** score of 21-25 on Local Autonomy Index	
Commercial	**Commuting zone**	**Place-based**	**Low:** score of 12-20 on Local Autonomy Index	**Medium - Some integration of measures** - The administration is not familiar yet with SUMP but wishes to learn or beginner, getting familiar with SUMP
Industrial	**Metropolitan area**			
Port				**Low - No strategic planning** - The administration is not familiar with mobility planning.
Touristic				

Table 15: Category as qualitative variables that cities have to choose when filling in their typology

Note: Local autonomy category within the SUMP-PLUS City Typology is based on the Local Autonomy Index developed by Ladner et al. (2015) for the European Commission. The Index gives all European countries a score from 0-37, depending on the degree of local government autonomy across a number of policy areas and fiscal powers.

The categories in the SUMP-PLUS typology only range for scores between 12-30. While 0-37 is the theoretical range of scores on the Local Autonomy Index, the 2014 scores assigned to European countries only range from 12 to just under 30. The three ranges were calculated by calculating percentiles of the total distribution of country scores, as is described in figure below.

Local Autonomy Index score (2014)	Percentile of Local Autonomy Index score (2014)	D1.1 Local Autonomy categories
12-20	33rd percentile	Low
21-25	66th percentile	Medium
26-30	99th percentile	High

Country	Local Autonomy Index (2014)	Local Autonomy Category
Albania	18,17	Low
Austria	25,17	Medium
Belgium	21,79	Medium
Bulgaria	23,5	Medium
Croatia	20,7	Medium
Cyprus	15,73	Low
Czech Republic	24,67	Medium
Denmark	27	High
Estonia	23	Medium
Finland	29,33	High
France	25,64	High
Georgia	14,33	Low
Germany	27,5	High
Greece	19	Low
Hungary	17,33	Low
Iceland	28	High
Ireland	12,67	Low
Italy	25,5	High
Latvia	20,33	Low
Liechtenstein	26,67	High
Lithuania	23,67	Medium
Luxembourg	22,17	Medium
Macedonia	20,67	Medium
Malta	17,67	Low
Moldova	12	Low
Netherlands	21,67	Medium
Norway	27	High
Poland	26,71	High
Portugal	24,33	Medium
Romania	20	Low
Serbia	25,21	Medium
Slovak Republic	22	Medium
Slovenia	17,34	Low
Spain	22,06	Medium
Sweden	28,67	High
Switzerland	29,76	High
Turkey	16,58	Low
Ukraine	16,61	Low
United Kingdom	17,38	Low

Table 16: Local Autonomy Index per MS country (Landner et al. 2015)

6 Locating SUMP-PLUS cities within the new typology

As per Task 1.1.3, the SUMPs-UP survey questionnaire was distributed among SUMP-PLUS city partners, who responded to all survey questions in March 2020. Drawing on survey responses and the additional variables discussed above, the SUMP-PLUS cities were classified in relation to the new SUMP-PLUS city typology, as displayed in Table X below.

Fig. X below visualises the differing context of the six SUMP-PLUS cities in terms of private vehicle mode share and GDP per capita. The trend line illustrates a trend towards reduced private vehicle modal shares in cities with higher GDP / capita.

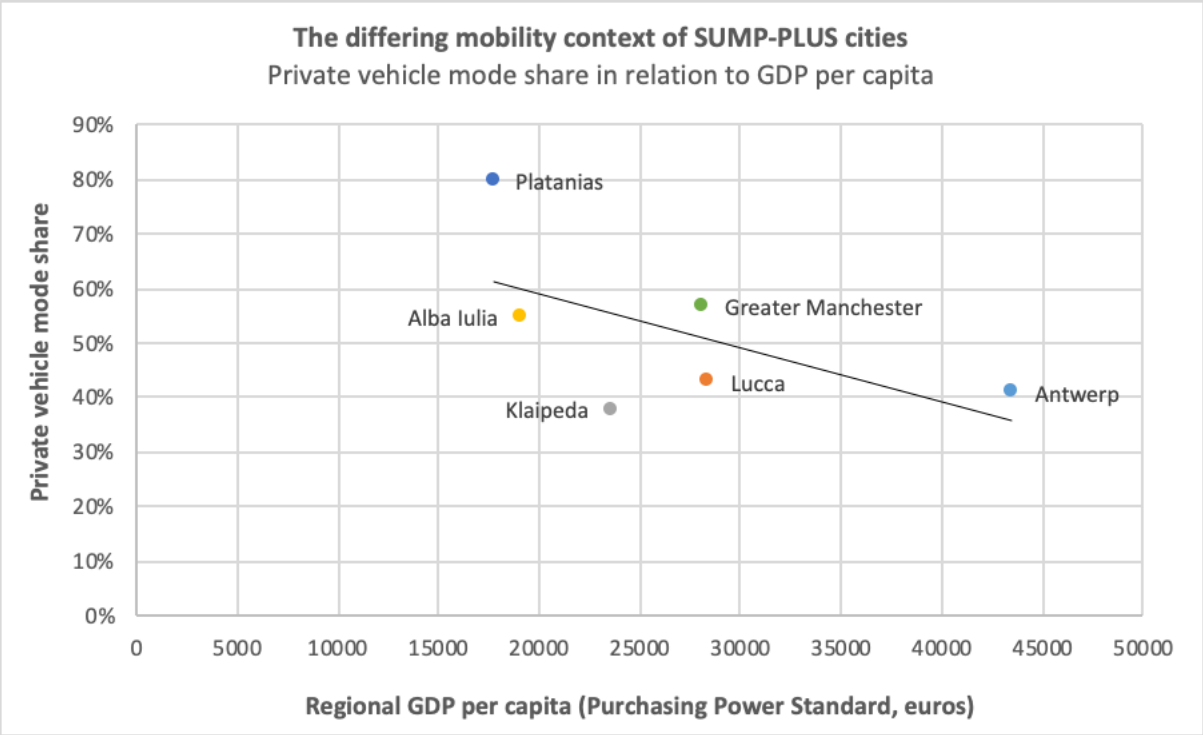


Figure 34: The different mobility context of SUMP-PLUS cities

		Very small municipalities (<50.000)	Small and mid-sized cities (50.000-500.000)	Large cities and city-regions (>500.000)
Southern Europe		PLATANIAS	LUCCA	-
		Population: 20.972 inhab. **Population density:** 42.6 inhab./km2	**Population:** 89.346 inhab. **Population density:** 480 inhab./km2	
		Adjusted regional GDP/capita: €14.676	**Adjusted regional GDP/capita:** €25.113	
		Mode share (private car): 70%, trend-increasing	**Mode share (private car): 64.7**%, trend-slowly decreasing	
	F	AGRICULTURAL / TOURISM	COMMERCIAL / TOURISM	
	S	SATELLITE / Commuting zone	POLYCENTRIC	
	C	CAR-BASED	CAR-BASED	
	L	LOW AUTONOMY	MEDIUM AUTONOMY	
	P	**LOW CAPACITY** Not yet familiar with sustainable urban transport planning. Does not have a SUMP, with the first plan currently under development.	**MEDIUM CAPACITY** Has applied sustainable mobility measures, but not systematically. Currently implementing the SUMP.	
Central and Eastern Europe			KLAIPEDA	-
			Population: 172.272 inhab. **Population density:** 1356 inhab./km2	
			Adjusted regional GDP/capita: €15.600	
			Mode share (private car): 34%, trend-decreasing	
	F		INDUSTRIAL / PORT	
	S		POLYCENTRIC	
	C		CAR-BASED	
	L		MEDIUM AUTONOMY	
	P		**MEDIUM CAPACITY** Has applied sustainable mobility measures, but not systematically. Currently implementing the SUMP.	
			ALBA IULIA	-
			Population: 74.885 inhab. **Population density:** 720 inhab./km2	
			Adjusted regional GDP/capita: €11.995 (county level)	
			Mode share (private car): 55%, trend-increasing	
	F		ADMINISTRATIVE / TOURISM	
	S		POLYCENTRIC	
	C		SUSTAINABLE MOBILITY	
	L		LOW AUTONOMY	
	P		**MEDIUM CAPACITY** Has applied sustainable mobility measures, but not systematically. Currently implementing the SUMP.	

