**The CIVITAS CAPITAL indicator set - and beyond**

Damian Stantchev a [[1]](#footnote-1), Henrik Gudmundsson b,Tom Rye a, Daniel Sauter c, Jimmy Armoogum d, Christian Rydén e

a Transport Research Institute, Edinburgh Napier University, Merchiston Campus,10 Colinton Road, Edinburgh, EH10 5DT, UK

b CONCITO, Kattesundet 4, 1458 Copenhagen K, Denmark

c Urban Mobility Research, Muehlebachstrasse 69,8008 Zurich, Switzerland

d IFSTTAR, 14-20 boulevard Newton, Cité Descartes, Champs-sur-Marne, 77447 Marne-la-Vallée cedex 2, France

e City of Lund, Department of City Planning, Brotorget 1, 221 00 Lund, Sweden

**Abstract**

The availability of data, and especially of reliable and robust indicators that can provide as comprehensive view of mobility in a city as possible, without requiring an enormous amount of data gathering, is crucial to the prosperity and competitiveness of cities. This research builds on the work undertaken by the CIVITAS Capital Data and Statistics Advisory Group (AG5).The authors of this paper took an active part in the discussions within AG5 and as a result produced a set of 28 indicators for sustainable urban mobility planning that most cities across Europe should be able to use. This paper presents the policy and literature background for European urban transport indicators in general as well as the process of deriving the specific indicator set proposed by AG5. In order to assess the practicality and appropriateness of these indicators, information was obtained from a number of cities across Europe, including Edinburgh, Copenhagen, Paris, Lyon, Stuttgart and Zurich. The results and feedback received from these cities is also summarised in this study. The consultation with a number of European cities have shown that collecting data for the full set of indicators would be a rather challenging task, mainly due to various resource constraints. Therefore, an initial attempt to prioritise the indicators has been made and is presented in this paper. Some of the pros and cons related to standardised urban mobility indicators for European cities compared to other approaches have also been briefly considered.

Key words: performance indicators; urban transport and mobility systems; performance measurement; European cities

1. Introduction and background to the study

Monitoring and evaluation of transport patterns and their impacts are important elements in urban mobility planning and delivery, from a technical as well as a political point of view. Data and indicators are helpful for planning and goal setting as well as for tracking progress towards objectives and targets. They are also essential for a structured learning and improvement process towards a more sustainable future as indicated for example in Sustainable Urban Mobility Planning (SUMP) guidance (Wefering et al. 2014; Burggraf et al. 2015), and in more general literature on sustainable transport indicators (Gudmundsson et al 2016).

While the rationales for the use of indicators for sustainable mobility planning are multiple, it may be less obvious to many cities where to begin, how to frame their approach, and which indicators to use. Establishing comprehensive indicator systems is time and resource consuming. There is a risk that such systems will not be maintained if the requirements or the utility for the city are not evident. Typical barriers for the effective use of monitoring in transport planning include lack of financial and staff resources, as well as gaps in technical knowledge (Burggraf et al. 2015). Cities do not start from the same level of experience or set of conditions. Moreover, somewhat competing definitions and priorities are found across indicator frameworks offered by various national, European, global, or independent bodies and programs, as described in studies such as Lopez-Lambas et al. (2011), Van Dijken (2012), Marsden et al. (2005), Litman (2015), and WBCSD (2015).

The CIVITAS Advisory Group on Data and Statistics (AG5) has sought to develop an indicator set that should balance the need to support sustainable urban mobility planning, taking into consideration what is useful and feasible for most European cities, regardless of whether they are more or less advanced in their mobility planning, which overarching frameworks they may commit to, or where they are located on the continent. Key desirable features of the proposed indicator set were defined as:

* Covering key aspects of sustainable urban mobility planning;
* Building links to European policy frameworks;
* Ensuring relevance for many cities;
* Offering realism and manageability for the cities;
* Allowing a quick start.

The first draft indicator list produced by AG5 was based on consulting literature on data requirements for sustainable urban mobility planning as well as existing or proposed indicator sets (e.g. Steenberghen 2013; Van Rooijen and Nesterova, 2011). Additional sources have been identified and considered in the process. The paper will not report in detail on all the indicator sets identified, but will reflect on their diversity and similarities.

After reviewing the literature, a consolidated list of indicators was prepared by the AG5 members and presented to selected European cities. In-depth interviews based on a pre-defined questionnaire were conducted with representatives of five cities. Research aimed to investigate whether cities have access to data sources for the proposed indicators, whether these indicators would be well matched to their planning goals and monitoring programs, and how cities were already using indicators for decision support or communication purposes. The proposed set was also discussed with urban mobility stakeholders at the CIVITAS Forum in October 2015. These consultations revealed, amongst other things, that even experienced cities would find it challenging to fully adopt the initially proposed indicator set.

A prioritisation exercise was then conducted. Indicators were grouped under main topics considered as fundamental for any sustainable urban mobility planning effort, and scores were attached to the different candidate indicators for each topic using criteria derived from relevant literature. The proposed list of indicators was subsequently organised into ‘Core’ and ‘Additional’ indicators based on the assessment.

