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Sprout

Sustainable Policy RespOnse to Urban mobility Transition

D2.1: Urban mobility transition inventory

Work package:	2 - Understanding transition in urban mobility
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SPROUT Project Profile

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Glossary of terms and abbreviations used

Abbreviation / Term	Description
CERTH	Centre for Research and Technology
GA	Grant agreement
KPI	Key performance indicator
MAMCA	Multi Actor Multi Criteria Analysis
MPP	Mobility Policy Package
NOVELOG	New Cooperative Business Models and Guidance for Sustainable City Logistics
PESTEL	Political, Economic, Social, Technological, Environmental, Legal
PPP	Purchasing Power Parity Public-Private Partnership
SPROUT	Sustainable policy response to urban mobility transition
SUMP	Sustainable Urban Mobility Plan
TD	Transition Driver
UVAR	Urban Vehicle Access Regulation
VUB	Vrije Universiteit Brussel
WBCSD	World Business Council for Sustainable Development
WP	Work Package
ZLC	Zaragoza Logistics Center

1 Executive Summary

The goal of SPROUT is to generate innovative policy responses to the challenges presented by the emergence of digitally-enabled business models, new mobility patterns and corresponding travel behaviour, pursuing a city-led approach. This deliverable is the result of task 2.1 of the project. It proposes an inventory of the factors that are used by each of the SPROUT cities as a common framework to collect and integrate data in order to construct a comprehensive overview of their respective current and future mobility status, and to understand as well as to anticipate the urban mobility transition. The inventory will be used by 1st and 2nd layer SPROUT cities to collect and structure the data that will form the core of deliverables resulting from task 2.2: 'Current state of mobility' and task 2.3 'Urban mobility transition drivers'.

The elements of the inventory are categorised as key performance indicators (KPIs) (table1.1), urban mobility transition drivers (table 1.2) and stakeholders (table 1.3). The selection of these elements is based on a review of a variety of sources, especially previous EU initiatives in the field of urban mobility and logistics, such as Mobility4EU, TRANSFORuM, MIND-SETS, NOVELOG and CITYLAB, but also the sustainable mobility indicators used by the Word Business Council on Sustainable Development and CIVITAS. Input from these initiatives has been adapted to the specificities of SPROUT using various EU and local policy documents as well as academic literature. Tables 1.1-1.3 summarise the selected KPIs, urban mobility transition drivers and stakeholders.

Table 1.1. Summary of KPIs

Summary of KPIs	
Urban population and economics	KPI01 - Residents' net average monthly income KPI02 - Price level of transport KPI03 - Vehicle ownership rate KPI04 - Mobility Net Public Finance
Urban land use and accessibility	KPI05 - Mobility space usage KPI06 - Distribution of land use types KPI07 - Commuting to work
Urban traffic and infrastructure	KPI08 - Proportion of road types KPI09 - Fatalities KPI10 - Urban mobility accidents KPI11 - Traffic volume of cars KPI12 - Traffic volume of freight vehicles

	KPI13 - Environmental impact of urban mobility
Urban passenger & active transport characteristics	KPI14 - Rate of parking spaces KPI15 - Modal split for passenger trips within the city KPI16 - Modal split for trips for commuting to the city KPI17 - Availability of bike-sharing KPI18 - Availability of e-scooter sharing KPI19 - Availability of car sharing KPI20 - Availability of real-time travel information KPI21 - Availability of smart payment and booking methods on local public transport
Urban logistics	KPI22 - Commercial establishments KPI23 - Delivery vehicle parking KPI24 - Freight trips KPI25 - Goods delivery frequency KPI26 - Goods delivery volumes KPI27 - Urban logistics innovation

Table 1.2. Summary of urban mobility transition drivers

Summary of urban mobility transition drivers	
Political	P1: Liberalisation P2: Political agenda P3: Transparency and corruption P4: Tax policy P5: Participation of citizens & economic actors
Economic	Ec1: New employment arrangements as a result of the sharing economy Ec2: Tourism Ec3: New business models Ec4: Economic growth and crisis Ec5: Transformation of retail
Social	S1: Migration S2: Urban structure S3: Demographic composition S4: Health consciousness S5: Changing behaviour towards car ownership

	S6: Environmental consciousness S7: Safety concerns S8: Security concerns S9: Individualisation S10: The requirement for on-demand delivery
Technological	T1: Electrification of mobility T2: Adoption of smart-city technology T3: Citizen & consumer-oriented digitalisation T4: Automation
Environmental	En1: Climate change En2: Local environmental quality
Legal	L1: Labour and employment laws L2: Consumer protection laws L3: Data and privacy laws L4: Health and safety laws

Table 1.3. Summary of stakeholder types in urban mobility and logistics

Summary of stakeholder types in urban mobility and logistics	
• Public administrations • Public Services • Conventional public transport operators • 'New mobility' providers • Data/Tech companies	• Energy providers • Urban Logistics • Vehicle manufacturers (locally relevant) • Users • Residents • Local businesses

2 Introduction

2.1 Project introduction and aims

The goal of SPROUT is to provide new city-led innovative and data-driven policy responses to face the challenges generated by emerging mobility patterns, digitally-enabled operating and business models and the changing needs of travellers. The need for these responses emanates from the inadequacy to address the current changes in the urban mobility landscape with conventional policy measures such as access restrictions, congestion charge or the provision of infrastructure. Besides, the project follows the principle that policy measures should not only take the present situation into account but also the expected future.

SPROUT therefore starts by creating an understanding of the current transitions in urban mobility and its impacts with regard to sustainability and governance. These understandings form the basis for city-led innovative policy responses, making use of the cities' capacity to find data-driven innovative urban mobility solutions. Within the framework of SPROUT, six cities function as pilots, addressing challenges in both passenger and freight mobility, in a range of different contexts in both urban and suburban environments.

Special attention is paid to issues that relate to vulnerable groups, taking into account the needs of users with different cultural backgrounds and different genders. SPROUT ensures the active participation of numerous representatives from authorities of small and medium-sized cities through a three-layer engagement structure and through the creation of an *Open Innovation Community* on urban mobility policy.

2.2 Aim of this deliverable

The first phase of the SPROUT project is dedicated to constructing a general overview of the cities' current status with regard to urban mobility and logistics. The goal of this deliverable therefore is to present an 'urban mobility transition inventory'; a framework for the collection and integration of data by the cities involved in the project, presenting a comprehensive overview rather than an in-depth discussion. The framework is presented here in the form of a catalogue containing the following elements:

- Key Performance Indicators (KPIs) for defining the current and future state of urban mobility
- Drivers that influence the transition from the current to the future
- Urban mobility policies so far employed to harness the transition
- Urban mobility stakeholders affecting or affected by the transition

2.3 How this deliverable relates to other deliverables

This deliverable is the first deliverable of the SPROUT project, presenting the results of task 2.1 'Understanding transition in urban mobility'. The catalogue presented in this deliverable is to be used by the SPROUT cities to collect and structure the data that will form the core of deliverables resulting from task 2.2: 'Current state of urban mobility' and task 2.3 'Urban mobility transition drivers'. In a later phase, the identified stakeholders will participate in further city-specific tasks including the co-creation of scenarios (T3.1), the stakeholder-based assessment of the prioritisation of alternative policy responses (T4.4), the validation of pilots (T5.1) and in building the cities' policy making capacity (T6.4).

3 Structure and Methods

3.1 How this deliverable differs from and complements similar previous projects

The input for this deliverable partly originates from previous EU initiatives in the field of mobility and logistics, such as the CIVITAS sustainable mobility indicators (CIVITAS CAPITAL Advisory Group 5 Data and Statistics, 2016), the Mobility4EU (L'Hostis et al., 2016), TRANSFORuM (Anderton, Åkerman, et al., 2015; Anderton, Brand, et al., 2015), MIND-SETS (Pickup, Laurie, 2017) NOVELOG (Ayfantopoulo,& Lozzi, 2018) and CITYLAB (Dablanc et al., 2016) projects. The added value of the presented catalogue lies in the integration of the data gathered in these projects and the critical reflection and adaptation of the information by the different project partners, but also in the reframing of these factors in the light of the transition in urban mobility that SPROUT strives to aid understanding and harnessing.

3.2 Structure of this deliverable

After this introduction, which includes notes on the main sources used, the conceptualisation of terms and methodology, this deliverable presents chapters that each deal with a specific part of the catalogue, i.e. the urban mobility KPIs, urban mobility transition drivers, including their potential impact on mobility and urban policies employed so far to harness transition, and finally a section identifying stakeholders in urban mobility.

3.3 Conceptualisation of terms

3.3.1 Urban mobility transition

Changing user requirements, emerging technological solutions and new transport services (including business models) lead to a change of the urban mobility environment towards a new state characterised by significantly enhanced environmental sustainability, social responsibility and efficiency. This transition is being led by a number of drivers and is evidenced by their respective trends.

A transition is a process of structural change in the way the urban mobility system is organised. A transition towards sustainability is characterized by significantly enhanced environmental sustainability, social responsibility and efficiency. Transitions are based on the interplay of factors such as infrastructures, technologies, business models, travel behaviour, or planning approaches. They are enabled through external drivers, which can act as push and pull factors. Pull factors, such as the emergence of new technologies, facilitate transitions, while push factors such as the climate crisis or urbanisation exert pressure to adapt the existing mobility system.

3.3.2 Key performance indicators

Key performance indicators (KPIs) are the critical indicators of progress toward an intended result. KPIs provide a focus for strategic and operational improvement, create an analytical basis for decision making and help focus attention on what matters most.

3.3.3 Drivers

Drivers are factors with the strength to impact the future development of the urban mobility system, e.g. demographic composition, urban structure, digitalization etc.

3.3.4 Trends

Trends are the direction of the driver (e.g. “population is ageing”; “population is decreasing”; “online shopping is becoming more widespread”). The direction of the trend may differ substantially from city to city.

3.3.5 Stakeholders

Stakeholders are organisations or persons that cause or that are affected by the transition of urban mobility. They can be public or private. They can be individual organizations (e.g. a transport operator) or umbrella organizations (e.g. civil association of cyclists or the automobile association).

3.4 Methods

Different methods have been used to compile the respective lists of KPIs, drivers and stakeholders.

3.4.1 KPIs

The goal of the key performance indicators is to provide cities with methods for gathering data and quantifying every indicator. This catalogue of KPIs, as well as the guidance for compiling input data, calculating the parameters, scaling the values and presenting the information, is based on the WBCSD Sustainable Mobility Project 2.0 (from now on referred to as SMP2.0) (WBCSD, 2015)and the CIVITAS Indicator framework (CIVITAS CAPITAL Advisory Group 5 Data and Statistics, 2016). We have also added indicators that are not included in these sources but reflect recent developments and transitions in urban mobility (such as the proliferation of e-scooters or free-floating car sharing). Also, in the preparatory phase of the project, cities were asked to confirm the availability of data from a preliminary list (see table 3.1 and annex A). Our aim was to provide a list of KPIs that are available in most of the SPROUT cities without additional need for data collection (e.g. new surveys), easy to calculate or provide and comparable across the diverse SPROUT cities. This approach enables SPROUT cities to provide these KPIs for their respective cities in Task 2.2.

Table 3.1. Current data availability in the sprout cities

	Va	Bu	Pa	Ka	Ta	Ni	Io	Me	Ar	He	If	Al	Wm	Go	Mi
Urban population & economy	●	●	•	•	●	●	●	●	●	●	●	●	●	●	●
Urban land use & accessibility	●	•	●	●	●	●	●	●	●	●	●	●	●	●	●
Urban traffic	●	●	•	•	•	●	●	•	●	●	●	●	●	●	●
Urban passenger & active transport	●	●	•	•	●	●	●	●	●	●	●	●	●	●	●
Urban freight transport		•	●	•	•	•	•	•	•	●	●	●	•	●	•

Va:Valencia; Bu:Budapest; Pa:Padua; Ka:Kalisz; Ta:Tel Aviv; Ni:Ningbo; Io:Ioannina; Me:Mechelen; Ar:Arad; He:Hertogenbosch; If:Ile-de-France; Al-Almada; Wm-West Midlands; Go-Gothenburg; Mi:Minneapolis

● high; ● moderate; ● low; • very low

The KPIs cover the following fields of sustainability: urban population and economics, urban land use and accessibility, urban traffic and infrastructure, urban passenger and active transport characteristics, as well as urban logistics.

3.4.2 **Drivers**

The urban mobility transition drivers have been identified following the PESTEL approach (Social, Technological, Economic, Environmental, Political) to trend analysis. This is a framework used to analyse and monitor the macro-environmental factors that may have a profound impact on an organisation or other entity. It includes both demand- (e.g. customer requirements) and supply-oriented (e.g. mobility innovations) drivers. For the selection and description of the drivers and their potential impacts on mobility, earlier EU projects such as Mobility4EU, TRANSFORuM NOVELOG and CITYLAB have been reviewed, complemented by various academic and policy documents. The main selection criterion was relevance to urban mobility transition in the European context. The resulting catalogue of drivers will be used by SPROUT cities in Task 2.3 to identify city-specific drivers.