Northern and Western Europe			ANTWERP
			Population: 523.248 inhab. **Population density:** 2595 inhab./km2
			Adjusted regional GDP/capita: €19.911
			Mode share (private car): 42.2%, trend-decreasing
	F		COMMERCIAL / PORT
	S		POLYCENTRIC
	C		SUSTAINABLE MOBILITY
	L		MEDIUM AUTONOMY
	P		**HIGH CAPACITY** Has experience with integrated sustainable urban transport planning. Currently implementing its 2nd or 3rd generation SUMP.
			GREATER MANCHESTER
			Population: 2.8812.569 inhab. **Population density:** 2031 inhab./km2
			Adjusted regional GDP/capita: €30.500
			Mode share (private car): 61%, trend-increasing
	F		COMMERCIAL / INDUSTRIAL
	S		POLYCENTRIC
	C		SUSTAINABLE MOBILITY
	L		**MEDIUM AUTONOMY** (Greater Manchester has unique autonomy agreements that extend beyond typical UK local government structures).
	P		**HIGH CAPACITY** Has experience with integrated sustainable urban transport planning, and is currently implementing the SUMP for the city-region.

***** 2017 figures derived from Eurostat table [nama_10r_3gdp]

******For Greater Manchester as a metropolitan region, the adjusted regional GDP/capita is at NUTS2 level.

***Local governments in the UK have a low degree of autonomy as classified in the Local Autonomy Index, however following recent devolution of powers to the Greater Manchester Combined Authority, the Greater Manchester area represents a (relatively unique) case of a somewhat higher degree of local autonomy within the UK.

Table 17: Classification of SUMP-PLUS cities within the city clusters

7 Appendices

7.1 Appendix A: SUMPs-Up survey questions

The SUMPs-UP survey included 14 questions, which are listed in Appendix A along with comments on why certain questions (not all) have been subject to further analysis by the SUMP-PLUS team.

Name: _

Email address: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Main occupation in a...

- ○ Transport planning or related department of the city
- ○ Other public authority on the local or regional level
- ○ Public transport operator or authority
- ○ Research institution or university
- ○ Non-governmental organisation
- ○ Consultancy
- ○ Other (please specify)

Name of the city for which you are completing this survey: _ _ _ _ _ _ _ _ _ _ _

Country your city is located in: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

City structure

In the first section we are interested in the size and geographical context, which majorly influences urban transport systems. Please provide us with some context information that helps us identify the challenges and needs of different types of cities.

1) What is the **population** of the city, for which you are completing this survey?

- ○ Less than 25,000
- ○ 25,000 to 50,000
- ○ 50,000 to 100,000
- ○ 100,000 to 250,000
- ○ 250,000 to 500,000
- ○ 500,000 to 1 million
- ○ More than 1 million

2) What is the **population trend** in your city?

Growing population ○ ○ ○ ○ ○ Shrinking population

3) Where is your city **located**?

Please select the option that best applies. If your city is in the catchment area of several cities select the largest of them.

- ○ In a rural area (not close to a town with more than 25.000 inhabitants)
- ○ Close to a city with 25,000 to 100,000 inhabitants
- ○ Close to a city with 100,000 to 500,000 inhabitants
- ○ Close to a city with more than 500,000 inhabitants
- ○ It is the largest city in the catchment area
- ○ Other (please specify) _____

4) What is your city's **modal split** according to the latest assessment?

*Please indicate the percentage **share of the total number of trips by city residents** (not the share of distance travelled in kilometres). It can be an informal assessment and the numbers do not have to be precise, approximations help as well.*

Private motor vehicle (car, motorcycle, scooter, etc.)	0 %
Public transport (bus, metro, train, etc.)	0 %
Bike	0 %
Walk	0 %
Total	0 %

Source of the modal split data

- ○ Traffic count, travel survey, data from the public transport operator, or similar
- ○ Your own assessment

Sustainable urban transport planning

*In the second section we are interested in the current state of transport planning. The first two questions aim at **Sustainable Urban Mobility Plans (SUMPs), which is a strategic planning instrument for local authorities that is used to foster the balanced development and integration of all transport modes while encouraging a shift towards more sustainable modes of transport**. You can answer the questions regardless whether your city has already developed a SUMP. In fact, information about the transport planning procedures in cities without such a plan is particularly important for us.*

5) Please select the statement that describes the **situation in your city** best. My city…

- ○ …is **not yet familiar** with sustainable urban transport planning.
- ○ …has **already applied** sustainable urban transport measures, **but not systematically**.
- ○ …has already conducted **integrated sustainable urban transport planning**.
- ○ Other

5a) Does the urban mobility plan (VEP / PDU / GKKP / LTP / …) of your city qualify as a Sustainable Urban Mobility Plan? *(Click here for a SUMP definition)*

- ○ Yes
- ○ No
- ○ Do not know

5b) Which of the following aspects does the urban mobility plan (VEP / PDU / GKKP / LTP / …) of your city fulfill?

Please select all options that apply.

- ☐ Long-term vision and clear implementation plan
- ☐ Participatory approach
- ☐ Balanced and integrated development of all transport modes
- ☐ Horizontal and vertical integration
- ☐ Assessment of current and future performance
- ☐ Regular monitoring, review and reporting
- ☐ Consideration of external costs for all transport modes
- ☐ None of them

5c) **Who developed** the most recent urban mobility plan of your city?

- ○ The city administration on their own
- ○ Parts of the SUMP have been done by consultant(s)
- ○ Consultant(s) have taken over all parts of the SUMP
- ○ Other

6) When it comes to sustainable urban mobility planning in your city, what is the **status** at the moment?

Please select the option that best applies.

- ○ No activities
- ○ Considering to develop our first SUMP
- ○ Developing our first SUMP
- ○ Finalised SUMP waiting to be adopted
- ○ SUMP is adopted but not implemented
- ○ Implementing the SUMP
- ○ Evaluation and revision of the previous SUMP
- ○ 2nd or 3rd generation SUMP is being prepared
- ○ Other (please specify)

7) Has your city plans or programmes for individual mobility policy areas?

For example a walking plan, bicycle plan, public transport plan or traffic safety programme.

- ○ Yes
- ○ No

8) What tools or methods does your city currently use in transport planning? Please write the **name or brand of three tools or methods** in the boxes below.