1. Literature review

Two sets of literature sources have been reviewed to support the development of an indicator set that can fulfill the desired characteristics listed above in section 1:

* Material on European policy frameworks for sustainable urban transport and mobility; and
* Literature on how to develop, select and apply an indicator set that could be useful and manageable for European cities.
  1. European policies, frameworks and indicators

Urban transport and mobility is a relatively recent concern for Europe where policy-making is facing a complex reality, involving many issues (May 2013, Bernardino et al. 2015). European level goals and strategies addressing urban mobility have been developed within transport policy but also, directly or indirectly, in policy frameworks for environment, climate change, urban and regional development, as well as other areas (European Parliament 2015a; European Commission 2014; 2013; 2011). The emerging European Urban Agenda where ‘urban mobility’ is highlighted as one of 12 main themes will especially aim to ensure that cities play their role in delivering European policy objectives (European Parliament 2016). However, a key observation is that conditions, resources and ambitions for urban transport and mobility differ among the various regions in Europe. To obtain legitimacy, a European level approach to urban mobility policy and planning has to take account of diversity as well as principles of subsidiarity (Gudmundsson et al, 2015, European Parliament 2015b, Debyser 2014).

The basic European framework for urban transport policy and the use of associated indicators is the Sustainable Urban Mobility Planning concept. A SUMP is a strategic document aiming to satisfy the mobility needs of people and businesses in a city and its surroundings with an aim to improve quality of life. According to Wefering et al (2014) minimum objectives for a SUMP should be to:

* Ensure all citizens are offered transport options that enable access to key destinations and services;
* Improve safety and security;
* Reduce air and noise pollution, greenhouse gas emissions and energy consumption;
* Improve the efficiency and cost-effectiveness of the transportation of persons and goods;
* Contribute to enhancing the attractiveness and quality of the urban environment and urban design.

A SUMP is supposed to be based on a long-term vision for the city, a clear implementation plan and a participatory approach. It is also important to ensure a balanced and integrated development of all transport modes and to be concerned with all three pillars of sustainability, including social, economic and environmental impacts (Bakker et al. 2014; Wefering et al. 2014). It has to be noted, however, that European member states and cities are not at the same page as a few cities are already advanced, some are engaged in their first SUMPs, while many have yet to take the first steps (Rupprecht Consult and Edinburgh Napier University 2012).

Regular monitoring, review and reporting are essential components in any SUMP, pointing to a need for indicators. Indicators can be useful in all phases of a SUMP planning process, including Preparation, Goal setting, Elaboration, Implementation and Assessment. While SUMP’s need to be tailored to the local circumstances as well as the development stage of each city, there are many features and challenges that are similar for cities throughout Europe and therefore also create the basis for a common indicator reference.

Until now there is not one unified indicator set that addresses all the measurement and monitoring needs for urban transport and mobility planning in Europe. A large number of frameworks and initiatives contribute to the identification of topics and potential indicators for monitoring related to urban transport.

Some frameworks have been developed from a bottom-up perspective, driven by the needs of groups of local authorities. An example is the network BEST (Benchmarking in European Service of Public Transport) where six cities in five countries have defined standardised indicators to measure, compare and report the satisfaction of citizens with the regional public transport service (<http://www.best2005.net/>). Other transport and mobility measurement frameworks have been developed for e Europe-wide scope within projects such as Ecomobility Shift, ENDURANCE, CONDUITS and SUNRA, targeting for example the performance of Mobility Management plans, or ITS systems, or sustainable road management. Other initiatives again with a thematic focus have been driven by international organisations or partnerships such as the Covenant of Mayors, addressing climate policy measures, or Walk21 with attention to pedestrians. These initiatives and several others contribute to make different features of urban transport measurable for cities using quantitative or qualitative methods.

There are a number of more generic frameworks for general urban statistical or policy purposes at the European level, such as the ‘City Statistics’ (formerly ‘Urban Audit’) operated by Eurostat (Feldmann 2008), the ‘Reference Framework for European Sustainable Cities’ (RFSC) within Regional policy (van Dijken et al. 2012), or the ‘European Green Capital Award’ (EGCA) managed by DG Environment (Gudmundsson 2015). These types of frameworks cover broad, comprehensive performance agendas where urban transport and mobility are represented with a subset of indicators. Some directly transport related indicators within these initiatives are illustrated in Table 1.

These are all voluntary frameworks that do not cover all cities but they are still important here, not least due to the high policy relevance of the measured topics and the efforts that have been made to identify indicators, associated data sources, calculation methods, etc. that should be applicable in cities throughout Europe. However, indicators are not fully aligned across these initiatives, in part due to the specific aims set for each framework.

A more comprehensive, forward-looking review of potentially relevant European urban transport indicators is presented by Steenberghen et al. (2013).

Table 1. Directly transport related indicators in three different European urban indicator frameworks.

|  |  |  |
| --- | --- | --- |
| **City Statistics (Urban Audit)** | Reference Framework for European Sustainable Cities (RFSC) | European Green Capital Award (EGCA) |
| ***Transport system features*** | | |
| Number of private cars registered | Number of personal cars per adult |  |
| Length of bicycle network (dedicated cycle paths and lanes) | Bicycle lanes and paths proximity | Length of cycle lanes (meter/inhabitant) |
|  | Percentage of pedestrian streets and walkways |  |
|  | Accessibility to public transport stops | Population living within 300 metres of hourly public transport service |
|  | Roads maintenance |  |
|  | Investment in transport infrastructure |  |
| ***Travel patterns and behaviour factors*** | | |
| Share of journeys to work by mode | Traffic modal split for persons | Share of journeys under 5 km made by private car (%) |
|  | Modal split of freight transport |  |
| Average time of journey to work (minutes) | Congestion index |  |
| Average length of journey to work by private car (km) |  |  |
| People commuting in and out of the city |  |  |
| Cost of a combined monthly public transport ticket in the central zone | Passenger transport prices |  |
| Cost of a taxi ride of 5 km to the centre at day time |  |  |
| Satisfaction with level of public transport services | Satisfaction with level of public transport services |  |
| ***Transport impacts*** | | |
| Number of deaths in road accidents |  |  |
|  | Transport energy consumption | Transport ton CO2/inhabitant |
|  | Traffic light using LED |  |
|  | Number of companies with Green Travel Plans |  |
|  |  | Share of buses classified as low emission vehicles (%) |

Note: Indicators with similar content are listed side by side. Very few are exactly identical across frameworks. Each framework contains several other indicators that may be of indirect relevance for transport monitoring, such as air quality levels, GHG emissions, noise levels, or expenditures of households, not shown here.