3.4.3 **Stakeholders**

In the SPROUT project, the identification of stakeholders is based on the central question: 'who affects or is affected by the urban mobility transition?'. The final selection is largely based on previous projects carried out by the partners, notably Mobility4EU and CITYLAB. The resulting generic list is used by the cities in Task 2.3 to identify city-specific stakeholders. Special attention is requested for the inclusion of vulnerable groups, but also for the inclusion of stakeholders that either emerge for the first time (e.g. operators of free-floating mobility

services, start-ups etc.) or stakeholders assuming different roles from their traditional ones (e.g. public transport operators participating in sharing platforms).

4 Catalogue of Key Performance Indicators

The catalogue below lists the names, descriptions, formulae for calculation and units of measurement for each of the key performance indicators, which are used to collect data from each of the 1st and 2nd layer SPROUT cities.

4.1 Urban population and economics

Table 4.1. Urban population and economics: Residents' net average monthly income

KPI01 - Residents' net average monthly income	
KPI name	Residents' net average monthly income
KPI description	This KPI is used to calculate the affordability of transport based on the next indicator (price level of transport)
Formula to calculate KPI:	Average net monthly income requires the deduction of income taxes and employees' social security contributions from the gross amounts and the addition of family allowances. It is demanded the data is given in local currency, which is to be converted based on purchasing power parities (PPPs) after receiving the data from the cities. If data is only available at country or regional level it is indicated.
Unit	Value [local currency] per person and per month

Table 4.2. Urban population and economics: Price level of transport

KPI02 - Price level of transport	
KPI name	Cost of the use of transport
KPI description	This KPI indicates the cost of using public and private transport
Formula to calculate KPI:	The KPI consists of the following sub-indicators: 1. Price for one hour of parking in the city centre (most expensive zone) 2. Price for a single trip by public transport. In case distance-based fares or zones are used, the average travel distance in the city for a person is used (if this is not available assume trips of 10 km). In case time-based fares are used, a fare that is valid for maximum 1 hour is used. If different operators charge different fares (e.g. bus and metro), use the average of the operator's fares. 3. Price for a monthly public transport pass without any concessions valid for all local public transport (if available). If such

	an integrated pass is not available, the price for specific operators e.g. bus or metro only) is indicated. 4. Average local price of one litre 95-octane petrol ("Euro-super").
Unit	All prices in local currency 1: price/hour 2: price/ticket 3: price/month 4: price/litre

Table 4.3. Urban population and economics: Vehicle ownership rate.

KPI03 - Vehicle ownership rate	
KPI name	Vehicle ownership rate
KPI description	Vehicle ownership indicates the number of vehicle owners per 1000 inhabitants. 'Vehicles' refers to cars, bicycles (including electric bikes) and motorized two-wheelers (e.g. motorbikes). This KPI contains 4 separate sub-indicators: 1. *Car ownership*: cars refer to motor vehicles other than two-wheelers, intended for the carriage of passengers and designed to seat no more than nine people (including the driver) 2. *Bicycle ownership*: bicycles refer to electric and non-electric two-wheelers. 3. *Motorized two-wheeler ownership*: this vehicle refers to motorcycles, mopeds, or other motor-powered two- wheelers with a seat. 4. *E-scooter* is a motorised stand-up scooter using an electric motor as a form of micromobility.
Formula to calculate KPI:	1. *Car ownership* is the number of cars registered in the city divided by the number of inhabitants in the city and multiplied by 1000; 2. *Bicycle ownership* is the number of bicycles registered in the city (included electric bike) divided by the number of inhabitants and multiplied by 1000; 3. *Motorcycle ownership* is the number of motorcycles that are registered in city divided by the number of inhabitants and multiplied by 1000. 4. *E-scooter ownership* is the number of e-scooters owned by local residents in the city divided by the number of inhabitants

	and multiplied by 1000. (public shared e-scooters are not included)
Unit	Number of vehicles per 1000 inhabitants

Table 4.4. Urban population and economics: Mobility net public finance.

KPI04 - Mobility Net Public Finance	
KPI name	Mobility Net Public Finance.
KPI description	This KPI refers to the net balance of government and other public authority revenues and expenditures related to city transport. It reflects the affordability for governments to sustain the expenditures in the transport system. This indicator covers all modes of transport (road, rail, inland waterways, persons and freight) for which the city government is responsible. Maintenance costs are included as well.
Formula to calculate KPI:	City government annual revenues from transport related charges minus city government annual operation costs related to city transport [all in local currency] divided by the GDP of the city or region [in local currency]
Unit	%

4.2 Urban land use and accessibility

Table 4.5. Urban land use and accessibility: Mobility space usage.

KPI05 - Mobility space usage	
KPI name	Mobility space usage
KPI description	This KPI reflects the proportion of land use (square meters), taken by all the city transport modes (direct and indirect uses). 1. Direct uses: Fast transit roads, other roads, railways, inland ports and waterways. 2. Indirect uses: Open parking, private parking, service area and petrol station, storage and logistics centres, stations. It measures the efficiency of mobility space usage as the ratio of the area covered by all city transport modes (direct, indirect) to the total population of the city.
Formula to calculate KPI:	Total of direct land use for mobility applications plus the total of indirect land use for mobility applications divided by the number of inhabitants.
Unit	Km^2/ capita

Table 4.6. Urban land use and accessibility: Distribution of land use types.

KPI06 - Distribution of land use types	
KPI name	Distribution of land use types
KPI description	This KPI reflects the distribution of land among residential, commercial, industrial/business and recreational use. There is one sub-indicator for representing the percentage of space occupied for each type of activity. 1. *Residential land use*: Percentage of city land used for residential areas (houses and apartments). 2. *Industrial & business land use*: Percentage of city land used by industry and businesses (offices). 3. *Commercial land use*: Percentage of city land used by commerce (shops, supermarkets, services). 4. *Recreational land use*: Percentage of city land used for entertainment activities (sports fields, parks, swimming pools).
Formula to calculate KPI:	Space occupied by the specific activity [km^2] divided by the city area [km^2]
Unit	%

Table 4.7. Urban land use and accessibility: Commuting to work.

KPI07 - Commuting to work	
KPI name	Commuting to work
KPI description	This KPI is determined by the average travel distance for commuting and the average travel time for commuting to jobs. 1. *Average commute distance*: Average distance for traveling between one's home place and place of work on a regular basis. This is an average value for all residents living in the city irrespective of where they work (in or outside the city). 2. *Average commute time*: Average time for traveling between one's home place and place of work on a regular basis. This is an average value for all residents living in the city irrespective of where they work (in or outside the city).
Formula to calculate KPI:	1. Total distance of commuting trips by city residents divided by the number of commuters living in the city

	2. Total travel time of commuting trips by city residents divided by the number of commuters living in the city
Unit	1. [km], 2. [minutes]

4.3 Urban traffic and infrastructure

Table 4.8. Urban land use and accessibility: proportion of road types

KPI08 - Proportion of road types	
KPI name	Proportion of road types
KPI description	This KPI reflects the percentage of road dedicated to the specific modes of transport below. 1. *Extent of high-speed roads (speed limit is over 51km/h or over)*: percentage of urban road length dedicated to high-speed roads. 2. *Extent of slow roads (speed limit is 30km/h or below)*: percentage of urban road length dedicated to high-speed roads. 3. *Extent of bicycle lanes and paths*: percentage of the urban road length dedicated for bicycles. 4. *Extent of bus lanes*: percentage of urban road length dedicated to buses only (24hrs or during certain periods). Bus lanes where taxis and/or bicycles are included.
Formula to calculate KPI:	Length of the type of road/lane [in km] divided by the total length of urban roads
Unit	%

Table 4.9. Urban traffic and infrastructure: fatalities.

KPI09 - Fatalities	
KPI name	Fatalities
KPI description	Total number of fatalities per 100,000 capita. This KPI has adopted the Vienna Convention definition stated in 1968 as "*A human casualty who dies within the 30 days after the collision due to injuries received in the crash".*
Formula to calculate KPI	Total number of fatalities divided by the number of inhabitants and multiplied by 100,000
Unit	Number of fatalities per 100.000 capita per year

Table 4.10. Urban traffic and infrastructure: urban mobility accidents.

KPI10 - Urban mobility accidents	
KPI name	Urban mobility accidents
KPI description	The total number of accidents per 100,000 capita. We refer to an accident as an unfortunate incident that happens unexpectedly and unintentionally, typically resulting in damage or injury. This KPI splits into four sub-indicators (one per mode of transport): 1. *Car accidents,* the number of incidents with a private car involved per number of inhabitants. 2. *Public transport accidents,* the number of events with a public transport vehicle involved per number of inhabitants. 3. *Bicycle (including electric) accidents,* the number of incidents with a bicycle involved per number of inhabitants. 4. *E-scooter accidents, the* number of events with an e-scooter involved per number of inhabitants. One accident can appear more than once as every sub-indicator accounts for a specific mode of transport.
Formula to calculate KPI	Number of accidents of each mode of transport divided by the number of inhabitants and multiplied by 100,000
Unit	Number of accidents with the specific mode transport involved per 100.000 population per year

Table 4.11. Urban traffic and infrastructure: traffic volume of cars.

KPI11 - Traffic volume of cars	
KPI name	Traffic volume of cars
KPI description	This KPI refers to the average number of private cars entering the city on an average weekday. The value reflects the number of passenger cars that cross the city border towards the city during an average 24-hour period.
Formula to calculate KPI	Average number of vehicles entering the city on a daily basis
Unit	#/day

Table 4.12. Urban traffic and infrastructure: traffic volume of freight vehicles.

KPI12 - Traffic volume of freight vehicles	
KPI name	Traffic volume of freight vehicles

KPI description	This KPI refers to the average number of freight vehicles (trucks/vans) entering the city on an average weekday. The value reflects the number of freight vehicles that cross the city border towards the city during an average 24-hour period. Freight vehicles are classified by category: <3.5t and >3.5t.
Formula to calculate KPI	Average number of vehicles entering the city on a daily basis
Unit	#/day (by category)

Table 4.13. Urban traffic and infrastructure: environmental impact of urban mobility.

KPI13 - Environmental impact of urban mobility	
KPI name	Environmental impact of urban mobility
KPI description	This KPI is defined with three sub-indicators: Greenhouse gas (GHG) emissions per inhabitant, PM_{10} and NO_2 emissions. 1. *GHG per inhabitant* represents the kilograms of GHG emissions produced by transport per inhabitant. 2. *PM_{10}* represents the particulate matters below 10 micrometres of diameter produced by transport. 3. *NO_2* emissions produced by transport.
Formula to calculate KPI:	For the GHG emissions: GHG emissions divided by the number of inhabitants.
Unit	*GHG per inhabitant:* $kgCO_2e$/inhabitant, *PM_{10} and NO_2*: µg/m3 yearly average per measurement station and average of all urban roadside measurement stations

4.4 Urban passenger & active transport characteristics

Table 4.14. Urban passenger and active transport characteristics: Number of parking spaces rate.

KPI14 - Rate of parking spaces	
KPI name	Number of parking spaces
KPI description	This KPI reflects the number of parking spaces that are 24 hours open to the public for private cars compared to the number of households. This includes parking garages, off-street open-air designated public parking areas and on-street parking where it is allowed.
Formula to calculate KPI:	Number of 24h parking spaces for private cars divided by the number of households in the city.

Unit	Number parking places per household

Table 4.15. Urban passenger and active transport characteristics: Modal split for passenger within the city.

KPI15 - Modal split for passenger trips within the city	
KPI name	Modal split for passenger trips within the city
KPI description	It is the percentage share of each mode of transport in the total distance travelled by all passengers (passenger-kilometres) within the city boundaries for any purpose on an average weekday (commuting trips with a destination or origin outside the city boundaries are not included). There are 6 sub- indicators for each mode: 1. *Car as a driver*, percentage of passenger-kilometres by car as a driver. 2. *Car as a passenger*, percentage of passenger-kilometres by car as a passenger 3. *Public transport*, percentage of passenger-kilometres by local public transport i.e. tram, bus, metro, local train, ferry, etc. 4. *Cycling*, percentage of passenger-kilometres by bike (own or shared). *5. Walking,* percentage of passenger-kilometres as a pedestrian 6. *Other*, percentage of percentage of passenger-kilometres by any other mode (taxi, motorbike, etc.)
Formula to calculate KPI:	This is be derived from previous household surveys: A) Using the length of trips per mode between the origin and the destination B) Using the number of trips per mode
Unit	%

Table 4.16. Urban passenger and active transport characteristics: Modal split for trips for commuting to the city.