Tools can be guiding documents (handbooks, manuals, checklists), software (e.g. for calculation, modelling or simulation), standardised methods and planning approaches.

Needs for support

You made it to the last section. Good job and thank you for your valuable input so far! This might be the most important part, where we are interested in the support your city needs in urban transport planning.

9) A range of policy fields are relevant to sustainable urban mobility planning. For each of the following **mobility policy areas**, please select

- the box in the first column if you need support in selecting measures and/or
- the box in the second column if you need support in implementing measures or
- the box in the third column if you do not need support (neither in selecting nor implementing measures).

	We need support in selecting measures	We need support in implementing measures	Do not need support
Walking	☐	☐	☐
Cycling	☐	☐	☐
Public transport	☐	☐	☐
Urban road safety	☐	☐	☐
Road transport	☐	☐	☐
Car parking management	☐	☐	☐
Urban logistics	☐	☐	☐
Integration of different transport modes	☐	☐	☐
Mobility management for target groups with specific needs (e.g. children and youngsters, companies, tourists)	☐	☐	☐
Intelligent transportation systems	☐	☐	☐
Electric mobility and clean fuels	☐	☐	☐
Shared mobility	☐	☐	☐
Automation in car traffic and public transport	☐	☐	☐
Additional policy field(s) you need support on (please specify)	☐	☐	☐

10) Please provide an answer **for each of the planning steps** below, indicating your **preferred type of support** offered by CIVITAS SUMP projects (multiple answers possible).

Your input is valuable regardless if you have already developed a SUMP, plan to develop one or if you just want to plan parts of your transport system more sustainably.

	Workshops, peer-to-peer learning	E-learning, webinars	Software (models, simulators, calculators)	Handbooks, guidelines, manuals, checklists	Good practice examples	Do not need support
Project and resource management	☐	☐	☐	☐	☐	☐
Data acquisition and management	☐	☐	☐	☐	☐	☐
Status analyses and existing plans	☐	☐	☐	☐	☐	☐
Engagement of institutional stakeholders and citizens	☐	☐	☐	☐	☐	☐
Scenarios and measure selection	☐	☐	☐	☐	☐	☐
Financing, procurement and legal aspects of measure implementation	☐	☐	☐	☐	☐	☐
Monitoring and evaluation (of individual measures and the whole SUMP process)	☐	☐	☐	☐	☐	☐

11) The CIVITAS SUMP projects are European projects with English as their working language. Would you **participate in learning activities** that are **in English**?

- ○ I definitely would
- ○ I probably would
- ○ I probably would not
- ○ I definitely would not

12) What are the **drivers for developing a SUMP** in your city? Please provide an answer for each of the aspects below if you think it is an important reason for the decision makers to develop a SUMP, or if it is not important.

	Important driver	Not an important driver	Do not know
It is legally required to develop a SUMP	○	○	○
Improved access to funding	○	○	○
Political will	○	○	○
Seen as solution to address transport challenges	○	○	○
Other (Please specify)	○	○	○

13) What kind of **additional support from your national government** do you need for SUMP development?

Please select all options that apply.

- ☐ None
- ☐ Institutional framework (responsibilities and requirements for cooperation)
- ☐ Legal framework for mobility planning
- ☐ Legal framework for the integration of mobility and land use planning
- ☐ Networking and monitoring
- ☐ Guidance, expertise and training
- ☐ Financing SUMP development
- ☐ Financing SUMP measures
- ☐ Other (please specify)

14) If you would like to comment or add something to the answers of the survey, please enter them below. *(optional question)*

7.2 Appendix B: Distribution of survey responses across countries

Country	Number of city responses	Proportion of total sample
Spain	63	19 %
Greece	36	11 %
France	32	10 %
Romania	32	10 %
Poland	18	5 %
Italy	17	5 %
Germany	16	5 %
Sweden	13	4 %
Lithuania	12	4 %
Hungary	9	3 %
Portugal	9	3 %
Bulgaria	7	2 %
Slovenia	7	2 %
Austria	5	1 %
Croatia	5	1 %
Netherlands	5	1 %
Ireland	4	1 %
United Kingdom	4	1 %
Belgium	3	1 %
Cyprus	3	1 %
Czech Republic	3	1 %
Estonia	3	1 %
Denmark	2	1 %
Finland	2	1 %
Latvia	2	1 %
Slovakia	2	1 %
Malta	1	0 %
Other (non-member states)	**21**	6 %
Total cities (responses)	**336**	**100 %**

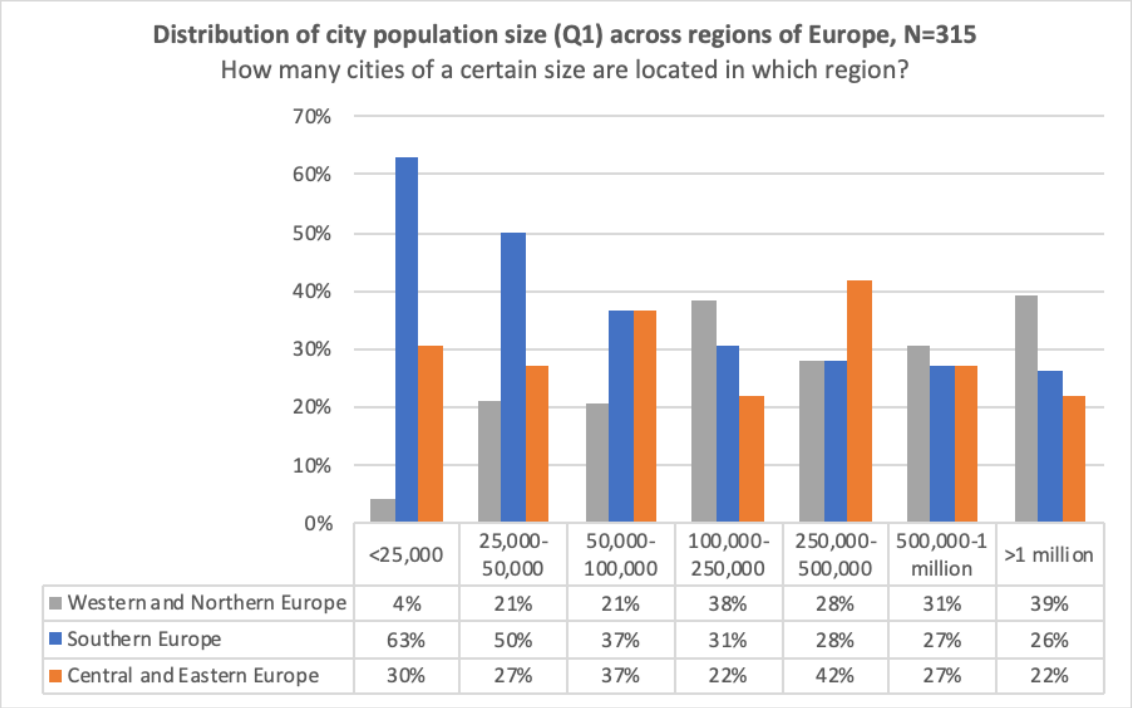
Table 18 Distribution of survey responses across countries