Sources: Websites of the respective frameworks, accessed March 2016, except for EGCA (Gudmundsson 2015)

The European Commission has announced that it aims to set up an Urban Mobility Scorecard that will be based on harmonised indicators to compare the progress of urban areas, drawing in part from some of the sources mentioned in this section (European Commission 2013). The scorecard is currently in the planning phase. It will primarily be a tool to be applied by the Commission itself to compare and report on progress for European goals and strategies, not directly to assist cities in their own planning efforts.

* 1. Identification and selection of indicators

There are many topics associated with urban mobility that potentially need an indicator and many types of indicators to potentially apply. There is an extensive literature on the design and selection of indicators in general, and a growing one on choosing indicators for sustainable transport planning in particular, see for example Marsden et al. (2005), Litman (2015), Castillo and Pitfield (2010) and Olofsson et al (2015). Joumard and Gudmundsson (2010) propose that indicator sets (in general and for sustainable transport) are built, based on three broad types of criteria, namely Representation, Operation, and Application.

Starting with *Application* this refers to the relevance and applicability for policy and decision making of an indicator, in other words to what extent it reflects key concerns, policy objectives, and specific strategies of the city. Urban mobility objectives and associated indicators may seek to reflect main aims defined in European and national frameworks (as illustrated in section 3.1), but should primarily be focused on the concerns of the particular city. Steenberghen et. al (2013) surveyed a number of city representatives and identified the following six typical concerns in regard to urban transport (in the following order): Environmental protection, Transport system efficiency, Energy savings and climate change mitigation, Social cohesion, Safety and security, and Public health. Toth-Szabo and Várhelyi (2012), consulting cities as well as literature, also identified six topics, namely Efficiency, Accessibility, Safety, Liveability, Emissions, and Resource use. These six topics were also chosen to cover all three sustainability dimensions. The two sets of topics have clear overlaps. Whatever the set of topics chosen, for each such topic multiple indicators may be considered, where some indicators could point directly to one impact (e.g. GHG emission from transport per capita pointing only to Climate Change) whereas others could be more indirect measures for several different topics (e.g. travel speeds indicating aspects of efficiency, safety, and environment). The first step will be to define or identify those concerns and objectives that are in the main interest for the city, and then seek to define an operational and representative set of measures for them. For the indicators presented in the following section of this paper, all of the topics areas mentioned here were considered.

*Operation* type criteria refers to exactly this, namely the practical measurability of the topics and the availability and cost of collecting and processing the data. It is not helpful to elaborate ambitious visions for ideal outcomes, only to find out that data to monitor them would be prohibitively expensive or demanding in manpower. Another operational problem can be ethical concerns that will limit the public use of data, for example for privacy reasons. So the city should not pick more indicators than it can manage to produce on a regular basis. The more frequent problem, however is if cities become too occupied with the operational side, and restrict themselves only to indicators that are already available and measured, even if these are not necessarily sufficient or precise to measure results for adopted goals, or important emerging concerns. For example, to monitor for ‘Transport efficiency’ only using available measures of automobile flows (Litman 2003). There is obviously a balance between a too demanding and a too complacent approach to indicator selection. For the indicator set presented in the following section we considered only indicators that are reasonably operational at the city level.

*Representation* are criteria that can help avoid the use of inadequate variables as indictors. It refers to aspects of the quality of the indicator itself, to what extent it is a valid and reliable measure of whatever concern it addresses. Indicators are not complete scientific models of the world, and there will always be limitations to how precise a representation can be given for a topic like sustainable urban mobility. However, for each topic to measure it is necessary to reflect on the validity in order not to draw false conclusions for policy and planning. Sensitivity is a related criterion. If a problem changes (e.g. satisfaction with public transport deteriorates), but it is not shown in the indicator (e.g. frequency of public transport service according to time table remains the same), it may be because the indicator is not sensitive enough (i.e. another cause than timetable frequency cause dissatisfaction). For the indicators presented in the following section of this paper, we have considered how representative each indicator is for key urban mobility concerns, also when ranking several potential indicators for a shorter list.

Another concern is what *type* of indicators to use. For some topics or objectives it is possible to establish clear quantitative indicators, which is often an advantage in terms of comparison over time and accurate monitoring of progress. Sometimes, however, partly qualitative indicators are needed, for example to assess issues like satisfaction or the quality of strategies and plans. Within quantitative indicators absolute numbers may be helpful to describe a trend, but it is often more useful to introduce normalized or relative indicators to compare performance with other cities, or normative indicators where the indicator is divided by a performance target level (e.g. distance to desired level of accidents). The indicators in the proposed set can easily be made into relative or normative measures by a city. Annex 1 provides an example of the detailed guidance for each indicator as presented in the AG5 report.