KPI16 - Modal split for trips for commuting to the city	
KPI name	Modal split for trips for commuting to the city
KPI description	It is the percentage share of each mode of transport in the total distance travelled by all passengers (passenger-kilometres) across the city boundaries into the city for any purpose on an average weekday (trips with an origin and destination within the city boundaries are not included). There are 6 sub- indicators for each mode: 1. *Car as a driver*, percentage of passenger-kilometres by car as a driver.

	2. *Car as a passenger*, percentage of passenger-kilometres by car as a passenger 3. *Public transport*, percentage of passenger-kilometres by local public transport i.e. tram, bus, metro, local train, ferry, etc. 4. *Cycling*, percentage of passenger-kilometres by bike (own or shared). *5. Walking,* percentage of passenger-kilometres as a pedestrian *Other*, percentage of passenger-kilometres by any other mode (taxi, motorbike, etc.)
Formula to calculate KPI:	This data can be derived from household surveys: A) Using the length of trips per mode between the origin and the destination B) Using the number of trips per mode
Unit	%

Table 4.17. Urban passenger and active transport characteristics: Bike sharing.

KPI17 - Availability of bike sharing	
KPI name	Bike sharing (*Bike sharing bikes per capita; number of bike sharing operators*)
KPI description	This KPI indicates the availability of shared bicycle schemes in the city. This KPI includes 4 sub-indicators: 1. Number of station-based shared bicycles per capita 2. Number of free-floating shared bicycles per capita 3. Number of station-based bike sharing operators in operation in the city 4. Number of free-floating bike-sharing operators in operation in the city Bike sharing covers any public or private schemes that are operated in the city, station-based and free-floating; manual and electric bicycles
Formula to calculate KPI:	1-2. number of shared bikes in operation divided by city population 3-4. provide total number of bikes sharing operators
Unit	1-2. % (Number of bicycles per capita) 3-4. # (Number of operators)

Table 4.18. Urban passenger and active transport characteristics: E-scooter sharing.

KPI18 - Availability of e-scooter sharing	
KPI name	E-scooter sharing (*Shared electric scooters per capita; shared e-scooter operators)*

KPI description	This KPI indicates the availability of shared electric scooter schemes (e.g. Lime, Dott etc.) in the city. This KPI includes 2 sub-indicators: 1. Number of e-scooters deployed in the city per capita 2. Number of e-scooter operators in operation in the city A shared e-scooter is a motorised stand-up scooter using an electric motor as a form of micromobility that can be rented through a mobile application. The shared e-scooter schemes cover any public or private schemes that are operated in the city
Formula to calculate KPI:	1. number of shared e-scooters in operation divided by city population 2. total number of shared e-scooter operators
Unit	1. % (Number of e-scooter per capita) 2. # (Number of operators)

Table 4.19. Urban passenger and active transport characteristics: Car sharing.

KPI19 - Availability of car sharing	
KPI name	Car sharing *(Shared cars per capita; car sharing operators)*
KPI description	This KPI indicates the availability of shared cars (e.g. ShareNow, Zipcar etc.) schemes in the city. This KPI includes 4 indicators: 1. Number of station-based shared cars deployed in the city per capita 2. Number of free-floating shared cars deployed in the city per capita 3. Number of station-based car sharing operators in operation in the city 4. Number of free-floating car-sharing operators in operation in the city Station-based car sharing covers any public or private schemes that are operated in the city providing cars that can be rented for shorter or longer periods with online booking, but they need to be returned to the same station where they are picked up. Free-floating car sharing covers any public or private schemes that are operated in the city providing cars that can be rented for shorter or longer periods with online booking and they can be returned to any free parking space within the business area of the operator.

Formula to calculate KPI:	1. number of station-based shared cars in operation divided by city population 2. number of free-floating shared cars in operation divided by city population 3. total number of station-based car sharing operators 4. total number of free-floating car sharing operators
Unit	1. %. 2. % 3. # 4. #

Table 4.20. Urban passenger and active transport characteristics: Availability of real time travel information.

KPI20 - Availability of real-time travel information	
KPI name	Availability of real-time travel information
KPI description	This KPI indicates the availability of real-time travel information about public transport (such as estimated arrival and departures times, delays, information about incidents). Local public transport covers buses, trams, metros, ferries, ships and local trains that primarily serve the city area (long-distance, regional and suburban services are not included).
Formula to calculate KPI:	Number of local public transport vehicles that are equipped to provide real-time data that is released to passengers through real-time displays at stops or through online applications divided by the total number of public transport vehicles operated in the city.
Unit	%

Table 4.21. Urban passenger and active transport characteristics: Availability of smart payment and booking methods on local public transport.

KPI21 - Availability of smart payment and booking methods on local public transport	
KPI name	Availability of smart payment and booking methods on local public transport
KPI description	The KPI indicates the percentage of passengers that use a smart method to pay for or validate local public transport tickets and season tickets.

	Smart methods are: - Contactless smartcards - Contactless credit or bank cards - Mobile ticketing Local public transport covers buses, trams, metros, ferries, ships and local trains that primarily serve the city area (long-distance, regional and suburban services are not included).
Formula to calculate KPI:	Number of trips making use of a contactless smartcard/credit card/mobile ticketing per year divided by the total number of trips by public transport in the city. If this data is not available: number of tickets and passes issued
Unit	%

4.5 Urban logistics

Table 4.22. Urban logistics: Commercial establishments

KPI22 – Commercial establishments	
KPI name	Commercial establishments
KPI description	Commercial establishments per category (shops, supermarkets, restaurants, other)
Formula to calculate KPI:	The KPI is calculated using existing statistics at the city level (most probably from the establishments' licensing database, or any relevant GIS land use database)
Unit	Number of commercial establishments per category

Table 4.23. Urban logistics: Delivery vehicle parking

KPI23 - Delivery vehicle parking	
KPI name	Delivery vehicle parking
KPI description	Designated delivery vehicle parking places in the city
Formula to calculate KPI:	The KPI is calculated using existing statistics at the city level. We consider that 1 parking place serves only 1 delivery vehicle. Therefore, if in the same location can be served at the same time 3 delivery vehicles, we count them as 3 parking places.
Unit	Number of delivery vehicle parking places

Table 4.24. Urban logistics: Freight trips

KPI24 - Freight trips	
KPI name	Freight trips
KPI description	Number of daily freight trips in the urban area
Formula to calculate KPI:	The KPI is calculated using either surveys of transport companies or by employing a local transport model. The outcome value can be in terms of: total number of trips for goods' delivery to the city in a typical day. In cases where the vehicle returns during the same day to its origin depot/warehouse and reloads for another delivery round, this is calculated as an additional trip.
Unit	Number of freight trips per day

Table 4.25. Urban logistics: Goods delivery frequency

KPI25 - Goods delivery frequency	
KPI name	Goods delivery frequency
KPI description	Average number of weekly deliveries to commercial/service establishments (e.g. shops, government buildings, large service building, etc.)
Formula to calculate KPI:	The KPI is calculated using surveys of goods recipients (establishment survey). The outcome value can be in terms of: average number of weekly deliveries to a typical city centre establishment.
Unit	Average number of weekly deliveries per commercial/service establishment

Table 4.26. Urban logistics: Goods delivery volumes

KPI26 - Goods delivery volumes	
KPI name	Goods delivery volumes
KPI description	Average volume per delivery to commercial establishments (e.g. shops, supermarkets, restaurants, other)
Formula to calculate KPI:	The KPI is calculated using surveys of goods recipients (establishment survey). The outcome value can be in terms of: average number of boxes (50x50x50 cm) per delivery, per establishment type

Unit	Number of boxes (50x50x50 cm) per type of commercial establishment

Table 4.27. Urban logistics innovation

KPI27 - Urban logistics innovation	
KPI name	Urban logistics innovation
KPI description	Existence of companies providing innovative urban logistics services. This KPI includes 5 indicators: 1. Number of available freight capacity sharing (cargo consolidation) apps for urban delivery in your city 2. Number of transportation companies providing combined urban passenger & cargo delivery services by using spare (public or private) passenger transport capacity in your city 3. Number of transportation companies providing green urban delivery services in your city (e.g. with cargo-bikes, bikes, electric vans, etc.) 4. Number of companies providing on-demand next-hour to same-day delivery services in your city (e.g. for delivering at home an order placed online to a store) 5. Number of companies providing or testing delivery services using autonomous/automated vehicles in your city
Formula to calculate KPI:	1. number of freight capacity sharing (cargo consolidation) apps for urban delivery 2. number of transportation companies providing combined urban passenger & cargo delivery services by using spare (public or private) passenger transport capacity 3. number of transportation companies providing green urban delivery services (e.g. with cargo-bikes, bikes, electric vans) 4. number of companies providing on-demand next-hour to same-day delivery services (e.g. for delivering at home an order placed online to a store) 5. number of companies providing or testing delivery services using autonomous/automated vehicles in your city
Unit	1. # 2. # 3. #

4. #
5. #

5 Catalogue of Urban Mobility Transition Drivers

This catalogue lists the drivers that are likely to influence the transition from the current to the future state in the SPROUT cities, including a general description, their estimated impact on mobility, linked trends, policies employed so far to harness transition and further references. Table 5.1 summarises the drivers following the PESTEL approach.

Table 5.1. Urban mobility transition drivers

Political	Economic	Social	Technologi-cal	Environmen-tal	Legal
P1: LIberalisation	Ec1: New employment arrangements as a result of the sharing economy	S1: Migration	T1: Electrification of mobility	En1: Climate change	L1: Labour and employment laws
P2: Political agenda	Ec2: Tourism	S2: Urban structure	T2: Adoption of smart-city technology	En2: Local environmental quality	L2: Consumer protection laws
P3: Transparency and corruption	Ec3: New business models	S3: Demographic composition	T3: Citizen & consumer-oriented digitalisation		L3: Data and privacy laws
P4: Tax policy	Ec4: Economic growth and crisis	S4: Health consciousness	T4: Automation		L4: Health and safety laws
P5: Particpation of citizens and economic actors	Ec5: Transfor-mation of retail	S5: Changing behaviour towards car ownership			
		S6: Environmental consciousness			
		S7: Safety Concerns			
		S8: Security Concerns			
		S9: Individuali-sation			
		S10: The requirement for on-demand delivery			

5.1 Political Drivers

Political factors refer to the degree of government impact in the economy and its consequences for transport and mobility, including tax policies, regulatory prices, political stability, and corruption. Political factors may also include goods and services that the government wants to provide and/or support as well as needs to be provided (i.e. foreign trade policy and trade restrictions).

P1: Liberalisation

Linked trends: privatisation, nationalisation

Source and further details: “Privatisation of Public Services: Impacts for Employment, Working Conditions, and Service Quality in Europe” (Hermann & Flecker, 2013).

General description:

The question to what extent public services are to be liberalized or privatized is a long-standing and ongoing and strongly ideological debate, but essential in the management and planning of transport. Liberalisation potentially touches all types of public transport on different scales, and even the management of road infrastructure, through tolls or road pricing. There are many different degrees and modalities for the implementation of liberalisation, such as PPPs, concessions and others.

Policies:

On a EU level, liberalisation of railway passenger transport has been given a strong push with the adoption of the Third and the Fourth railway packages (Bormans, 2017).

Impact on mobility:

- Likelihood of more customer-oriented services and products
- Possibility of higher efficiency and diminishing undesirable effects resulting from monopolies
- Likelihood of more competitive pricing of certain services
- Stronger incentives for innovation
- More difficult to implement sustainability goals
- More difficult to attain societal, non-profitable goals of transport (ensuring accessibility for socio-economically vulnerable groups, remote areas, or off-peak hour traffic)

P2: Political agenda

Linked trends: transport budget; mobility policy packages; awareness about environmental and inclusive issues

Source and further details: European Commission: “Europe on the move” (Bormans, 2017)

General description:

The political agenda is a key aspect for cities to face their challenges, such as increased mobility demands, transport emissions, and urban sprawl. In this sense, the European Council and Parliament have intensively worked in different Mobility Policy Packages (MPP). The main objective of those MPP in the EU is to trigger a Single European Transport Area with policies that make it competitive and sustainable in the longer term. The Single European Transport Area facilitates citizens´ movements and freight transport, reducing costs and increasing the sustainability of European transport. Consequently, most of European countries have experienced a trend towards more sustainable transport policies highly committed to the environmental objectives of the EU. Although it is a common core in the mobility agendas of different countries, differences exist in the instruments to be implemented, but also in terms of understanding the problem (e.g. support the existing car industry vs. mobility transition).

Policies:

Political and institutional barriers have been recognised as a major challenge for sustainable mobility measures. Measures to increase the financial feasibility of measures are laid out in the Topic Guide on Funding and Financing of Sustainable Urban Mobility Measures. (Werland & Rudolph, 2019).