7.3 Appendix C: Classification of countries into regions of Europe

Country	Region
Cyprus	Southern Europe
Greece	Southern Europe
Italy	Southern Europe
Malta	Southern Europe
Portugal	Southern Europe
Spain	Southern Europe
Bulgaria	Central and Eastern Europe
Croatia	Central and Eastern Europe
Czech Republic	Central and Eastern Europe
Estonia	Central and Eastern Europe
Hungary	Central and Eastern Europe
Latvia	Central and Eastern Europe
Lithuania	Central and Eastern Europe
Poland	Central and Eastern Europe
Slovakia	Central and Eastern Europe
Slovenia	Central and Eastern Europe
Austria	Western and Northern Europe *technically also in Central Europe
Belgium	Western and Northern Europe
Denmark	Western and Northern Europe
Finland	Western and Northern Europe
France	Western and Northern Europe
Germany	Western and Northern Europe
Ireland	Western and Northern Europe
Netherlands	Western and Northern Europe
Sweden	Western and Northern Europe
United Kingdom	Western and Northern Europe

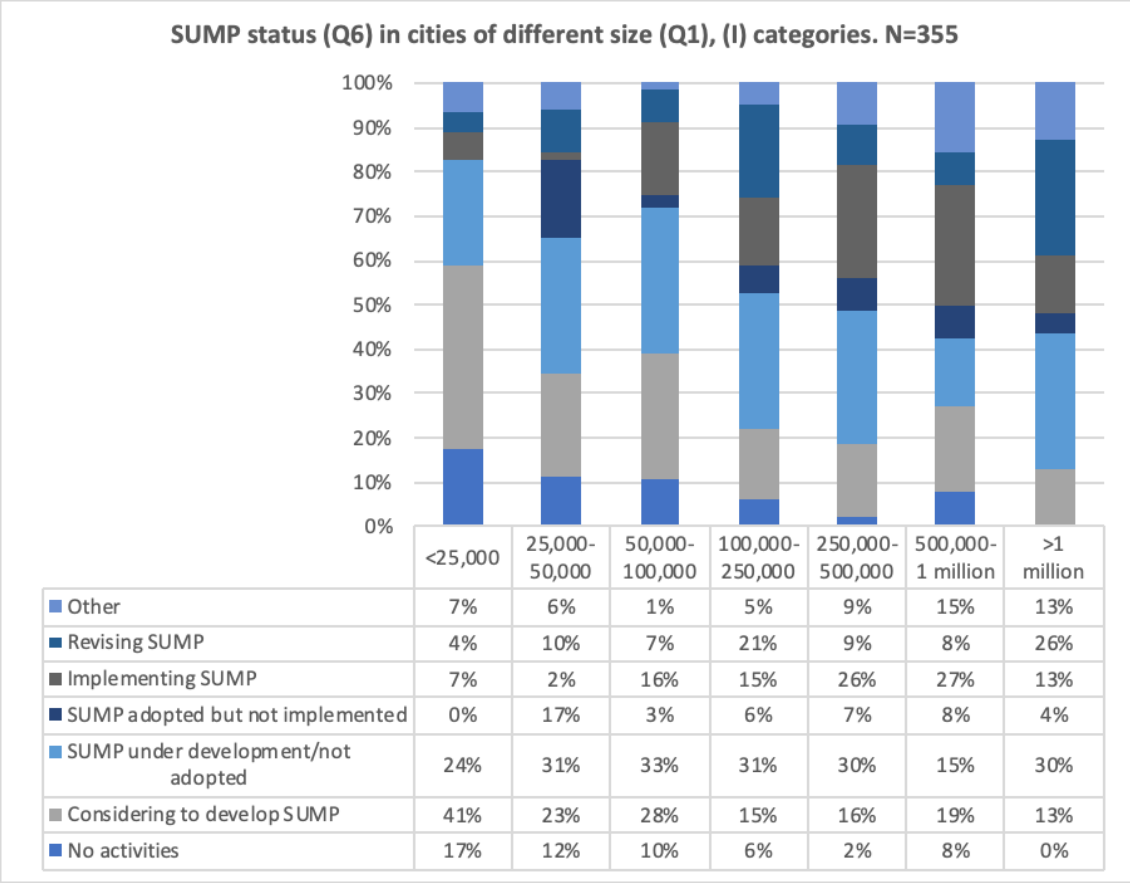
Table 19: **Classification of countries into regions of Europe**

7.4 Appendix D: SUMPs-UP survey questions



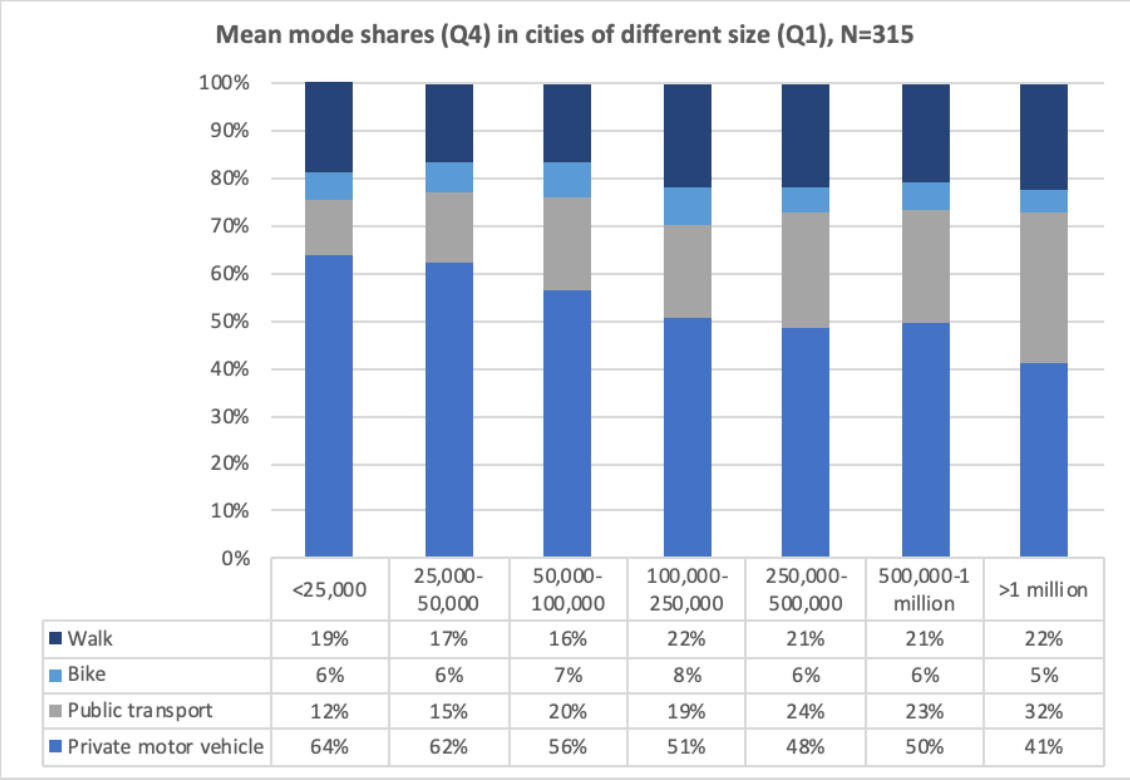
	<25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000-500,000	500,000-1 million	>1 million
Western and Northern Europe	4%	21%	21%	38%	28%	31%	39%
Southern Europe	63%	50%	37%	31%	28%	27%	26%
Central and Eastern Europe	30%	27%	37%	22%	42%	27%	22%