Finally, it is relevant to consider what phase of the planning is concerned, e.g. measuring factors that contribute to a *cause* of a problem (say, rising car ownership) or factors that describe the resulting *effects* (say, the level of air pollution) . The former is most relevant to support planning to intervene or prevent problems from arising in the first place, whereas the latter is most relevant to reveal if initiatives or trends actually have an impact on the key concerns for sustainable mobility. Obviously, an indicator set can contain indicators for both ‘ends’ of the cause-effect chain, as well as measures in between. One way to group indicators according to cause-effect type chains is to distinguish between input, output and outcome indicators (intermediate and final) (see for example the Assessment Model for Measuring Walking, Sauter and Tight 2010). Input indicators report on resources or efforts invested in the transport system (e.g. budget share for cycling infrastructure), outputs is the actual delivery (e.g. km of new lane) where outcome can be the share of the population using bicycle, or as final outcome the health impact (e.g. reduced obesity due to physical activity). If regularly collected such a set of indicators can be a powerful tool to analyze the effectiveness and results of adopted policies and to climb up the learning curve. However, a complete representation of the full set of urban transport system interactions is not realistic, or not an ‘operational’ ambition in the former terminology, choices need to be made.

The measures that will be proposed in this paper include indicators across the causal chain, including indicators that can help understand the cause of problems (e.g. use of space for parking, and cost of public transport) as well as ones that reveal the impact of transport or the outcome of policies (e.g. retail activity, or air quality).

1. The process of deriving the indicator set and consulting selecting European cities
   1. The process of deriving the indicator set

Building on the concepts presented in the previous section, the main role that was envisaged for AG5 was to provide some practical guidance to cities on how to use data and statistics for evidence-based decision-making. The group’s remit was to complement but not duplicate the European Commission’s work on the Urban Mobility Scorecard, as the latter would be more a tool to assess the quality and performance of cities’ mobility policies, whilst this group’s work would be more focused on what cities need and can do with respect to a greater use of data and statistics in their actions on urban mobility.

The experts first contributed by putting themselves in the position of a city that might want to know more about using data and statistics. A brainstorming session was conducted in order to translate the theoretical considerations in the indicator literature (section 2) into practical questions for data use in urban planning. The results of the brainstorming exercise are shown below and can be helpful to inform the content of any guidance that the European Commission might produce on the topic:

* What data should I gather?
* From the very large menu of possible indicators – what is a real priority to gather? For example, of the following, which should be a priority? Number of trips per person per weekday, daily mileage, household motorisation, commute trips by mode, characteristics of longer trips, danger reduction
* How precisely are indicators defined – and how do I communicate that?
* What methodology should I use? How often should data be gathered – on a one-off basis, or more regularly?
* What should I use the data for?
* What skills do I need to analyse and present the data?
* Can we use what we are already doing in data collection?
* Where do I keep the data and how do people access it – both city employees, and others?
* How much will it cost, how long will it take?
* Is there someone (a company) who could gather it for me?
* Where can I see data from other cities? And what constitutes ”good” performance in these data?
* How can I communicate the data to politicians and general public?

The main outcome of the work of AG5 was a short document (a brochure) that cities could use to guide them in the collection and use of data. The aim of this guide is to provide a set of simple, easy to use indicators that cities can utilise to measure how well their transport system is performing. Data gathering regularly has main advantages. For example, it can show if objectives are achieved, if what is supposed to function, does function, and to show politicians and citizens that their city is improving.

During the brainstorming phase, AG5 members generated a list of indicators. This process was based on literature review (see section 2), experts’ pre-existing knowledge of the field and, in the case of Lunds Kommun, the City’s own use of indicators to develop and monitor its own mobility policy.

The group’s discussions resulted in the preparation of a list of 28 indicators grouped into different sub-sections, that were included in the brochure. Each of the indicators was presented in the same format. First, a definition was provided along with a summary of the urban mobility objectives that it is related to. Then some information was included on how to gather the necessary data and how often, as well as the costs of so doing. Finally, examples were given of cities that have gathered such data already and how they have used it. An example of an indicator description is included in Appendix A. One of the biggest challenges was to provide clear and unambiguous descriptions and definitions. Since the context in each city is so different, it is difficult to leave the descriptions general and open enough and yet be sufficiently precise so that each city knows exactly what to measure.

Table 2: Grouping of indicators (before prioritisation)

|  |  |
| --- | --- |
| No | Indicator |
|  | ***Travel Patterns*** |
| 1 | Modal split |
| 2 | Trip lengths and travel time by different modes |
|  | ***Accessibility*** |
| 3 | Density (land use) |
| 4 | Accessibility to key services |
| 5 | Distance from home to nearest public transport stop |
|  | ***Speed and safety*** |
| 6 | Traffic calmed and car-free/pedestrianised streets |
| 7 | Percentage of vehicles speeding |
| 8 | Safety – people killed and seriously injured in traffic collisions |
|  | ***Walking*** |
| 9 | Extent of off-street walking path network |
| 10 | Accessibility of outside built environment |
|  | ***Cycling*** |
| 11 | Extent of on-street cycle network |
| 12 | Bike ownership |
| 13 | Bike sharing bikes and stations per capita |
|  | ***Public Transport*** |
| 14 | Public transport service per head of population |
| 15 | Cost of public transport |
| 16 | Peak PT speed related to car speed at peak times |
| 17 | Public Transport reliability |
|  | ***Cars and parking*** |
| 18 | Use of space for parking |
| 19 | Parking cost |
| 20 | Car ownership |
| 21 | Car share cars and stations per capita |
|  | ***Social impacts/Liveability*** |
| 22 | Citizen satisfaction with transport system |
| 23 | Health (physical activity) |
| 24 | Footfall in shopping areas |
|  | ***Environmental impacts*** |
| 25 | CO2 emissions from personal transport per capita |
| 26 | PM10 (particulates) |
| 27 | NO |
| 28 | Noise |

* 1. Consulting selected European cities

In order to assess the practicality and appropriateness of such a system of indicators, several cities across Europe, including Edinburgh, Copenhagen, Paris, Lyon, Stuttgart and Zurich, were consulted about their views on the indicator set and their use in general of such indicators. This was done by means of a questionnaire and face-to-face interviews with city representatives (or appointed representatives) by the AG5 experts. The results and feedback received from these cities is summarised below.