Impact on mobility:

A more central role of mobility and transport on the political agenda could result in:

- Higher amount of budget available for transport and mobility issues
- More options for innovations and new business models
- More adequate environment to develop more efficient transport technologies

A lower position of mobility and transport on the political agenda could originate in:

- Lower amount of budget available to create and operate transport and mobility infrastructure and services
- Limited opportunities to innovate and foster new business models
- Less efficient transport technologies will remain for longer periods

P3: Transparency and corruption

Linked trends: transparency, free competition, confidence in public institutions, political instability

Source and further details: Transparency International; Surveys “Western Europe and EU: stagnating anti-corruption efforts and weakening democratic institutions” (Transparency International, 2019),

General description:

Although the EU region has one of the highest scores on different corruption indicators (e.g. international transparency), various issues remain, potentially having a detrimental effect on the functioning of public services.

Policies:

The EU has set up an expansive legal framework to foster fair practices of public procurement, including directive 2014/23/EU on the award of concession contracts, directive 2014/24/EU on public procurement and Directive 2014/25/EU on the procurement by entities operating in the water, energy, transport and postal services sectors (Rudolph & Werland, 2019)

Impact on mobility:

The presence of corruption could have the following effects on mobility:

- It is more difficult to incorporate improvements and innovations into fields requiring cooperation with public authorities, as mobility and transport.
- Budgets are inefficiently spent, fundamentally in fields such as mobility and transport
- Limitations to free competition, affecting businesses in transport and mobility

- Trend to ignore aspects such as environmental and social awareness

P4: Tax policy

Linked trends: investment, political stability, liberalism

Source and further details: European Commission: "A fair share. Taxation in the EU for the 21st century" (European Commission, 2018a)

General description:

Tax policy is a fiscal instrument playing a crucial role in ensuring sustainable urban mobility. The tax system can incentivise or dis-incentivise certain innovations or transport modes.

Policies:

There are many examples of mobility related tax policy measures, such as tax exemptions for diesel fuels that are granted in many EU member states or allowances for commuters (i.e. an amount of money per km that can be deducted from the taxable income). Time-bound exemptions for vehicle or registration taxes can be granted for e-vehicles or VAT can be reduced for public transport tickets. Also, differentiated energy taxes on fossil fuels and electricity can set incentives to buy combustion vehicles or electric cars.

Impact on mobility:

The tax policy effects on mobility could be:

- To penalise non-sustainable transport behaviours (e.g. taxing the price of fuels, road tolls, congestion charging, low emissions zones).
- It can be also used to stimulate the use of more equitable and healthy transport modes. For example, by reducing the cost of certain public transport services or with bonuses and tax exemptions to clean energy, mobility in pollutant vehicles can be modulated in favour of more sustainable transport means.
- Tax policy can drastically affect the urban mobility transition. A "light" tax policy may have budgetary implications for some states, i.e., less fiscal revenues to invest in innovative urban mobility solutions.

P5: Participation of citizen & economic actors

Linked trends: co-creation, co-design, capacity building, inclusivity

Source and further details: Mobility4EU D2.3, Section 3.6.2 "Co-Creation of urban mobility solutions based on citizen involvement" (Mobility4EU consortium, 2018)

General description:

The classical top-down planning paradigm is increasingly being replaced by procedures where citizens are given a significant degree of decision-making power. Reasons for this shift are the goals to match the projects with the needs of citizens, and to foster capacity building within local communities. A pragmatic reason for participation is to curb opposition in early planning phases. Participation exists in many forms, ranging from citizens being given the possibility to

contest plans to full-fledged co-design. For governments, the flipside of participation lies in the time and resources needed for proper participation procedures, but also in the relinquishment of control over the results of projects.

Policies

As one of the eight key principles of SUMPs (Eltis, 2019), involvement of citizens and stakeholders has become mainstream policy practice, though participation can be applied in many different forms and levels.

Impact on mobility:

- Possibility of better matching mobility and freight transport measures with the needs of local communities
- Increase of (mostly small-scale) innovative bottom-up initiatives, such as the reconfiguration of public space or awareness campaigns, especially with regard to the local quality of the environment
- Longer and more complicated procedures in large public projects
- Less control and higher unpredictability over the outcome of mobility projects by governments

5.2 Economic Drivers

Ec1: New employment arrangements as a result of the sharing economy

Linked trends: More flexible working hours, increase in telework,

Source and further details: Mobility4EU; D2.1 Section "Restructuring working arrangements"; (L'Hostis et al., 2016); European Parliament: "In-depth analysis - The situation of workers in the collaborative economy" (European Parliament, 2016); European Parliament: "The Social Protection of Workers in the Platform Economy" (European Parliament, 2017)

General Description:

The way employment is organised has been changing significantly in the past decades. New, more flexible forms of employment emerged such as part-time work, flexiwork (flexible working hours), teleworking (e.g. working from home) and self-employment. Digitalisation has also enabled the so-called "gig-economy" which includes "crowdwork" and "work-on-demand". Crowdwork covers activities that can be carried out online through a platform specifically set up to connect organisations and individuals where opportunities are offered to a potentially global workforce irrespective of their physical location. Examples include *Crowdwork*, *Amazon Mechanical Turk or Crowdflower*. Work-on-demand covers traditional jobs (e.g. cleaning, clerical work, transport etc.) that are offered through an online platform or app by firms set up for this purpose and controlling quality, payments, recruitment etc (De Stefano, 2015). Examples include *UBER, Taskrabbit, Lyft, Deliveroo or UberEATS*.

Policies:

Societal challenges resulting from this driver are addressed by legislation such as described in the section of the driver: *L1: Labour and employment laws* (section 5.5)

Impact on mobility:

The changing work arrangements have an impact on the volume, as well as the temporal and spatial distribution of commuting trips and delivery services:

- *Part-time employment* reduces commuting demand as commuters only have to go to work on a few days per week.
- *Flexiwork*, i.e. flexible working hours can reduce the stress on the transport network during the morning and evening peak hours as flexible employment means flexible start and finish times of the working hours that can thus be outside of the peak traffic periods.
- *Teleworking* and *crowdwork* can reduce the need to travel to work as tasks can be carried out online but it has also been shown to increase other types of car trips around the home (e.g. shopping, running errands etc.).
- *Flexible work arrangements* also challenge the current subsidy system for work trips in effect in many countries (which assume that most people commute to work 5 times a week using the same mode of transport). Also, the offer of public transport companies in terms of monthly passes and other types of periodic tickets need to be adapted (e.g. more flexible passes allowing 10 days of travel within a month).
- *Work-on-demand* is particularly popular in the transport sector through platform-based taxi companies such as UBER and Lyft. The proliferation of such services has challenged traditional transport services (including taxis, public transport and last-mile delivery) and provides a flexible, easy-to-use door-to-door travel option although the legal, safety and employment aspects of such services are quite controversial.

Ec2: Tourism

Linked trends: growth in worldwide tourism, growth in city-trips (short visits to European cities), increasingly independent travellers, mobile phones used as guides

General Description: International tourist arrivals have grown significantly from 25 million in 1950 to 1.5 billion by 2018 (Dubois, Peeters, Ceron, & Gössling, 2011; World Tourism Organization UNWTO, n.d.)**.** European cities in particular show a continuous growth in tourists. Between 2012 and 2017 the average number of bednights in European cities grew by 4.7% year**.**

Policies:

The European Commission has laid out a number of recommendations to foster sustainable urban tourism, including guidelines for measuring the impact of tourism on the economy, the environment and residents' quality of life (Enterprise Directorate-General & Tourism Unit, 2014).

Impact on Mobility:

- Increasing tourism in cities puts pressure on the transport system as the demand for public transport, parking (both personal cars and tour buses as well as ships) and congestion increases.
- Tourism is also a source of revenue for transport providers offering tourist passes, increased fares to airports and collecting parking and port usage fees.
- Tourism also offers opportunities for new businesses (e.g. sightseeing buses, Segway tours etc.)
- As tourists mostly travel during off-peak hours (late morning, early afternoon, late night) and at weekends they may cross-subsidise local public transport services when local demand would be too low (Albalate & Bel, 2010).

Ec3: New business models (e.g. collaborative consumption, sharing economy)

Linked trends: digitalisation, growth of platform economy, individualisation

Further described in: Mobility4EU; D2.1 Section "3.6.1 New models challenging the individual vehicle ownership model" (L'Hostis et al., 2016); Gesing (2017) "Sharing Economy Logistics - Rethinking logistics with access over ownership"

General Description:

Digitalization has enabled the emergence of new forms of consumption. Collaborative consumption or the sharing economy is a "*peer-to-peer-based activity of obtaining, giving, or sharing the access to goods and services, coordinated through community-based online services"* (Hamari, Sjöklint, & Ukkonen, 2016, p. 1). Digital platforms and apps help people and companies share their resources (cars, vans, warehouses, houses, workforce, etc.), while they enable other people and companies to easily search for such shared opportunities and connect to others. It has been forecast that car- and ride-sharing could account for 30 per cent of all passenger kilometres covered by cars by 2050 in Europe (The Ellen MacArthur Foundation, McKinsey Center for Business and Environment, & SUN, 2015).

Policies

The SUMP Topic Guide on the integration of shared mobility approaches (Wulf-Holger, Drews, Hertel, Langer, & Wiedenhöft, 2019) presents an extensive overview of policy measures aimed at the regulation of shared mobility services, such as establishing rules on parking, the minimum technical equipment of the sharing vehicles and the operational quality (with deadlines) of the sharing system.

Impact on mobility:

- Car sharing, ride sharing, bike sharing and e-scooter sharing have emerged as alternatives to existing modes of transport. Therefore, it is expected that they attract users from traditional public transport, taxi services, but also pedestrians and cyclists.

This may endanger the cost-effectiveness of public transport as decreasing numbers of passengers bring less revenue, therefore necessitating more subsidies.

- At the same time the new modes can act as complementary to existing modes of transport: e.g. shared e-scooters may strengthen the public transport network by providing fast and convenient first- and last-mile connections to stations.
- Similarly, in the freight transport domain, shared logistics assets and capacity, and crowd-delivery emerged as alternatives to existing urban delivery solutions, increasing efficiencies and decreasing environmental impacts.
- The emerging new shared transport solutions are mostly operated by private players who aim to generate profit. Therefore, these services are accessible and affordable for the whole population. Many services though, cannot be used without a credit card or a smartphone and are not accessible to certain citizen/consumer groups (e.g. aged, people with disabilities, etc.).

Ec4: Economic growth and crisis

Linked trends: decreasing or increasing growth of per capita GDP, economic crises, economic boom, shrinking and growing economies

Further described in: Mobility4EU; D2.1 Section 3.1.1 “Share of European economy in world declines (L’Hostis et al., 2016); Moradi & Vagnoni (2018): “A multi-level perspective analysis of urban mobility system dynamics: What are the future transition pathways?”

General Description:

The share of Europe in the world’s economic growth has been decreasing. It is expected that by 2050 Europe will only produce 9% of the world’s GDP, a decrease by 19 percentage points from 2010 (Bassanini & Reviglio, 2011). These changes may affect cities in different ways. In some cities the economy may suffer, which can lead to growing unemployment; while other cities may be able to restructure their economy and build on new technologies, tourism, services or innovation.

Policies:

Resilience has become a key concept in urban planning, referring not only to environmental but also to economic shocks. In urban transport planning this mostly recurs in the focus on accessible and inclusive transport systems (Sing, 2016).

Impact on mobility:

- An economic downturn or crisis would decrease travel demand especially for commuting. Public transport tickets and fuel would be less affordable for many people.
- Economic problems would also decrease the demand for freight transport to, from and in the city.

- An economic boom, however, increases employment therefore the demand would grow for commuting with higher pressure on the public transport and the road system especially in peak hours.
- The increase in economic activities will also increase the demand for city logistics especially for the deliveries to shops as well as construction sites (L'Hostis et al., 2016).
- Increasing prosperity will create demand for new, innovative public transport and logistics services such as digitally enabled shred mobility, micromobility and enable the emergence of new businesses including start-ups.

Ec5: Transformation of retail

Linked trends: growth of online shopping, crisis of inner-city shopping streets,

Further described in: Singleton et al (2016): "Measuring the spatial vulnerability of retail centres to online consumption through a framework of e-resilience"

General Description:

E-commerce has significantly changed how people shop. On average, 6 out of 10 people purchased goods on the internet in 2018 in Europe. There are, however, significant variations by region with 83% in the UK and only 20% in Romania (EUROSTAT, 2018). Online retail has a considerable impact on the future of physical shops i.e. shopping streets and shopping centres. Many shopping streets reposition themselves as places where people can get *experience* rather than only products: i.e. creating restaurants, bars, clubs, pop-up stores, organising events etc.

Policies:

For facing the mobility challenges related to the transformation of retail, the SUMP topic guide to sustainable urban logistics (Aifandopoulou & Xenou, 2019) provide manifold examples for aligning sustainable urban logistics plans and SUMPs.