Figure 35: Distribution of city population size across regions of Europe



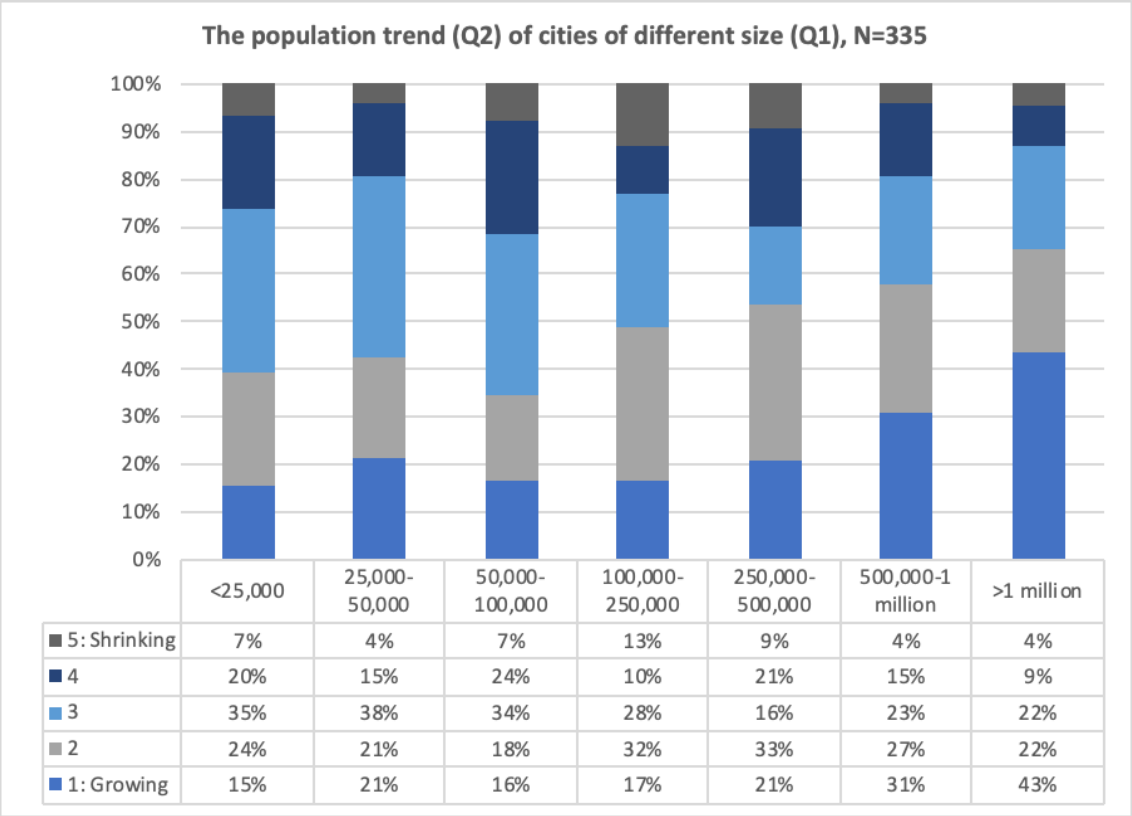
	<25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000-500,000	500,000-1 million	>1 million
Other	7%	6%	1%	5%	9%	15%	13%
Revising SUMP	4%	10%	7%	21%	9%	8%	26%
Implementing SUMP	7%	2%	16%	15%	26%	27%	13%
SUMP adopted but not implemented	0%	17%	3%	6%	7%	8%	4%
SUMP under development/not adopted	24%	31%	33%	31%	30%	15%	30%
Considering to develop SUMP	41%	23%	28%	15%	16%	19%	13%
No activities	17%	12%	10%	6%	2%	8%	0%

Figure 36: SUMP status in cities of different size



	<25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000-500,000	500,000-1 million	>1 million
Walk	19%	17%	16%	22%	21%	21%	22%
Bike	6%	6%	7%	8%	6%	6%	5%
Public transport	12%	15%	20%	19%	24%	23%	32%
Private motor vehicle	64%	62%	56%	51%	48%	50%	41%

Figure 37: Mean mode shares in cities of different size



	<25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000-500,000	500,000-1 million	>1 million
5: Shrinking	7%	4%	7%	13%	9%	4%	4%
4	20%	15%	24%	10%	21%	15%	9%
3	35%	38%	34%	28%	16%	23%	22%
2	24%	21%	18%	32%	33%	27%	22%
1: Growing	15%	21%	16%	17%	21%	31%	43%

Figure 38: The population trend of cities of different size

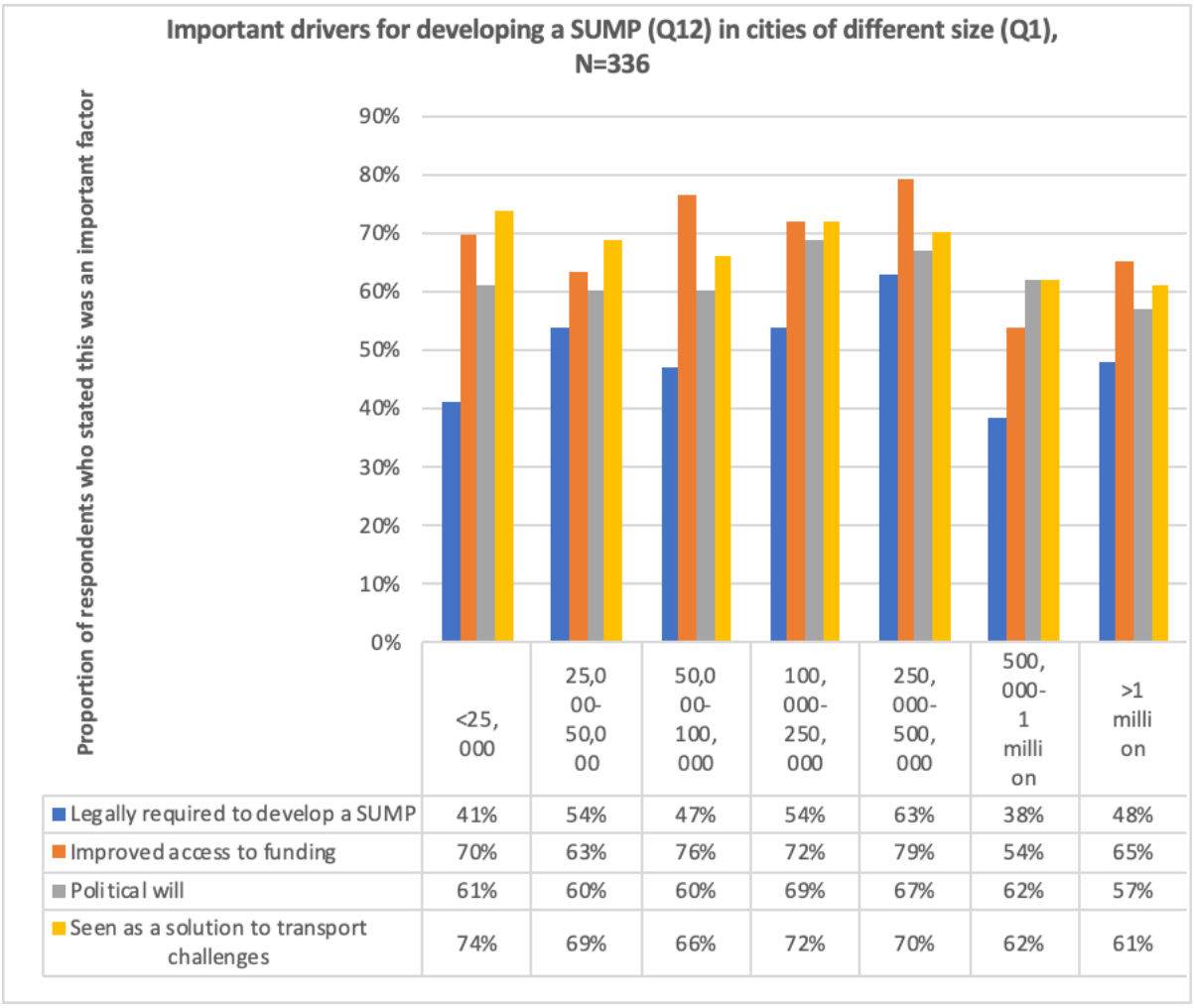
7.5 Appendix E: Cross-tabulations indicating no significant relationships