* + 1. Existing data collected by the cities in comparison to the CAPITAL indicator set

The cities interviewed collect data on a number of indicators either by themselves or through other organisations. A wide range of methods and sources for data collection are used, such as questionnaire surveys, automatic or manual counts, calculations based on mapping or other input, registry and general statistics.

Even though there are quite a few similarities in the ways cities collect data, the responses are very specific to each city.

Overall it is a clear finding and important to note that the interviewed cities currently gather a narrower range of indicators than that set out in the indicator set developed by the AG5. Most cities gather data together with other agencies in their respective region or use disaggregated national-level data. Taken all data sources together, only the three cities of Stuttgart, Copenhagen and Zurich gather data related to more than half of the indicators in the AG5 indicator set – although often not in the same format as that proposed by AG5.

Main areas where data are gathered/available among the six cities include:

* Safety (collisions, casualties)
* Public Transport supply
* Air quality
* Car ownership
* Mode split
* Bike stations, car club cars
* Length of pedestrianised, traffic calmed streets
* Cost of PT
* Cost of parking
  + 1. Collection of data that are not covered by the AG5 indicators

Some of the cities interviewed collect data that are not covered by the list of indicators included in the brochure produced by AG5. Specific examples include the city of Zurich which collects bicycle and walking data based on around 20 automatic bicycle and as many pedestrian counters as well as data on bicycle parking and data related to the walking network and its infrastructure (e.g. inventory of benches). Some of these data are collected only for internal purposes.

The city of Edinburgh collects the following additional data: length of bus lanes, number of PT passengers per year, annual city centre passenger and pedestrian cordon count, numbers of paid on-street parking acts per year, number of parking fines per year, number of parking fines appealed (successfully), number of people slightly injured, queues at traffic signals. It also has access to automatic vehicle location data for main bus operator’s vehicles meaning that it has a record of the journey time of every single bus vehicle trip undertaken in the city by this operator.

* + 1. The number and scope of indicators seen as necessary to collect

The general view of the cities was that the proposed range of indicators is interesting but rather too large and that it could therefore be too expensive and complex to collect. However, Stuttgart and Zurich did agree that 20-30 indicators are a good number if a comprehensive picture of the city’s mobility system is to be obtained. Specific comments were as follows:

* Paris collects a large set of indicators and for this reason they would not use the proposed set of indicators.
* Lyon mentioned that the indicators were too complicated to collect and would be put off by the frequency of data collection.
* Zurich mentioned that one important issue for them would be communication if they adopted the indicator set. They already have their own set and only communicate a limited number of indicators. They would not publish further indicators but may possibly use them internally.
* Edinburgh said that it seems many indicators are quite expensive to collect and it is not totally clear what they would do with the data if they had it – with the possible exception of those related to accessibility and access to services, and CO2. They felt that the data they have gives them a sufficient idea of their progress against the SUMP objectives.
  + 1. Main reasons for collecting data and the ways in which it is used

The main motivations of cities for collecting the data are statutory requirements (Paris, Lyon), monitoring or controlling requirements (to measure the progress of Zurich’s “Stadtverkehr 2025” mobility strategy), data requirements (to get basic figures for operating and planning the transport supply in the city of Stuttgart) and monitoring longer-term impacts of policies (Edinburgh). Copenhagen also collects data to inform and engage the public in urban policy, e.g. through ‘green accounts’. In this sense there is a commonality between most cities – they are collecting data to understand how to plan the city’s transport system, and then to see whether or not their policy objectives have been achieved.

The AG5 was interested to understand what the cities interviewed actually do with the data that they already collect. Clearly, a possible use of a standard set of indicators is the ability to benchmark one’s performance against that of other cities, whilst a set of indicators specific to one city only permits that city to monitor its progress internally, over time, in relation to its own objectives. The majority of cities interviewed use their data primarily for the second of these two purposes, as is confirmed by the following individual responses:

* No benchmarking is done because the challenge is to find comparable territories – and how to characterize these territories (Lyon);
* The data is used mostly internally. Benchmarking would be nice but the indicators are rarely comparable due to different contexts, definitions, situations and backgrounds of and within the cities. Even between Swiss cities the data is very difficult to compare on a fair basis (Zurich);
* The data is only used internally (Stuttgart);
* The data is primarily used internally and for SUMP monitoring. Benchmarking rarely is a major issue (Edinburgh).
  + 1. The most important indicators for a city

Cities were asked their views on the highest priority indicators. In general, outcomes and impacts such as mode split and environmental impacts were seen to be of high importance. Zurich is also very interested in the use of public transport and travel by bike. Specific points raised were as follows.