Impact on mobility:

- The increase in online shopping may decrease the number of shopping trips to physical stores, therefore having an impact on traffic and public transport patronage.
- The delivery of goods purchased online generates significant extra traffic especially in city centres with frequent stops and unloading that may hinder other traffic.

5.3 Social Drivers

S1: Migration

Linked trends: Increasing net migration, cross-border movement

Further described in: Mobility4EU; D2.1 Section 3.2.2 "Migration trend generating long distance flows" (Mobility4EU consortium, 2018)

General Description:

Net migration plays an important role in population changes in most European countries. On the one hand there is intra-EU migration within the common European job market; on the other hand, migration from outside the EU. The European Commission estimates that migration will add 50 million new residents to the EU by 2050.

Policies:

The goal of citizen participation (see P5), a key component of SUMPs, is to adequately reflect the different groups that make up society, including migrants.

Impact on mobility:

- Migration is expected to increase long-distance movements i.e. migrants visiting their home countries which may put a strain on the urban terminals of long-distance networks (train stations, bus stations, airports)
- Migration also means that the urban population becomes more diverse in terms of languages spoken that may require the deployment of multilingual information services (e.g. route planners, timetables)
- The different driving culture of migrants may have an impact on traffic safety.
- Migrants may have a different attitude towards the use of certain transport modes (in many countries the car is a status symbol). This may have an impact on travel behaviour and the tools urban authorities can use to promote modal shift.

S2: Urban structure

Linked trends: Suburbanization, revitalization, densification, sprawl, growth, shrinkage

Further described in: Mobility4EU; D2.1 Section 3.2.1 Rising and expanding suburbanization (L'Hostis et al., 2016); Naess (2006): "Urban Structure Matters: Residential Location, Car Dependence and Travel Behaviour"

General Description:

Urban structure refers to the spatial articulation of urban functions, such as commercial and service activities, but also the residential function. Modernist city planning, with a separation of residential and economic functions, is increasingly overhauled by planning paradigms that favour the reinforcement of the inner city. In many cities, however, the trend of a suburbanizing population continues. While in some cities, suburbanization is concentrated in sub-centres within its metropolitan area, in other cities both residential and economic activities tend to sprawl. Another important development is the revitalization of inner cities which leads to increased density as well as gentrification. At the same time, many cities in rural or post-industrial regions face the challenge of shrinkage.

Policies:

Curbing sprawl, core densification and transit-oriented development nowadays form the backbone of the land-use plans and spatial development visions of many European cities.

Impact on mobility:

- Density reduces, whereas sprawl increases travel distances, including all associated impacts
- Centralization of residential or commercial activities, either mono-centric or polycentric facilitates efficiency and viability of public transport, while sprawl enhances car dependency.
- Increased density, as opposed to sprawl, facilitates active modes of travel (e.g. walking, cycling)
- Increased density or city size, when not matched with adequate transport facilities or infrastructure can cause increased road congestion and increases the burden on existing public transport networks
- Shrinkage of cities decreases congestion on transport networks, but can lead to issues of the viability of public transport networks

S3: Demographic composition

Linked trends: Ageing, Increased Life Expectancy, High birth rate, Baby boom

Further described in: Mobility4EU; D2.1 Ch. “Increasing life expectancy of the population” (L’Hostis et al., 2016)

General Description:

The age distribution and dependency ratio in a city greatly shape the social mix and life in the city. Most European societies experience a trend towards an older society, yet the rate of ageing differs from country to country. In addition, there is often an urban/rural divide in terms of age, as cities attract working age inhabitants. With old age comes a higher risk of disability, consequently higher share of disabled people in older populations. In addition, an ageing society will likely put pressure on governmental budgets. On the other hand, some cities may experience high birth rates with increasing younger population segments and an increasing demand for schools and public transport.

Policies:

The EU initiative TRACY (Transport Needs for an Ageing Society) (TRACY consortium, 2013) has resulted in an action plan with concrete policy measures, such as promoting an all-mode approach, including walking and cycling and harmonising guidance on age-friendly road and street design.

Impact on mobility:

- An ageing population has implications for mobility:
    - It makes it crucial to expand accessible transport for the silver generation. One example would be the encouragement of e-bikes
    - However, encouraging walking and cycling is not always feasible. Therefore, a focus on services in proximity and a compact city structure may also become important

  - Future old generations will be more mobile after a lifetime of getting used to cheap air travel, long distance trips etc.
  - Older car drivers pose a potential traffic safety risk
- A young population also has implications on mobility:
  - Families are more likely to purchase a car as the first children are born
  - Young adults often rely much more on public transport than older generations

S4: Health consciousness

Linked trends: rate of active travel mode usage

Further described in: Mobility4EU; D2.1 Ch. 3.2.5 “Move towards more active and healthy lifestyles” (Mobility4EU consortium, 2018)

General Description:

Health considerations can be a significant factor in the behaviour of individuals. However, public health can also be a consideration of authorities in the promotion or discouragement of certain types of behaviour among individuals. The possibility of health monitoring with technical tools by individuals (e-health), may contribute to increased health consciousness.

Policies:

The SUMP topic guide on health (A. Davis, Rye, Pressl, & Köllinger, 2019) lists various policy measures related to health, ranging from the stimulation of active travel modes to road safety measures.

Impact on mobility:

- Awareness of health impacts are likely to lead to increased use of active travel modes (walking, cycling)
- High levels of air pollution, on the other hand, might deter people from active travel
- Public health concerns among authorities leads to the encouragement of healthy travel behaviour (choice of active modes), but also to efforts to curb air (and noise) pollution in cities through measures such as traffic calming and banning polluting vehicles in certain areas (low emission zones).
- Increased support for active-travel mode infrastructure (bicycle paths), leading to less road space for cars

S5: Changing behaviour and lifestyles towards car ownership

Linked trends: urbanization, densification, environmental consciousness, individualization

Further described in: Mobility4EU; D2.1 Ch. 3.2.4 “Less car use by younger generations” (Mobility4EU consortium, 2018)

General Description:

Both in the US and in Europe changing attitudes towards the ownership of a private car has been observed, especially among younger people. (B. Davis, Dutzik, & Baxandall, 2012; Goodwin, 2012; Metz, 2013). Fewer people consider ownership necessary, but also the

average age at which people obtain their driver's license increases and a growing number of young people refrain from obtaining one at all. These changing attitudes are strongly linked with the conditions that facilitate the possibility of a lifestyle without owning a car, such as increased urbanization and densification, but also the increasing availability of car sharing platforms, as well as the possibilities brought by "new" transport modes, such as electric scooters and electric bikes. On the long term, the advent of autonomous vehicles is expected to bring about dramatic changes in current modalities of car ownership.

Policies:

Changing attitudes towards car ownership cross-cut numerous policy fields included in other drivers, such as *new business models* (EC3), *environmental consciousness* (S6) and *individualisation* (S9).

Impact on mobility:

- Decreasing car ownership
- Increased use of carsharing
- Increased use of public transport, active travel modes and "new" transport modes

S6: Environmental consciousness

Linked trends: rate of car use, active modes, public transport, electrification, sprawl

Further described in: "Rethinking habits and their role in behaviour change: the case of low-carbon mobility" (Schwanen, Banister, & Anable, 2012); "Can environmental awareness explain declining preference for car-based mobility amongst generation Y? A qualitative examination of learn to drive behaviours" (Hopkins, 2016)

General Description:

This driver refers to the awareness of the behaviour of individuals of the environment, including their choice of where to travel and especially which mode they use. It can even play a role in individual choices in terms of location of residence and work. This also affects the support of people or companies for government-led measures, such as traffic restrictions in cities, incentives favouring the usage of modes of transport other than cars, or electric cars.

Policies:

Environmental consciousness with regard to urban mobility planning can be strengthened and harnessed through citizen participation, which has become a mainstream component in urban mobility planning (see P5: Participation of citizen & economic actors). A concrete policy measure driven by environmental consciousness is the implementation of Urban Vehicle Access Regulations (UVARS) (Cré, 2019).

Impact on mobility:

- Individual modal choice (increased usage of active modes, public transport, "new" transport modes [e.g. e-scooter])

- Choice of activities (favouring nearby, easy-to-reach activities), choice of residence or work with good public transport or active travel accessibility
- Increased support for measures in which car use is curbed (e.g. traffic and parking restrictions, low-emission zones, road pricing)
- Public space as the physical carrier of mobility: use of more environmentally friendly configurations of public space (e.g. more green space, less use of hard surfaces)

S7: Safety Concerns

Linked trends: decreasing rate of accidents, zero road deaths objective,

Further described in: Mobility4EU; D2.1 Ch. 3.7 “Safety in transport” (L’Hostis et al., 2016)

General Description:

Safety is a persistent issue in mobility. While over the last decades the situation has improved in most European cities, in recent years there has been a slowdown. This slowdown has been attributed to factors such as a higher interaction between unprotected (pedestrians, cyclists, scooter riders) and motorized road users in our cities, and an ever growing number of elderly people in road traffic. (European Commission, 2015). “New” transport modes, especially autonomous vehicles, pose enormous challenges for existing regulatory frameworks and infrastructure. While it can be said that up to now safety concerns are following rather than steering technological developments, the rise of autonomous vehicles is currently sparking a debate on the fundaments of safety concerns and the underlying ethics.

Policies:

Safety concerns recur in many aspects of transport and mobility planning, both in conventional engineering and road design as in the management of new small-scale modes of urban transport, such as e-scooters. Policy measures concerning the active travel modes and road safety are listed in the respective SUMP topic guide (Engels, 2019).

Impact on mobility:

- usage rate of active modes, especially cycling
- usage rate of “new” light modes (e.g. e-scooter, e-bike)
- the need for infrastructure to keep up with new developments
- the need for regulatory frameworks for the use of “new” light modes
- the need for regulatory framework for autonomous vehicles
- the need for regulation of mobile phone usage in traffic
- changing attitudes with regard to autonomous vehicles and artificial intelligence

S8: Security Concerns

Linked trends: increased fear of terrorism and crime, cyber attacks

Further described in: Mobility4EU; D2.1 Ch. 3.8 “Security in transport”

General Description:

Terrorism has been posing an increasing threat in cities in general and at stations and on transport vehicles in particular. In addition, the increased digitalization of our lives has led to a significant threat of cyber-attacks both to personal accounts and systems (Zellner, 2014). Also, anti-social behaviour and the fear of crime on public transport and on streets may be deterring factors for many citizens.

Policies:

The EU-initiative MODSAFE project (Dillenseger, 2012)has resulted in a number of security strategies in urban guided transport, including technical recommendation, design, certification, training, etc.

Impact on mobility:

- Alarms and attacks cause major disruptions and damage in the transport system.
- Increased security, however, reduces passenger processing capacity at stations and causes inconvenience to passengers due to increased boarding times and queuing due to security checks.
- Fear of crime on public transport and streets may deter many people and especially women, older people and children from using public transport during certain periods (night) or certain areas.

S9: Individualisation

Linked trends: decreasing household size, flexibilisation of labour market

Further described in: Mobility4EU; D2.1 Section 3.2.7 “Personalization of liquid modern society” (L’Hostis et al., 2016)

General Description:

Individualism is a prime feature of modern societies (Bauman, 2000), associated with a declining household size, especially in cities. Contributing factors are lower marriage and fertility rates, ageing population, urbanization and rising wealth in emerging markets (Euromonitor 2013). Individualization goes in pair with new types of more flexible jobs that compete with existing jobs or economic structures (e.g. platform economy, or *uberization*).

Policies:

The changes in working conditions and economic circumstances related to individualisation are addressed under the driver *Labour and employment laws* (see L1).

Impact on Mobility:

- Reduction of vehicle ownership
- Increased demand for transportation due to more complex social networks
- Less regular commuting hours

S10: The rise of next-hour to same-day (on-demand) delivery requirement

Linked trends: increased online shopping (B2C), on-demand economy

Further described in: Dablanc et al. (2017)**: "**The Rise of On-demand Instant Deliveries in European cities",

General Description:

Consumers are increasingly requesting the on-demand delivery of the items they buy online. In response to this requirement traditional logistics services providers and start-ups are providing next-hour to same-day delivery services from the retail stores to the consumers' residences using a variety of means (from vans to bikes).

Policies

The SUMP topic guide on sustainable urban logistics planning (Aifandopoulou & Xenou, 2019) provides guidelines for policy measures related to the challenges of short-term delivery requirement

Impact on mobility:

- Increased demand for expedited transportation
- Increased demand for small-size deliveries impacting the city's transportation capacity
- Data capture, integration and analytics capabilities are becoming critical for the respective logistics service providers to respond to the delivery speed required

5.4 Technological Drivers

This section contains emerging technologies with the potential to steer future development.