Drivers for SUMP development (Q12)

Q12 asked respondents: 'What are the drivers for developing a SUMP in your city?' and asked respondents to provide an answer for each of five factors:

1. It is legally required to develop a SUMP
2. Improved access to funding
3. Political will
4. Seen as solution to address transport challenges
5. Other

The response options for each factor were: Important Driver; Not an important driver; Do not know. A cross-tabulation between each Q12 factor/response with Q1 (population size) was undertaken, and then the proportion (%) of cities of different sizes (Q1 categories) who responded 'Important driver' for each factor summarised in a table. The Figure below was produced using these figures, with the y-axis representing the proportion of respondents within each Q1 category who responded that a certain factor was an 'Important driver'.



	<25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000-500,000	500,000-1 million	>1 million
Legally required to develop a SUMP	41%	54%	47%	54%	63%	38%	48%
Improved access to funding	70%	63%	76%	72%	79%	54%	65%
Political will	61%	60%	60%	69%	67%	62%	57%
Seen as a solution to transport challenges	74%	69%	66%	72%	70%	62%	61%

Figure 39: Important drivers for developing a SUMP in cities of different size

City population trend (Q2)

No significant trend revealed by the cross-tabulation of Q2 and Q4.

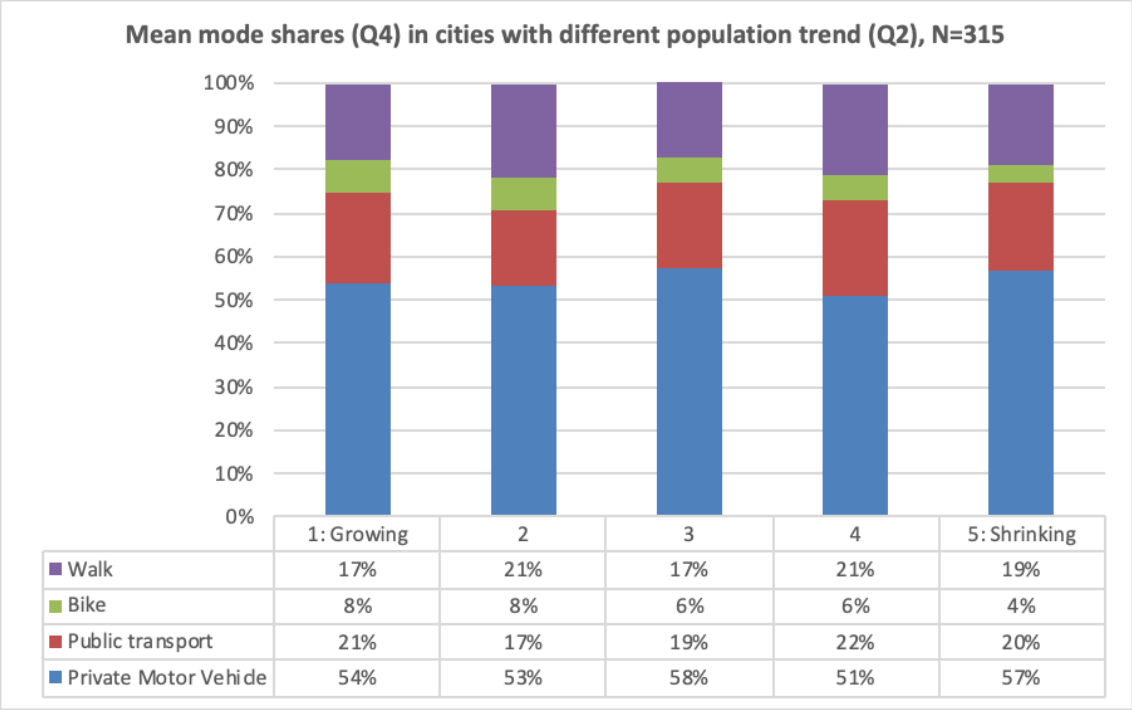


Figure 40: Mean mode share in cities with different population trend

A second cross-tabulation was undertaken for Southern Europe to check for an intra-regional trend, but this also revealed no significant relationship.

City location	1: Not familiar	2: Applied measures, but not systematically	3: Experienced with integrated planning	Other
In a rural area	44 %	33 %	0 %	22 %
Close to a city with 25,000-100,000 inhabitants	53 %	47 %	0 %	0 %
Close to city with 100,000-500,000 inhabitants	30 %	30 %	40 %	0 %
Close to city with >500,000 inhabitants	53 %	30 %	13 %	3 %
Largest city in catchment area	22 %	49 %	24 %	4 %
Other	50 %	30 %	10 %	0 %