* Mobility description (Paris)
* Depends on the objective we want to achieve. The issue of pollution or greenhouse gases, we should look to all sectors that also pollute in order to have a global vision. (Lyon)
* Mode split is the most important indicator. Important are also (2) footfall and bicycle counts, particularly the developments over time; (3) public transport: punctuality, catchment and (4) environmental aspects: crashes, noise, pollutants. (Zurich)
* Transport demand, environmental data (Stuttgart)
  + 1. Funding to collect the data

The general pattern is that cities pay themselves, but if there is a survey that is the responsibility of a higher level of government, then that government body pays, sometimes with a contribution from the city for an increase in local sample size (as for example for Copenhagen). In France there are specific state contributions for the collection of household travel survey data. In the cases of Paris and Lyon, the local authorities pay for the data (and the analysis) with a contribution from the state. Unlike these two French cities, the city of Zurich pays for all data collection and processing. It contributes to the national travel survey by enlarging the sample. The main costs of that survey are paid by the federal government. The Region of Stuttgart (VRS) pays for data collected within the region, including therefore data collected from residents of the City of Stuttgart. In Scotland, mode share data collection is financed by Scottish Government but with a contribution from the City of Edinburgh to boost sample. Census is paid for nationally. All else is paid for by the City of Edinburgh.

* + 1. Storage and availability of data

The AG5 team sought to understand whether cities not only collect data, but also store it in a “location” and format that makes it accessible to other professionals and potentially also to the public – so-called “open data”. The tendency, with some exceptions, is that although in principal there are some provisions in place for storing the data in a central data bank, this has not been fully done yet. The data is also only partially accessible by the public. The following specific responses were obtained from the cities:

* No storage, but it can be done (as all the data files since the beginning are available) (Paris)
* Yes, there is a central storage (Réseau Quételet) with a systematic approach to archiving the data if the city accepts the financial contribution from the state (Lyon)
* Yes, there is central data bank (TAZ Datenbank) and a systematic approach to archiving the data (Zurich)
* There is a partial storage (Stuttgart)
* No storage (Edinburgh)
* Has created Open Data website with some transport data (Copenhagen)

The public availability of the data still remains an issue as no open data policy is in place as reported by Paris, Lyon and Stuttgart. Nevertheless, anonymized data are available for researchers (Paris and Lyon) and raw data on bicycle counts are public in Zurich. The City of Zurich intends to increase data availability in the future, and currently there are plans to make the data on parking spaces for cars and bicycles available to the public. In the case of Edinburgh, data are published periodically in the regular updates of the city’s Local Transport Strategy. Copenhagen publishes its indicators in a biennial cycling monitor document, and in their Green Account, and is also pioneering an Open Data site (http://data.kk.dk/).

1. Prioritisation and consolidation

The interviews with a number of cities across Europe have shown that collecting data on a regular basis for all indicators is an almost impossible task, mainly due to various resource constraints. Therefore, there is a need to prioritise the indicators for which data need to be collected.

To reduce subjectivity and improve the usefulness of the indicators, the authors proposed that this prioritisation should follow a set of criteria and should take into consideration the characteristics of each individual city, such as size, level of economic development, political governance and history. The individual characteristics of a city are important as they will inevitably place different priorities and pressures on the need to collect data for each of the indicators.

The prioritisation is a subjective task and is inevitably based on individual preferences, choices, influences, expert knowledge. That is why a set of criteria for prioritisation has been produced, as shown in Table 3.

The issue of subjectivity is exacerbated even more if the selection has to be made across the entire set of indicators. Therefore, the indicators have been divided into the following 9 groups already in an earlier stage, as shown below:

1. Travel patterns

2. Accessibility

3. Speed and safety

4. Walking

5. Cycling

6. Public transport

7. Cars and parking

8. Social impacts/Liveability

9. Environmental impacts

To ensure that each of the reference categories are represented, at least one indicator per group should be selected. In this way, the prioritisation exercise is carried out among a more limited number (typically 3-4) of indicators within each group, which also to an extent alleviates the issues arising from the inevitable subjectivity during the selection process.

The requirement to select one indicator per category does not only ensure full coverage of the entire range of topics, but also satisfies the criterion on having all modes represented (since there are modal categories), and (partly) the one of having sustainability dimensions represented.

Table 3: Criteria for prioritisation

|  |  |
| --- | --- |
| No | Criterion for prioritisation |
| C1 | Relevance for one or more of the three impact dimensions of sustainability (environment, social, economic), or measuring key transport system features (which are precursors of those impacts) |
| C2 | Representation of all urban modes, especially SUMP compatible modes such as walking, cycling and public transport, bust also motor vehicles and freight distribution that need to be managed |
| C3 | Alignment with data and indicators that many cities use already |
| C4 | Easy data collection, preferably with standard concepts and methods |
| C5 | Actionability and decision relevance for a city, including for urban planning, financial allocation, and communication |
| C6 | Support reporting for key European urban transport policy goals, such a GHG emissions, fuel mix of vehicles in use, traffic safety, congestion, ICT/ITS deployment |

To counterbalance the unavoidable subjectivity during the selection process, the prioritisation exercise should not be conducted by one person but by a group of experts. It is proposed that a panel is appointed to do the scoring, comprising ideally of academic experts and practitioners in urban planning.

For the purposes of this research, a pilot exercise of the prioritisation was undertaken by the AG5 experts (a mixture of consultants and academics from different European cities and countries) and resulted in selecting one indicator with the highest score within each category, as shown in Table 4.