T1: Electrification of mobility

Linked trends: increasing driving range, deployment of charging points

Further described in: Mobility4EU Section 3.5.5 "Future generation of electric vehicles (Mobility4EU consortium, 2018)

General description:

Vehicles in all transport modes are becoming increasingly electrified. According to the Global EV Outlook, the number of electric vehicles increased by 2 million from 2017 to 2018. It is estimated that by 2030 the global electric vehicle stock will reach 130 million vehicles. It is expected that 26% of new car sales will be electric in the EU by 2030.The European Parliament adopted strict CO_2 emission standards for passenger cars and vans with new regulations in preparation for heavy trucks as well, which will incentivize further deployment of electric vehicles. 26 EU countries have implemented incentive schemes to promote the purchase of electric vehicles.

Policies:

The SUMP topic guide on electrification (Polis & Rupprecht Consult, 2019) provides a number of guidelines and concrete policy measures to foster electrification, such as urban access vehicle restriction, parking measures, funding and financing, procurement measures, promotion and incentives.

Impact on mobility:

- Electrification requires new networks of charging stations.
- A significant reduction in noise and air pollution is expected in cities.
- City authorities will no longer be able to argue with pollution reduction for access restrictions and parking regulation
- Electrification will provide no solution to congestion and space occupation of vehicles
- Drivers of electric vehicles may use their vehicles more as there is less environmental impact and fuel may be cheaper which can lead to increase in traffic.
- Traditional petrol stations will have to be converted

T2: Adoption of smart-city technology

Linked trends: intelligent traffic management, internet of things, automation, big data, data and privacy laws

Further described in: Mobility4EU; D2.1 Ch. 3. "The emergence of smart cities" 3 (L'Hostis et al., 2016); Garrido-Marijuan et al (2017): "The making of a smart city: best practices across Europe"

General description:

Technological evolutions have fostered the collection and usage of (big) data, which provides manifold possibilities for monitoring and managing community services such as power plants, water supply networks, waste management, crime detection, information systems, schools, libraries, hospitals, but also traffic and transportation systems. Smart city applications are specifically developed to manage urban flows and allow for real-time responses.

Policies:

The SUMP topic guide on the role of intelligent transport systems in sustainable urban mobility planning (ERTICO – ITS Europe, 2019a) lists a number of policy measures with regard to the concrete application of smart-city technology. These include: reactive and predictive traffic management and control, public transport and emergency vehicle priority, parking management and information, red light and parking enforcement, floating vehicle data, road user charging, fleet management systems and demand responsive transport systems.

Impact on mobility:

- New possibilities, as well as more efficiency and efficacy in the management of mobility and logistics
- Better possibilities for the adoption and management of new, data-driven forms of mobility, especially automated/autonomous vehicles
- Increased importance of data protection and privacy regulation

T3: Citizen- and consumer-oriented digitalization

Linked trends: emergence of mobility as a service and on-demand logistics, towards more comprehensive data and privacy legislation, consumer protection laws

Further described in: Mobility4EU; D2.1 Ch. 3.5.3. “Expectation of customers and digitalization of mobility”

General description:

The digitalization of mobility has enabled real-time passenger information systems, online route planners and booking systems (Mobility as a Service). The connected traveller seeks information on routes, books and validates tickets and sends feedback to transport operators about the comfort or satisfaction online. Also, GPS navigation in cars has become a standard equipment. There is an increased interest in the protection of private data of passengers that is collected through smartphones and in-car GPS-based devices. Furthermore, it has enabled the emergence of on-demand urban logistics services, characterized by increased delivery speed.

Policies

The SUMP topic guide on Mobility as a Service (ERTICO – ITS Europe, 2019b) lists various operational and governance models for MaaS, such as those involving private integrators, Open Back-End platforms, as well as those involving public transport authorities as integrators.

Impact on mobility:

- Travellers’ and commercial vehicles’ routes can be more optimized through real-time route planners
- There is an increased expectation of passengers for accurate and reliable real-time information at each stage of the journey (planning, travelling) (Goodall, Dovey Fishman, Bornstein, & Bonthron, 2017).
- There is an increased expectation of citizens and consumers to be fully aware of how the information they provide is handled and by whom and they want to be reassured that privacy issues are respected.
- Route planning algorithms may have unexpected consequences and lead users to low capacity roads or direct them to (private) transport providers that sponsor the route planning application.
- Digital booking and information systems (Mobility as a Service) can help transport providers (both on-demand and public transport) to provide capacity that better reflects the passenger demand (e.g. real time re-routing of bus services if there is capacity need somewhere in the network).
- Data of consumer orders enable retailers and logistics service providers to anticipate future orders using algorithms and analytics, thereby achieving decreased delivery costs and improved responsiveness

T4: Automation

Linked trends: deployment of cooperative intelligent transport systems (C-ITS), artificial intelligence, autonomous/automated vehicles

Further described in: Mobility4EU; D2.1 Ch. 3.5.2. “More automation” 3 (L’Hostis et al., 2016); DHL (2018) “Logistics Trend Radar 2018/19”

General description:

Improved sensor technology and data processing has led to increasing automation of all transport modes, but the highest expectation is for the automation of road transport. Connected autonomous vehicles will most probably be first deployed on motorways where the environment is more controlled. Urban environments are the most complex, therefore the deployment of private or shared autonomous vehicles will require longer preparations. It is estimated that autonomous vehicles with human assistance will be market ready by 2022-2025 (Fagnant & Kockelman, 2015). After that, the wider deployment of autonomous fleets is expected to take 10 to 20 more years, especially in cities (Firnkorn & Müller, 2015).

Policies:

The SUMP practitioner briefing to road vehicle automation (Backhaus, Rupprecht, & Franco, 2019) provides a framework for policy guidelines, categorised in institutional adjustments, infrastructural adjustments and collective mobility services. As of 2019, more policy tools are being developed in the framework of the LEVITATE project (LEVITATE consortium, 2019)

Impact on mobility:

- Automated vehicles are expected to increase traffic safety as accidents due to human errors will be reduced (L’Hostis et al., 2016).
- Automation and intelligent traffic management will enable more efficient fleet management of shared vehicle and public transport operators as vehicles can be self-driven to charging points or can be rerouted depending on demand or incidents.
- If autonomous vehicles will be widely available for purchase (individual ownership), several negative consequences can be expected: road congestion may not decrease; many unnecessary and empty trips will be carried out; urban sprawl will be caused as travel time while commuting can be spent with useful activities (e.g. working).
- If shared autonomous vehicles are promoted, significant amount of parking in cities will become unnecessary.

5.5 Environmental Drivers

En1: Climate change

Linked trends: decarbonization, carbon neutrality,

Further described in: Mobility4EU; D2.1 Ch. 3.4.4. “Impact of climate change on transport” (L’Hostis et al., 2016)

General description:

In 2013, 25% of all greenhouse gas emissions were caused by transport. There is an increasing pressure to decrease transport-related emissions. A reduction of at least 60% is

required in Europe in comparison to 1990 according to the White Paper on Transport (European Commission, 2011).

Policies:

Environmental concerns, including climate change, have become a main focus in transport and mobility planning. The SUMP topic guide on the harmonisation of energy and sustainable urban mobility planning (Fresner, Krenn, Morea, Alessandrini, & Tomasi, 2019), provides guidelines for aligning mobility and energy policy.

Impact on mobility:

- There is pressure on cities to promote a shift from cars to sustainable travel modes.
- Stricter EU regulations have been accepted and are in the pipeline for the reduction of the CO_2 emission of cars and light vans.
- Low emission zones that have been implemented in many cities can help to reduce the negative environmental impact of older vehicles.
- Cities are implementing incentives (prioritization of cycling and public transport, car-free areas, parking restrictions) to incentivize sustainable travel

En2: Local environmental quality

Linked trends: air pollution, noise pollution

Further described in: Mobility4EU; D2.1 Ch. 3.4.1. “Stricter regulations for environmental protection” (L’Hostis et al., 2016)

General description:

This driver is strongly connected to ‘En1: climate change’ but differs in the sense that certain types of pollution, such as those associated with NOx and particulate matter, but also noise and even light, have a local rather than a global impact, and therefore have a strong connection with health and the local environment, rather than with global conditions.

Policies:

Local environmental concerns, have become a main focus in transport and mobility planning, and recurs in numerous policies applications, such as electrification of mobility (see T1).

Impact on Mobility:

- Pressure to implementation of low-emission zones
- Pressure to reduce the environmental impact of road traffic (speed limits, downscaling or removal of infrastructure)
- Incentives for the electrification of public and private transport
- Local air quality affects the willingness to use active modes of transport (cycling, walking)

5.6 Legal Drivers

Although these factors have some overlap with the political drivers, they include more specific laws with mobility implications such as employment laws, consumer protection laws, data and privacy laws, and health and safety laws. Globally operating mobility actors need to adhere to laws that change from country to country. In addition, it is necessary to be aware of any potential changes in legislation and the impact it may have on mobility systems in the future.

L1: Labour and employment laws

Linked trends: Regulated or deregulated labour and employment market; unemployment rates; shared mobility systems; self-employment.

Source and further details: European Commission (2013)**:** "EU Programme for Employment and Social Innovation"; Fraser Institute (2019): "Economic Freedom of the world: 2019 Annual Report"

General description:

Labour and employment laws define and protect rights and obligations of workers and employers. The EU adopts directives that establish minimum requirements for working and employment conditions. The European Commission checks that the EU directives are correctly incorporated into national legal systems. In general, EU countries have regulated labour and employment markets strongly. Examples of less regulated markets are Hong Kong and USA. Within the EU, the United Kingdom and Czech Republic are the least regulated, while Finland, Greece and Spain are among the most regulated countries.

Impact on mobility:

A deregulated labour and employment market can have the following impacts on transport and mobility:

- It may lead to a reduction in the labour force, i.e., high unemployment rates
- Fostering new systems of sharing economy (Uber and the like, bicycles, scooters, on-demand deliveries, etc.)
- This will lead to uncertainties in labour law, from new forms of insurance to an increase of self-employment.

A regulated labour and employment market have implications on mobility:

- It would be impossible for certain new forms of mobility to appear or they would be much more difficult and slower to implement.

L2: Consumer protection laws

Linked trends: Compensation and insurance mechanisms

Source and further details: European Commission (2014): "Consumer Rights Directive"

General description:

Consumer rights are collected in an EU directive, aiming to achieve a real business-to-consumer (B2C) internal market, with a high level of consumer protection and competitive business and gives consumers the same strong rights across the EU, also in online markets. However, it is considered necessary to further improve enforcement and awareness of the implication of the rules between countries.

Impact on mobility:

Consumer protection laws have implications on mobility:

- It guarantees that consumer have compensation and insurance mechanisms
- It ensures that all goods and services meet the needs of consumers
- It ensures more protection when purchasing mobility products, both physically and online.
- It encourages higher levels of ethical business conduct and avoid abusive business practices.

Excessive consumer protection laws may also have negative effects on mobility:

- Far from generating incentives for mobility suppliers to try to win the trust of consumers, it encourages them to find mechanisms to avoid the important over-costs generated by a rigid and intervening regulation.
- Small and medium mobility and transport businesses would be less likely to bear the costs. This could have a negative impact on the supply of specific mobility products.

L3: Data and privacy laws

Linked trends: consumer confidence, data-based mobility innovations

Source and further details: European Commission (2019) “Data protection rules”

General description:

The General Data Protection Regulation applies across the European Union for over one year (GDPR). It is at the centre of a coherent and modernized EU data protection landscape that also includes the Data Protection Law Enforcement Directive and the Data Protection Regulation for EU institutions and bodies. This framework is to be completed by the e-Privacy Regulation which is currently in the legislative process. Strong data protection rules are essential to guarantee the fundamental right to the protection of personal data. They are central to a democratic society and an important component of an increasingly data-driven economy, but they can also be seen as an obstacle to data-based mobility innovations, if they are very rigid.

Impact on mobility:

- Data and privacy laws guarantee the protection of consumer’s data, possibly leading to greater confidence in new mobility systems that imply the transfer of data by its users.

- If they are very strong and inflexible, they can be an obstacle for data-based mobility innovations. Mobility-as-a-Service products, automated vehicles or mobility apps, need a constant real-time data exchange between users and vehicles. They would not be possible without a change in data and privacy laws.

L4: Health and safety laws

Linked trends: transport emissions, active mobility, road safety

Source and further details: European Commission (2016)**: "**A European Strategy for Low-Emission Mobility"; European Union (2010): "Directive 2010/40/EU — rules on the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport"; (European Commission, 2018b): "Europe on the move. Sustainable Mobility for Europe: safe, connected and clean."

General description:

To ensure Europe stays competitive in the global shift towards low-carbon economy, the Commission´s low-emission mobility strategy sets clear and fair guiding principles to Member States to prepare for the future. The main elements of the Strategy are: increasing the efficiency of the transport system, speeding up the deployment of low-emissions alternative energy for transport, and moving towards zero-emissions vehicles. With respect to safety laws, while road safety in the EU has improved greatly in recent decades, the number of deaths and injuries is still far too high. This is why the EU has adopted the Vision Zero and Safe System approach and works closely on road safety with the authorities in its member countries.