Table 20: Variable common across several city typologie

7.6 Appendix F: Further information on identified typologies

NOTE: Relevant information copy-pasted from the respective sources

IOPScience: A novel global urban typology framework for sustainable mobility futures (link)		
Why was the typology developed?	**How was the typology decided? Why were these categories chosen?**	**How do the authors plan to use the typology?**
-Initiatives to classify cities and to better coordinate policies for mobility lack comprehensiveness and quantitative global analyses of city dynamics and their heterogeneity. This paper targets the gaps in research: To effectively address urban efficiency and environmental concerns, a mobility-oriented global urban typologization based on recent relevant data is required." "… Given the significant contribution of mobility to CO2 emissions and consequently climate change, effective pathways to sustainability must include sufficiently detailed transportation variables. Other important points: - Urban typologies can serve as a vehicle for understanding dynamics of cities, which exhibit high variability inform, economic output, mobility behaviour, among others. - A global analysis of city dynamics and their heterogeneity is especially critical in today's globalized transportation market, where solutions	- City sample: to 331 (spanning 124 countries and representing 40% of the global urban population). - Data collected consists of 64 indicators across seven urban dimensions: mobility, economy, environment, social development, urban form and geography. - Exploratory factor analyses was conducted to obtain latent urban attributes and consequently reduce dimensionality for further differentiation. - Nine urban factors were discovered: Metro Propensity, bus rapid transit (BRT) Propensity, Bikeshare Propensity, Development, Sustainability, Population, Congestion, Sprawl and Network Density. - Clustering methods were applied (Ward's method to cluster the cities based on the factor score dissimilarities), using the identified attributes, to obtain the typologies.	- Authors describe the usage of the typologies for detailed large-scale simulation in representative prototype cities for insights into sustainable future mobility policy pathways. -The typologies can directly impact policy through agent-based simulation of prototype cities. The authors plan to conduct simulations of alternative mobility scenarios beyond automated mobility-on demand and on an expanded set of prototype cities, in order to generate insights for optimal policy approaches that cities can adopt to effectively harness new vehicle technologies and mobility services for overall social and environmental benefits. - Application of the urban typologies to better understanding travel behaviour - Using a latent class choice modelling (LCCM) framework informed by the 9 urban factors discovered, the authors also plan to estimate a model to explain travel behaviour to further confirm

pioneered in one city are swiftly deployed in others with mixed outcomes. Consequently, results from academic efforts in understanding functional patterns in city dynamics can be harnessed to improve outcomes for sustainable urban mobility. - Very few studies have integrated and focused on the transportation dimension in large-scale urban classification.	-Results were validated by examining typology characteristics across the factors and key variables.	the validity of the typologies presented in this paper.

Classification from NOVELOG project - poly-parametric typology (link)

This paper explains how the typology was developed:

Developing a Multi-Dimensional Poly-Parametric Typology for City Logistics: Modelling and Planning Initiatives

Why was the typology developed?	**How was the typology decided? Why were these categories chosen?**	**How do the authors plan to use the typology?**
One of the major problems in selecting urban freight transport solutions for future implementation, is choosing – from many available options – those that meet the needs of a given city (via key urban freight stakeholder demand), that are compatible with the agreed stakeholder goals. Authors wanted to analyse and construct a city logistics typology as a methodological and theoretical tool for deductive work in the future, within the tradition of systems thinking and other research methods.	- Review of almost all European city logistics cases from the 1970s to the current day. Collected over 260 cases from 60+ projects involving 121 cities. - Reviewed urban freight typologies, based on land use, type of transport policies/measures, urban freight markets and traffic flows, city logistics problem/objectives, and other attributes, integrating cases with typologies, and validating our analysis through a panel of city logistics experts. -What is clearly missing, is a typology intended for use by the widest range of interested stakeholders.	The typology has multiple uses in analysing and selecting interventions. The authors propose the typology be five dimensional, with the dimensions sequenced in a logical flow for use by actors. With the 5 dimensions, the authors can construct a guidance tool for practitioners, to allow localised solutions derived from local problems within local societies, and informed by the body of knowledge built up over the last two decades. The dimensions are: • Why? What problems do we have, and what are our objectives?

The typology is used in the NOVELOG Toolkit, which enables the user to identify relevant measures and their impact based on the parameters.	Rather than losing the combined knowledge of previous research, the authors build upon the achievements of the past and utilise the parameters and their attributes to build a new, poly parametric city typology, containing the most appropriate parameters, and develop new ones previously missing. - Development of new multi-dimensional multi parametric typology (filling gaps with newly developed parameter standards; preliminary statistical analysis to see if indicative correlations can guide design) for city logistics.	• Where? What is the physical shape of the spatial area we are addressing in a city? • Who? In an approach that defines actors by the nature of the supply chains in which they operate, we aim to understand who is involved in this process and with whom. • What? Which measures shall we undertake? Will this be a mixture of hard and soft measures, or will soft measures be part of the next section? • How? Will this be a process of regulation, of voluntary co-operation?

Arthur D. Little: No.1 - Future of urban mobility (link)		
Why was the typology developed?	**How was the typology decided? Why were these categories chosen?**	**How do the authors plan to use the typology?**
The reform of urban mobility systems is one of the biggest challenges confronting policymakers, stakeholders and users today. Clustering of cities was carried out in order to propose different ways forward for cities at different stages of development. Using the typology, the authors highlighted what was holding different cities back, showcased best practice, and identified three strategic imperatives for cities and three clusters of future business models for	The study referred to 66 cities around the globe (50 largest and 16 Arthur D. Little focus cities – Amsterdam, Frankfurt, Prague, etc.). Cities were clustered based on their level of prosperity (GDP), modal split (share of individual motorised mobility), and population.	- The Arthur D. Little Urban Mobility Index aggregates the position of a city on 11 indicators. The authors scored each of the 66 cities on the Urban Mobility Index. Scoring results were used to identify common characteristics and factors explaining differences in performance for each of the six clusters. - Authors identified that there are three typical models of urban mobility – public, individual and emerging. Authors identified that each has specific challenges to solve and address, and each of the

mobility suppliers that will enable cities to meet the urban mobility challenge.		groups requires a different approach to make them fit for the future. - Arthur D. Little identified 39 key technologies and 36 potential urban mobility business models to meet today's urban mobility challenges. - Authors used the typology to identify three strategic imperatives for cities to implement to meet the urban mobility challenge, dependent on their location and maturity. Further, identified three long-term sustainable business models for the evolving urban mobility ecosystem. - Based on the study, the authors drew up four actions to which stakeholders should commit to devise effective and sustainable mobility solutions.

Arthur D. Little and UITP - Future of urban mobility 2.0 urban mobility index (link)		
Why was the typology developed?	**How was the typology decided? Why were these categories chosen?**	**How do the authors plan to use the typology?**
With this second edition of the Future of Urban Mobility study, the aim of the authors is to provide mobility decision-makers and stakeholders with reflections and guidance on devising sustainable strategies that are meeting current and future evolving mobility challenges. UITP, who was also a co-collaborator in the second edition, stated: We took the city ranking proposed by	- 19 indicators used to assess mobility maturing and performance of cities. (11 indicators related to how mature a city is in terms of existing infrastructure, from public transport's share of the modal split to smart card penetration. The other index points were awarded on the basis of performance, with categories including the level of transport-related CO2 emissions and the mean travel time to work.)	- Authors found that most cities are still badly equipped to cope with the challenges ahead. Using the typology, authors provided recommendations to overcome limitations. - Authors highlight what is holding cities back, and identify three strategic directions for cities to better shape the future of urban mobility. They further describe 25 imperatives for cities to consider when

Arthur D. Little as a starting point to perform and refine our analysis of today's mobility situation in view of tomorrow's requirements. Cities are clustered around their development stage and are given a series of strategic recommendations to overcome current limitations to achieve the objective of "networked mobility".	- Sample: 84 cities worldwide (comprising cities of the C40 Climate Leadership Group; 24 cities selected on the basis that they represent the largest metropolises determine by GDP share and population; and a group of smaller cities with good practices). - The mobility score per city ranges from 0 to 100 index points; 100 points being defined by the best performance of any city in the sample for each criteria.	defining sustainable urban mobility policies and case studies of cities demonstrating good practice. - Authors further identify and highlight three strategies for cities to implement to meet the urban mobility challenges, dependent on their maturity and the share of sustainable transport in their modal split; as well as four dimensions for cities to consider when defining sustainable urban mobility policies.