Table 4: Indicators with the highest scores within each category as a result of the joint prioritisation process

|  |  |
| --- | --- |
| Category | Indicator with highest score within category |
| *Travel Patterns* | Modal split |
| *Accessibility* | Density (land use) |
| *Speed and safety* | Safety – people killed and seriously injured in traffic collisions |
| *Walking* | Accessibility of outside built environment |
| *Cycling* | Extent of on-street cycle network |
| *Public Transport* | Public transport service per head of population |
| *Cars and parking* | Car ownership |
| *Social impacts/Liveability* | Citizen satisfaction with transport system |
| *Environmental impacts* | CO2 emissions from personal transport per capita |

To complete the prioritisation exercise, a simple matrix was used and each of the indicators was assessed on a 1-5 scale (where 1 is poor fit and 5 is best fit) to see how well each of the indicators corresponds to each of the criteria. A score for each of the indicators was obtained and the ranking of indicators within each group was also derived.

An example of the prioritisation is shown in Figure 1 below.

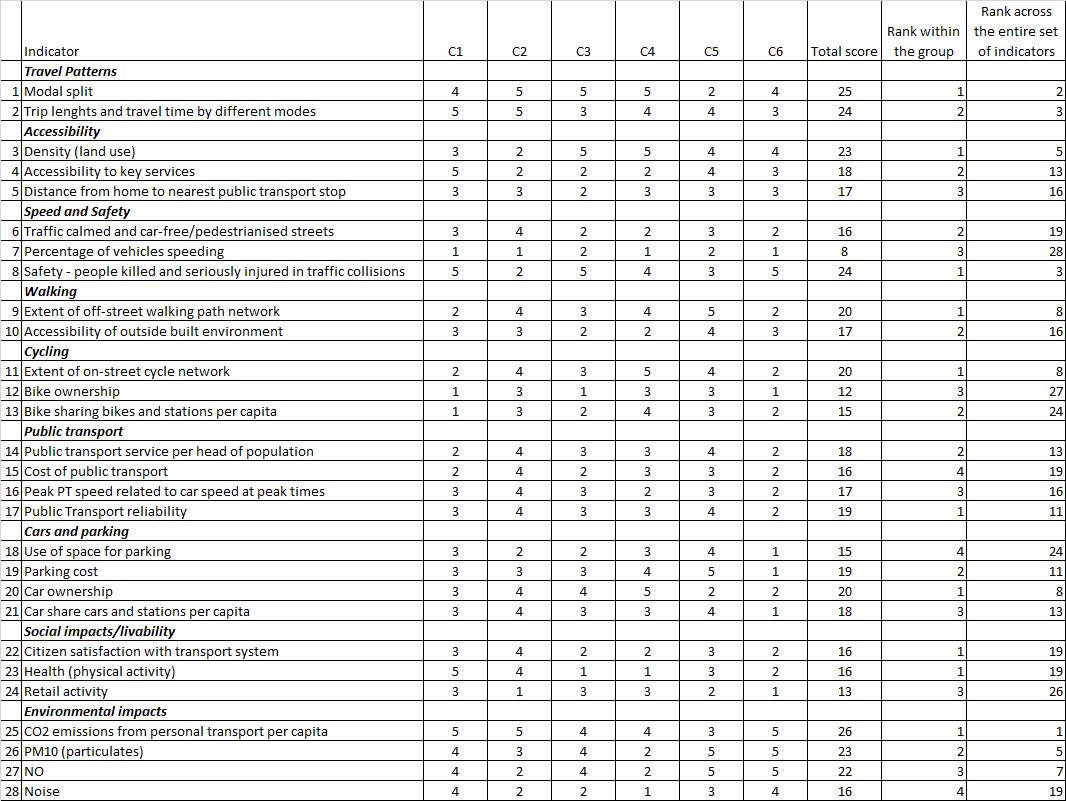


Fig. 1. An example of the prioritised indicators

The scores between the four experts were not identical, but almost unanimous when it came to selecting the indicator with the highest score within each category. The ranking across the entire set of indicators resulted in much more random and diverse scores, which confirmed the initial assumption by the team that the prioritisation would be more accurate if performed within each category group.

It should also be noted that cities in principle can derive their own set of top indicators. This approach, however, although it can be beneficial to individual cities, would not allow benchmarking against other cities to be performed due to the lack of consistency in priorities related to data collection and analysis. If cities do not collect data on the same or at least very similar prescribed set of indicators and monitor and analyse the data over a sufficient period of time, it is clear that any robust comparisons between cities become rather difficult or even impossible. Which approach would cities take will of course depend on their individual needs and preferences.

1. Conclusions

The review of policy and indicator literature as well as the interviews with cities have shown that clear reasons exist to gather data to track and use a set of urban mobility indicators in Europe. Cities acknowledge that the availability of reliable and robust indicators that can provide as comprehensive view of mobility in a city as possible, without requiring an enormous amount of data gathering, is crucial to their planning, management and communication needs. To address that requirement, the CAPITAL Advisory Group on Data and Statistics (AG5) has developed a coherent set of indicators in a transparent process which has been described in this paper.

This study has shown that the cities interviewed do collect at least some data either from primary or secondary sources and produce a range of sustainable mobility indicators. There are similarities, but also important differences in the way they collect, use and store the data. Most cities use the data internally and these are partially available to the public. Cities also reported some gaps in the data collection and its archiving in a systematic way.

It has transpired that most cities interviewed produce indicators in addition to the set listed in the brochure produced by AG5. The City of Edinburgh was the one that collects by far the largest number of indicators not mentioned in the brochure. On the other hand, other cities such as Zurich and Copenhagen along with other agencies in their region collect data that relates to a quite high proportion of the indicators produced by the CAPITAL Advisory Group. However, not all data that is collected by cities can be easily applied to the set of indicators listed in the brochure.