Impact on mobility:

Health and safety laws have implications on mobility:

- They encourage an active and healthier mobility (cycling and walking), public transport and shared mobility schemes (bike, car-sharing, car-pooling), to reduce congestion and pollution.
- They imply more investment in research and innovation in low-emission mobility solutions.
- However, the energy sector and fuel suppliers will be affected if they do not invest into advanced energy for transport, such as advanced biofuels.
- Safety mobility laws are aimed at achieving a drastic reduction in road traffic accidents.
- However, they can also be an obstacle to the implementation of intelligent transport systems if they do not consider the coexistence between autonomous and traditional vehicles.

6 The possible impact of transition

The shift towards sustainable urban mobility planning takes a central position in the SPROUT project. Sustainable transport strategies are intended to pursue economic, social and environmental objectives. These include improving access to mobility, reducing traffic and parking congestion, saving users money, supporting economic development, increasing public health and safety, and reducing air and noise pollution (Lah, 2017).

Many cities pursue a strategy known as sustainable urban mobility planning, which can be described as a strategic and integrated approach for dealing effectively with the complexities of urban transport. The core goal is to improve accessibility and quality of life by achieving a shift towards sustainable mobility. Sustainable urban mobility planning advocates fact-based decision making guided by a long-term vision for sustainable mobility. As key components, this requires a thorough assessment of the current situation and future trends, a widely supported common vision with strategic objectives, and an integrated set of regulatory, promotional, financial, technical and infrastructure measures to deliver the objectives – whose implementation should be accompanied by systematic monitoring and evaluation (Rupprecht, 2019).

In doing so, cities have the potential to be major catalysts of change in the implementation of recent international agreements such as the Paris Agreement and the New Urban Agenda. The United Nations Framework Convention on Climate Change conference of the Parties in Paris in 2015 (COP 21) recognised the critical role cities have to play in effective climate action. The transport sector is vital in delivering on these objectives.

6.1 Economic dimension

Transportation is a vector of the economic actions of production and consumption. By improving access to markets, goods and services, employment, housing, health care, and education while reducing the cost of moving people and goods, transportation projects can increase economic productivity and development. New transport infrastructure attracts residential and commercial development.

However, there are limits to the additional benefits from transport infrastructure expansion. It is often argued that individuals' travel times remain constant in the long run (i.e. travel time saved encourages increased distances), and congestion forces mobile people to efficiently use scarce space in city centres (Schafer & Victor 2000; Rudolph et al. 2015; Rudolph & Matrai 2018). Sustainable urban mobility planning may involve downscaling or even dismantling car-oriented infrastructure, which in turn influences real estate markets and freight flows.

6.2 Social dimension

As mobility is necessary for the access to jobs, health care and recreation, it is a prerequisite for inclusion. Accessibility therefore takes a central position in SUMPs. For cities, the provision of access to basic services also means to provide access to these with different transport

modes, as a significant part of the urban population does not own a private car. Fostering active modes therefore is an important part of SUMPs. A large proportion of victims on urban roads are pedestrians and cyclists who do not pose risks to other road users but who are exposed to high risks created by motorised traffic. Meeting the demands of the most vulnerable road user groups – the elderly, children and people with reduced mobility will not only help to achieve the highest safety standards but also help all road users to profit from a much safer urban environment (Engels, 2019). Another component of the social dimension is the function of public space where people meet and spend time for leisure.

6.3 Ecologic dimension

Air pollution contributes to more than 400,000 premature deaths per year in the European Union (EEA 2018). Many cities in Europe do not comply with the legal thresholds set by the European Commission. The EU has been approached by many think tanks and non-governmental organisations with petitions to tackle the growing air pollution problem across European countries and cities. Even more pressing is the need to reduce greenhouse gas emissions to tackle the climate crisis, and road transport is the second biggest source of CO2 emissions in the EU (EEA 2019).

While air pollution can be reduced relatively easily and effectively with end-of-pipe technologies for the internal combustion engine or electric vehicles, the climate crisis demands a profound transformation of our economy and society. Climate change mitigation in the transport sector requires transformation in mobility as well as in energy production. The mobility transformation includes the key strategies of travel demand reduction and modal shift from the car, both of which can be achieved with dense cities and mixed land-use. Promotion of other transport modes is also vital while increasing prices and decreasing space for motorised transport.

7 Catalogue of urban mobility and logistics stakeholders

The list below provides an overview of eligible stakeholders in urban mobility and logistics and is used by the SPROUT cities to identify city-specific stakeholders.

Table 7.1. Types of stakeholders in urban mobility and logistics

Types of stakeholders in urban mobility and logistics	
Public administration	• Governmental bodies responsible for transport planning, public works, infrastructure, environment, public space, on local, regional and metropolitan levels.
Public Services	• Police • Emergency services
Conventional public transport operators	• Operators of local transport (local bus, tram, (sub)urban rail, ferry, metro) • Operators of national or regional transport services (train, long-distance bus) • Conventional taxi companies

'New mobility' providers	• Shared mobility operators that provide shared cars, (e-) bikes, scooters, motorbikes
	• Peer-to-peer platforms that provide a platform for individuals to share vehicles or provide services (e.g. ride sharing):
	  ○ Carpooling
	  ○ Peer-to-peer car rental
	  ○ Platform-based taxi services

Data/Tech companies	• Wayfinding and route planning providers • Mobility as a Service providers • Providers of smart technology for traffic management
Energy providers	• Petrol station owners • Electricity providers • Providers of electric vehicle charging points
Urban Logistics	• Logistics service providers (delivery, warehousing, consolidation centres) • Local businesses (shippers and receivers of goods)
Vehicle manufacturers (locally relevant)	• Cars • Public transport (trains, trams, buses) • Bicycles • New and innovative means of transport

Users	• Travellers' associations • Public transport passengers' associations • Drivers' associations • Cyclists' and pedestrians' associations • Representatives of vulnerable groups • Representatives of physically vulnerable (disabled, elderly, …) • Socio-economically vulnerable groups (poor, ethnic minorities, immigrants, etc.)
Residents	• Civil society organisations representing residents (e.g. neighbourhood committees)
Local businesses	• Federations of business owners (e.g. chamber of commerce)

8 Conclusions

This deliverable presents a catalogue of components that are used to construct an image of the current state of the SPROUT1st and 2nd layer cities: key performance indicators (KPIs), urban mobility transition drivers and stakeholders. A template based on this catalogue will be used by each of the SPROUT city to collect data about their local situation, which will constitute the input of integrative analyses and benchmarking (tasks 2.2 and 2.3).

The sets of KPIs, drivers and stakeholders were compiled using the results from previous EU initiatives in the field of mobility and logistics, notably the sustainable mobility indicators developed by the World Business Council for Sustainable Development (WBCSD), the CIVITAS sustainable mobility indicators; Mobility4EU, MIND-SETS, TRANSFORuM and NOVELOG. Using various EU and local policy documents as well as academic literature, the output from these projects has been adapted and completed to align with the specific aims of the SPROUT project, i.e. to develop and test policy responses to the new challenges with regard to the urban mobility transition. While the goal of these elements is to construct a comprehensive overview of the mobility situation and its drivers in the SPROUT cities, it must be kept in mind that the selection of KPIs, drivers and stakeholders is not exhaustive for practical reasons such as the availability of resources and data in the cities.

9 References

Aifandopoulou, G., & Xenou, E. (2019). *Sustainable Urban Logistics Planning*. Retrieved from https://www.eltis.org/sites/default/files/sustainable_urban_logistics_planning_0.pdf

Albalate, D., & Bel, G. (2010). Tourism and urban public transport: Holding demand pressure under supply constraints. *Tourism Management*, *31*(3), 425–433. https://doi.org/10.1016/j.tourman.2009.04.011

Anderton, K., Åkerman, J., Brand, R., Chèze, C., Leiren, M. D., Gudmundsson, H., … Schippl, J. (2015). *Strategic Outlook TRANSFORuM D6.3* (p. 26). Retrieved from European Commission website: http://www.transforum-project.eu/resources/library.html

Anderton, K., Brand, R., Leiren, M. D., Gudmundsson, H., Reichenbach, M., & Schippl, J. (2015). *TRANSFORuM Urban Mobility roadmap* (p. 72). Retrieved from European Comission website: http://www.transforum-project.eu/fileadmin/user_upload/08_resources/08-01_library/TRANSFORuM_Roadmap_Urban.pdf

Ayfantopoulo, Georgia, & Lozzi, Giacomo. (2018). *NOVELOG Cities & Regions Factsheets*. Retrieved from European Comission website: http://novelog.eu/downloads-2/downloads/

Backhaus, W., Rupprecht, S., & Franco, D. (2019). *Road vehicle automation in sustainable urban mobility planning,*. Retrieved from https://www.eltis.org/sites/default/files/road_vehicle_automation_in_sustainable_urban_mobility_planning_0.pdf

Bassanini, F., & Reviglio, E. (2011). Financial stability, fiscal consolidation and long-term investment after the crisis. *OECD Journal: Financial Market Trends*, *2011*(1), 31–75.

Bauman, Z. (2000). *Liquid modernity* (Vol. 9). Retrieved from http://neilsquire.pbworks.com/w/file/fetch/35116162/Bauman-Liquid%EE%80%80Modernity%EE%80%81.pdf

Ben Gesing. (2017). *Sharing economy logistics. Rethinking logistics with access over ownership.* Retrieved from DHL trend research website: https://www.dhl.com/content/dam/downloads/g0/about_us/logistics_insights/DHLTrend_Report_Sharing_Economy.pdf

Bormans, Y. (2017, March 21). Fourth railway package of 2016 [Text]. Retrieved 1 October 2019, from Mobility and Transport—European Commission website: https://ec.europa.eu/transport/modes/rail/packages/2013_en

CIVITAS CAPITAL Advisory Group 5 Data and Statistics. (2016). City level Sustainable Mobility Indicator Descriptions. Retrieved 17 October 2019, from https://civitas.eu/document/civitas-capital-advisory-group-5-data-and-statistics-city-level-sustainable-mobility

Cré, I. (2019). *UVAR and SUMPs. Regulating vehicle access to cities as part of integrated mobility policies.* Retrieved from https://www.eltis.org/sites/default/files/uvar_brochure_2019-09-26_digital_version_v2.pdf

Dablanc, L., Blanquart, C., Combes, F., Heitz, A., klausberg, J., Koning, M., … Seidel, S. (2016). *CITYLAB Observatory of Strategic Developments Impacting Urban Logistics (2016 version)* (No. Deliverable 2-1 CITYLAB European Project; p. 136). Retrieved from European Commission H2020 Programme website: http://www.citylab-project.eu/deliverables/D2_1.pdf

Dablanc, L., Morganti, E., Arvidsson, N., Woxenius, J., Browne, M., & Saidi, N. (2017). The Rise of On-Demand 'Instant Deliveries' in European Cities. *Supply Chain Forum: An International Journal*. https://doi.org/10.1080/16258312.2017.1375375

Davis, A., Rye, T., Pressl, R., & Köllinger, K. (2019). *Linking transport and health in SuMps. How health supports SuMps.* Retrieved from https://www.eltis.org/sites/default/files/linking_transport_and_health_in_sumps_0.pdf

Davis, B., Dutzik, T., & Baxandall, P. (2012). *Transportation and the new generation: Why young people are driving less and what it means for transportation policy*. Retrieved from http://trid.trb.org/view.aspx?id=1141470

De Stefano, V. (2015). The Rise of the Just-in-Time Workforce: On-Demand Work, Crowdwork, and Labor Protection in the Gig-Economy. *Comparative Labor Law & Policy Journal*, (3), 471–504.

Dillenseger, P. (2012). *Security strategies in Urban Guided Transport systems* (No. DEL_D8.3_RATP_WP8_250512_V1). Retrieved from http://www.modsafe.eu/fileadmin/documents/deliverables/DEL_8.3_RATP_WP8_250512_V1.0.pdf

Dubois, G., Peeters, P., Ceron, J.-P., & Gössling, S. (2011). The future tourism mobility of the world population: Emission growth versus climate policy. *Transportation Research Part A: Policy and Practice*, *45*(10), 1031–1042. https://doi.org/10.1016/j.tra.2009.11.004

Eltis. (2019). The SUMP Concept and Guidelines. Retrieved 21 October 2019, from https://www.eltis.org/mobility-plans/sump-concept

Engels, D. (2019). *Topic Guide Urban Road Safety and Active Travel in Sustainable Urban Mobility Planning*. Retrieved from

https://www.eltis.org/sites/default/files/urban_road_safety_and_active_travel_in_sumps.pdf

Enterprise Directorate-General, & Tourism Unit. (2014). *Towards quality urban tourism. Integrated quality management (IQM) of urban tourist destinations* (No. Ref. Ares(2014)78430). Retrieved from European Comission website: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=2ahUKEwjchtzA26_lAhVPZ8AKHc31DHMQFjACegQIARAC&url=https%3A%2F%2Fec.europa.eu%2Fdocsroom%2Fdocuments%2F3634%2Fattachments%2F1%2Ftranslations%2Fen%2Frenditions%2Fpdf&usg=AOvVaw3kqupG__7KCxitvLAG_Oap

ERTICO – ITS Europe. (2019a). *Intelligent Transport Systems (ITS) and SUMPs – making smarter integrated mobility plans and policie*. Retrieved from European Platform on Sustainable Urban Mobility Plans website: https://www.eltis.org/sites/default/files/the_role_of_intelligent_transport_systems_its_in_sumps.pdf

ERTICO – ITS Europe. (2019b). *Mobility as a Service (MaaS) and Sustainable Urban Mobility Planning*. Retrieved from https://www.eltis.org/sites/default/files/the_role_of_intelligent_transport_systems_its_in_sumps.pdf

European Commission. (2011). *White paper: Roadmap to a Single European Transport Area—Towards a Competitive and Resource Efficient Transport System*. European Commission, Brussels.