SUMPs-Up **Users' needs analysis on SUMP take-up (here)**		
Why was the typology developed?	**How was the typology decided? Why were these categories chosen?**	**How do the authors plan to use the typology?**
To illustrate cities' level of maturity and experience in sustainable urban mobility planning.	Two approaches used when defining the city types: 1) one based on a city's SUMP experience (Q5 of CIVITAS SUMPs-Up Needs Assessment Survey); and 2) the other based on the status of SUMP activities in a city (Q6 of SUMP Needs Assessment Survey) (results were weighted by country population). The SUMPs-Up Needs Assessment survey was online and contained 14 questions. Responses from 328 cities were referred to. Survey database was established in SPSS Statistics	- Correlations were carried out between city type and city characteristics (city population, population trend, city location, modal split), and between city type and the need of support in selecting measures; need of support in implementing measures; no need of support; and preferred type of support. Strong correlation identified between city type and city characteristics (i.e., experienced cities more likely to be large, have a growing population, and have lower share of motorised traffic). - The needs assessment produced insightful data that enabled the CIVITAS SUMP projects to calibrate

		the supporting tools and services they are producing to help cities accelerate the take-up of SUMPs. For example, the 5 classes of the SUMP Learning Programme (SUMPs-Up) were designed around the 3 city types.

Journal of Transport Geography: Dimensions of urban mobility cultures - a comparison of German Cities (link)		
Why was the typology developed?	**How was the typology decided? Why were these categories chosen?**	**How do the authors plan to use the typology?**
In the context of the immense economic and social challenges urban transport faces in the near future, the analysis of city-specific differences in supply and usage of urban transport systems is a promising approach for identifying potential strategies for establishing more sustainable transport systems and mobility patterns.	- Drawing on the sociotechnical concept of urban mobility cultures, authors collected a set of 23 indicators. The approach used by the authors is possibly the first to quantify subjective parameters, such as mobility-related evaluations and perceptions at a city-level, and combine them with rather common objective data, such as land use and socio-economic characteristics. - Data was applied to a sample of 44 German cities. - Following a factor and cluster analysis, six groups of cities were identified. (The 6 clusters were generated using the Ward method and subsequently the k-means procedure). - A high increase of the error sum of squares suggested a number of six to eight clusters (elbow-criterion). Decision was made to go with the six-	- The multi-faceted approach allows for the obtaining of a more complex picture of urban mobility and transport as well as to identify matches and mismatches between the different dimensions of mode orientation represented by the chosen indicator-set (infrastructure and service, travel behaviour, perceptions and evaluations). - Study is relevant for mobility-related research, planning practice, and policy formulation. For practitioners, it offers an opportunity to identify cities with a similar mobility culture to the one they are working for. Thus, it can be used as a benchmarking instrument. - Results might be used for an exchange of ideas and strategies how to face common challenges. With regard to mobility research, authors hope that the findings can inspire more in-depth case studies of

	cluster solution because it is clearly and plausibly structured.	particular cities or city groups, which are able to shed light on how specific mobility cultures emerge and change over time. Ideas for further research, suggested by authors: Test by further in-depth research the assumption that certain city types are characterised by urban mobility cultures which are less dependent on objective constraints and more influenced by policy and cultural preferences and therefore are easier to change.

OECD – EC report (link)		
Why was the typology developed?	**How was the typology decided? Why were these categories chosen?**	**How do the authors plan to use the typology?**
Until recently, there was no harmonised definition of 'a city' for European and other countries that are members of the OECD. This undermined the comparability, and thus also the credibility, of cross-country analysis of cities. To resolve this problem, the OECD and the European Commission developed a new definition of a city and its commuting zone in 2011.	- New definition of 'a city' but is purely based on population size and density. -The definition is based on the presence of an 'urban centre', a new spatial concept based on high-density population grid cells. - To ensure that the definition identified all relevant centres, the national statistical institute were consulted and minor adjustments were made where needed and consistent with this approach. - The six cities with an urban centre of around three million inhabitants however are novel: Athens, Berlin, Madrid, Barcelona, Naples and Milan, because in four out of these six cities the population of their	This definition allows for the first a comparison of the number of cities and the share of population in them on a harmonised basis across Europe.

	administrative city is so much smaller than the population of their urban centre. For Athens, Barcelona, Naples and Milan, a greater city level was created to better capture this centre (see below).	

McKinsey (link)		
Why was the typology developed?	**How was the typology decided? Why were these categories chosen?**	**How do the authors plan to use the typology?**
To help city leaders structure their thinking with regards to the transition to integrated mobility, the authors have created scenarios for how mobility might change in three types of cities. Background: The transition to integrated mobility will be complicated, even challenging at times. Some cities can get an early start, while others will need to work on developing the right conditions. No matter how ready a city is to move toward advanced mobility models, municipal officials can already begin developing a vision for what integrated mobility ought to look like and how their cities might evolve accordingly. More important, they can consider how to manage the transition so that its benefits are maximized in line with local priorities for improving residents' quality of life.	The three city types were defined by levels of economic development, household income, and population density.	Using the typology, the authors developed three scenarios, one for each city types, with the purpose to help officials and planners anticipate the future of mobility. By looking at today's conditions and modeling how mobility trends could play out in each scenario, it can be possible to offer city planners ideas about which trends might advance more quickly than others, and what the effects those trends could have on safety, traffic, and the environment. In addition to laying out visions for the future of mobility, the authors provide ideas about how municipal officials and other urban stakeholders can help their cities navigate toward positive outcomes.

7.7 Appendix G: Local Autonomy Index

The L: Local autonomy category within the SUMP-PLUS City Typology is based on the Local Autonomy Indexdeveloped by Ladner et al. (2015) for the European Commission. The Index gives all European countries a score from 0-37, depending on the degree of local government autonomy across a number of policy areas and fiscal powers.

The categories in the SUMP-PLUS typology only range for scores between 12-30. While 0-37 is the theoretical range of scores on the Local Autonomy Index, the 2014 scores assigned to European countries only range from 12 to just under 30. The three ranges were calculated by calculating percentiles of the total distribution of country scores, as is described in Figure F1 below.

Local Autonomy Index score (2014)	Percentile of Local Autonomy Index score (2014)	D1.1 Local Autonomy categories
12-20	33rd percentile	Low
21-25	66th percentile	Medium
26-30	99th percentile	High

Table 2121: The three classifications used for SUMP-PLUS city typology category L: local autonomy, based on three ranges of scores given to European countries (2014 figures) in the Local Autonomy Index (Ladner et al. 2015).

Using these three categories for Local Autonomy, each SUMP-PLUS city was classified based on its country score within the Local Autonomy Index, as displayed in Figure F2.

Country	SUMP-PLUS city	Local Autonomy Index (2014)	D1.1 Local Autonomy categories
Greece	Platanias	19,0	Low
Italy	Lucca	25,5	Medium
Lithuania	Klaipeda	23,7	Medium
Romania	Alba Iulia	20,0	Low
Belgium	Antwerp	21,8	Medium
United Kingdom	Greater Manchester	17,4	Low

Table22: Classification of SUMP-PLUS cities using the Local Autonomy categories