Collecting data for all indicators was seen as an almost impossible task, due to various resource constraints. In practice even ”leaders” or ”champions” of sustainable transport gather far less than the full set included in the brochure. Therefore, the need to prioritise the indicators for which data is collected was identified. Furthermore, it was concluded that this prioritisation should follow a set of criteria and should take into consideration the characteristics of each individual city. An attempt to prioritise the indicators using a set of criteria and a worked example was reported in this study. It would be very useful to conduct similar exercise involving larger groups of experts and stakeholders, for example involving groups of cities with similar characteristics.

A possible use of a standard set of indicators is the ability to benchmark one’s performance against that of other cities. However, this research found little interest from cities in benchmarking. Although cities would like to get an idea about their own performance, it was acknowledged that benchmarking is difficult because of the different contexts of the cities that cannot properly be reflected in the existing set of indicators. Some local political influences that affect the process of communicating the indicators to the public were also reported.

The proposed set of indicators may therefore be helpful primarily in providing cities with knowledge of how they can establish their own monitoring system and in helping them to identify how to use these indicators for at least internal purposes. While it would be highly desirable that cities adopted the proposed indicators and published the collected data, the reality is that some cities already have their own indicators, others do not want to change their definitions and still others only want to communicate their own limited set of data.

In a wider context, indicators are building blocks within wider planning frameworks and decision-making processes. A standard indicator set provides only limited support to cities in their combined efforts to manage and improve their transport systems. Other projects are proposing more extensive frameworks and tools for sustainable urban mobility planning, where indicator sets are one of the components. Recent examples include the study on European Urban Transport Roadmaps 2030 (<http://urban-transport-roadmaps.eu/>) and the Sustainable Mobility 2.0 project of the World Business Council on Sustainable Development (http://www.wbcsd.org/work-program/sector-projects/mobility.aspx). These types of frameworks clearly provide more extensive guidance for cities than a mere indicator set. However, it may also be relatively demanding in terms of time and resources for cities to fully adopt such frameworks and utilize the associated planning, and evaluation tools. It is not our purpose to judge to what extent cities will gain more in terms of communication or decision making capacity by adopting broader frameworks and tools, if at the same time loosing resources and flexibility. However, we believe that a standard set of proposed indicators can be an easy and helpful starting point for many cities, even if they should decide to acquire or otherwise gain access to more comprehensive urban mobility planning systems and services in the future.

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1. An example of an indicator

**Indicator: Extent of on-street cycle network**

**Definition**

Percentage of urban roads with speed limits of 40 km/h or more with segregated cycle facilities alongside or on close parallel routes providing similar journey times.

**Purpose and link to objectives**

An extensive on-street cycle network in a city should provide users with direct, convenient and safe routes, minimising unnecessary delay and effort in reaching their destinations. It also contributes to improving the image of cycling and allows more people to make use of more environmentally-friendly modes such as walking and cycling that are more suited to shorter distances than the car. The positive health aspects of cycling should also be considered.

**How to gather data and derive indicator**

Most easily done via GIS. If GIS data is unavailable or difficult to obtain, a manual survey or manual measurement from maps can be conducted instead.

**Ease and cost of gathering data**

The data are not problematic to gather but the ease is increased if GIS is available.

**Example of how such data has been used previously by cities**

Some data related to this indicator, from Copenhagen, is shown to the right. The data are used to track progress in infrastructure development.

**Further information and related examples**

The example below is from the city of Copenhagen. This does not show the percentage of the road network paralleled by cycleways, but it does show the growth of the network over time.

***Fig 08.1 – Cycle data CPH***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***OTHER KEY FIGURES*** | ***‘96*** | ***‘98*** | ***‘00*** | ***‘02*** | ***‘04*** | ***‘06*** | ***‘08*** | ***‘10*** | ***‘12*** |
| **Cycled kilometres**  (mil. km per weekday) | 0.93 | 0.92 | 1.05 | 1.11 | 1.13 | 1.15 | 1.17 | 1.21 | 1.27 |
| **Cycled km between serious casualties** (mil. km) | 1.2 | 1.8 | 2.4 | 2.4 | 3.0 | 4.0 | 3.2 | 4.4 | 4.2 |
| **Cycling speed** (km/h) |  |  |  |  | 15.3 | 16.0 | 16.2 | 15.8 | 15.5 |
| **Cycle tracks** (km) | 294 | 302 | 307 | 323 | 329 | 332 | 338 | 346 | 359 |
| **Cycle lanes** (km) |  | 6 | 10 | 12 | 14 | 17 | 18 | 23 | 24 |
| **Green cycle routes** (km) | 29 | 30 | 31 | 32 | 37 | 39 | 41 | 42 | 43 |
| **Cycle super highways** (km)\* |  |  |  |  |  |  |  |  | 17.5 |
| **Cycle parking spaces on roads and pavements** (1000s) |  |  |  |  |  | 42 | 47 | 48 | 49 |
| \*Total for the Capital Region of Denmark (consists of the municipalities of Copenhagen and Frederiksberg, the former counties of Copenhagen and Frederiksborg, and the regional municipality of Bornholm) | | | | | | | | | |

Source: Copenhagen bike account 2012

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1. \* Corresponding author. Tel.: +44-131-455-2231; fax: +44-131-455-2953.

   *E-mail address:* d.stantchev@napier.ac.uk [↑](#footnote-ref-1)