European Commission. (2013). EU Programme for Employment and Social Innovation (EaSI). Retrieved 17 October 2019, from https://ec.europa.eu/social/main.jsp?catId=1081

European Commission. (2014). Consumer rights directive [Text]. Retrieved 17 October 2019, from https://ec.europa.eu/info/law/law-topic/consumers/consumer-contract-law/consumer-rights-directive_en

European Commission. (2015). Press release—2015 road safety statistics: What is behind the figures? Retrieved 27 June 2016, from http://europa.eu/rapid/press-release_MEMO-16-864_en.htm

European Commission. (2016). *A European Strategy for Low-Emission Mobility*. Retrieved from https://eur-lex.europa.eu/resource.html?uri=cellar:e44d3c21-531e-11e6-89bd-01aa75ed71a1.0002.02/DOC_1&format=PDF

European Commission. (2018a). *A fair share. Taxation in the EU in the 21st century*. Retrieved from https://ec.europa.eu/taxation_customs/sites/taxation/files/a_fair_share_brochure_taxud_en.pdf

European Commission. (2018b). *Europe on the move. Sustainable Mobility for Europe: Safe, connected and clean.* Retrieved from https://eur-lex.europa.eu/resource.html?uri=cellar%3A0e8b694e-59b5-11e8-ab41-01aa75ed71a1.0003.02/DOC_2&format=PDF

European Commission. (2019). EU data protection rules [Text]. Retrieved 17 October 2019, from https://ec.europa.eu/commission/priorities/justice-and-fundamental-rights/data-protection/2018-reform-eu-data-protection-rules/eu-data-protection-rules_en

European Union. (2010). Directive 2010/40/EU of the European Parliament and of the C... - EUR-Lex. Retrieved 17 October 2019, from https://eur-lex.europa.eu/legal-content/en/LSU/?uri=CELEX:32010L0040

EUROSTAT. (2018). E-commerce statistics for individuals—Statistics Explained. Retrieved 30 September 2019, from https://ec.europa.eu/eurostat/statistics-explained/index.php/E-commerce_statistics_for_individuals

Fagnant, D. J., & Kockelman, K. (2015). Preparing a nation for autonomous vehicles: Opportunities, barriers and policy recommendations. *Transportation Research Part A: Policy and Practice*, *77*, 167–181. https://doi.org/10.1016/j.tra.2015.04.003

Firnkorn, J., & Müller, M. (2015). Free-floating electric carsharing-fleets in smart cities: The dawning of a post-private car era in urban environments? *Environmental Science & Policy*, *45*, 30–40. https://doi.org/10.1016/j.envsci.2014.09.005

Fraser Institute. (2019, September 12). Economic Freedom of the World: 2019 Annual Report. Retrieved 17 October 2019, from http://bit.ly/2ZQlfLQ

Fresner, J., Krenn, C., Morea, F., Alessandrini, S., & Tomasi, F. (2019). *Guidelines for the harmonization of energy and mobility planning*. Retrieved from https://www.eltis.org/sites/default/files/harmonisation_of_energy_and_sustainable_urban_mobility_planning.pdf

Goodall, W., Dovey Fishman, T., Bornstein, J., & Bonthron, B. (2017). The rise of mobility as a service: Reshaping how urbanites get around. *Deloitte Review*, (20). Retrieved from https://dupress.deloitte.com/content/dam/dup-us-en/articles/3502_Mobility-as-a-service/DR20_The%20rise%20of%20mobility_reprint.pdf

Goodwin, P. (2012). Three views on peak car. *World Transport, Policy and Practice*, *17*. Retrieved from http://eprints.uwe.ac.uk/16119/21/wtpp17.4.pdf#page=9

Hamari, J., Sjöklint, M., & Ukkonen, A. (2016). The sharing economy: Why people participate in collaborative consumption. *Journal of the Association for Information Science and Technology*, *67*(9), 2047–2059. https://doi.org/10.1002/asi.23552

Hermann, C., & Flecker, J. (2013). *Privatization of Public Services: Impacts for Employment, Working Conditions, and Service Quality in Europe*. Routledge.

Hopkins, D. (2016). Can environmental awareness explain declining preference for car-based mobility amongst generation Y? A qualitative examination of learn to drive behaviours. *Transportation Research Part A: Policy and Practice*, *94*, 149–163. https://doi.org/10.1016/j.tra.2016.08.028

International Tourist Arrivals Reach 1.4 billion Two Years Ahead of Forecasts | World Tourism Organization UNWTO. (n.d.). Retrieved 27 September 2019, from https://www2.unwto.org/press-release/2019-01-21/international-tourist-arrivals-reach-14-billion-two-years-ahead-forecasts

Lah, O. (2017). Sustainable development synergies and their ability to create coalitions for low-carbon transport measures. *Transportation Research Procedia*, *25*, 5088–5098.

LEVITATE consortium. (2019). Societal Level Impacts of Connected and Automated Vehicles. Retrieved 29 October 2019, from https://levitate-project.eu/

L'Hostis, A., Müller, B., Meyer, G., Brückner, A., Foldesi, E., Dablanc, L., … Langheim, J. (2016). *Mobility4EU deliverable D2.1: Societal needs and requirements for future transportation and mobility as well as opportunities and challenges of current solutions*. Retrieved from http://www.mobility4eu.eu/?wpdmdl=1245

Metz, D. (2013). Peak car and beyond: The fourth era of travel. *Transport Reviews*, *33*(3), 255–270.

Mobility4EU consortium. (2018). *Deliverable D2.3 Novel and innovative mobility concepts and solutions*. Retrieved from http://www.mobility4eu.eu/test_/?wpdmdl=2069

Moradi, A., & Vagnoni, E. (2018). A multi-level perspective analysis of urban mobility system dynamics: What are the future transition pathways? *Technological Forecasting and Social Change*, *126*, 231–243. https://doi.org/10.1016/j.techfore.2017.09.002

Pickup, Laurie. (2017). *Applying the MIND-SETS approach to mobility issues across Europe: Working with the stakeholders* (No. Deliverable 4.2). Retrieved from European Comission website: http://www.mind-sets.eu/wordpress/wp-content/uploads/2017/08/MIND-SETS_D4.2_final.pdf

Polis, & Rupprecht Consult. (2019). *Electrification- planning for electric road transport in the SUMP context*. Retrieved from https://www.eltis.org/sites/default/files/electrification_planning_for_electric_road_transport_in_the_sump_context.pdf

Rudolph, F., & Matrai, T. (2018). Congestion from a Multimodal Perspective. *Periodica Polytechnica Transportation Engineering*, *46*(4), 215–221. https://doi.org/10.3311/PPtr.12048.

Rudolph, F., & Werland, S. (2019). *Public procurement of Sustainable Urban Mobility Measures*. Retrieved from https://www.eltis.org/sites/default/files/public_procurement_of_sump_v2.pdf

Rupprecht, S. (2019). *Guidelines for developing and implementing a sustainable urban Mobility Plan, second edition*. Brussels: Eltis.

Schafer, A., & Victor, D. G. (n.d.). The future mobility of the world population. *Transportation Research Part A*, *34*, 171–205.

Schwanen, T., Banister, D., & Anable, J. (2012). Rethinking habits and their role in behaviour change: The case of low-carbon mobility. *Journal of Transport Geography*, *24*, 522–532. https://doi.org/10.1016/j.jtrangeo.2012.06.003

Sing, K. (2016). *Contribution on Smart Urban Mobility for Safe, Inclusive, Resilient and Sustainable Cities*. Retrieved from https://www.iru.org/sites/default/files/2016-10/0354_UN_Habitat_report_web-FINAL.pdf

The Ellen MacArthur Foundation, McKinsey Center for Business and Environment, & SUN. (2015). *Growth Within: A Circular Economy Vision For A Competitive Europe*. Retrieved from https://www.ellenmacarthurfoundation.org/news/circular-economy-would-increase-european-competitiveness-and-deliver-better-societal-outcomes-new-study-reveals

TRACY consortium. (2013). *Transport Needs for an Ageing Society. Action Plan.* Retrieved from European Comission website: https://trimis.ec.europa.eu/sites/default/files/project/documents/9767/final1-d5-4-3rd-summary-paper-action-plan-accessible.pdf

Transparency International. (2019, January 29). Western Europe and EU: Stagnating anti-corruption efforts and weakening democratic institutions. Retrieved 17 October 2019, from Www.transparency.org website: https://www.transparency.org/news/feature/cpi2018-western-europe-eu-regional-analysis

WBCSD. (2015). *Methodology and indicator calculation method for sustainable urban mobility*. Retrieved from WBCSD website: http://docs.wbcsd.org/2015/12/SMP2.0_Sustainable-Mobility-Indicators_ENG.pdf

Werland, S., & Rudolph, F. (2019). *Funding and financing of Sustainable Urban Mobility Measures*. Retrieved from https://www.eltis.org/sites/default/files/funding_and_finance_of_sump_v2.pdf

Wulf-Holger, A., Drews, F., Hertel, M., Langer, V., & Wiedenhöft, E. (2019). *Integration of shared mobility approaches in Sustainable Urban Mobility Planning*. Retrieved from https://www.eltis.org/sites/default/files/integration_of_shared_mobility_approaches_in_sumps.pdf

Zellner, W. (2014). *Threat perceptions in the OSCE area*. Retrieved from https://ifsh.de/file-CORE/documents/core_news/CORE_News_Spring_2014.pdf

Annex A: Checklist sent to cities for data availability

	Data	Data collection means (*)	Comments
Urban population & economy			
☐	Average monthly income of residents		
☐	City government annual revenues from transport related charges		
☐	City government annual operational costs related to city transport		
☐	Vehicle ownership rate (car, bicycle)		
Urban land use and accessibility			
☐	Land use shares (residential, recreational, commercial, etc.)		
☐	Population density		
☐	Spatial distribution of land uses		
☐	Land use for mobility applications (roads, stations, railways etc.)		
☐	Accessibility to key services (work, education, shopping, leisure)		
Urban traffic			
☐	Traffic volume/day (road traffic; cars and trucks)		
☐	Average speed of public transport vehicles		
☐	Average speed of road traffic		
☐	Delays in road traffic and in public transport compared to free flow travel		
☐	Accidents due to urban traffic (casualties, damages, cost)		
☐	Environmental (CO_2, PM, CO, NO_x) emissions in the urban area		

☐	Total energy use by urban passenger and freight transport		
☐	Noise emissions in the urban area		
Urban passenger & active transport characteristics			
☐	Number of trips per day per person		
☐	Average trip length per person		
☐	Average travel time per person/day		
☐	Vehicle occupancy for private cars		
☐	Average commute time to work/school		
☐	Length of bicycle paths and lanes		
☐	Number of passengers travelling by public transport/day (each mode)		
☐	Number of cycling trips/day		
☐	Number of walking trips/day		
☐	Number of car-sharing users per year		
☐	Number of bike sharing users per year		
☐	Security on public transport (number of crimes committed)		
☐	Vehicle occupancy for public transport vehicles		
☐	Public transport fares		
☐	Public transport reliability		
☐	Number of car parking spaces		
☐	Public car parking occupancy rates		
☐	Number of parking violations per year		
☐	Level of accessibility of public transport stops and stations		
Urban freight characteristics			

☐	Freight vehicle traffic volumes		
☐	Freight vehicle fleet per capacity category (<3.5t, >3.5t)		
☐	Number of freight trips in the urban area		
☐	Number of service trips in the urban area		
☐	Number of deliveries & pickups of urban freight vehicles		
☐	Average mileage & distance of deliveries		
☐	Cargo volumes delivered/picked in the urban area		
☐	Load factor of urban freight vehicles		
☐	Time utilisation rate of urban freight vehicles		
☐	Freight vehicle parking spaces & capacity		
☐	Freight vehicle parking occupancy rates		
☐	Freight vehicle parking violations		
☐	Own account vs third-party freight transport		