



ADDRESSING KEY CHALLENGES OF SUSTAINABLE URBAN MOBILITY PLANNING

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CH4ALLENGE

Addressing Key Challenges of Sustainable Urban Mobility Planning

D4.1 Reports on Local Mobility Situation

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Authors	Miriam Lindenau (Rupprecht Consult); Iva Machalová (Brno); Ana Magdic (Zagreb); Tamás Mátrai (Budapest); Tony May (ITS, Univ. Leeds); Caroline Mullen (ITS, Univ. Leeds); Loredana Sibian (Timisoara); Matija Vuger (Zagreb); Tomasz Zwoliński (Krakow)
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1 Introduction

Achieving sustainable, energy-efficient and environmentally friendly transport systems is one of the European key aims. Sustainable Urban Mobility Plans (SUMP) are an instrument that contributes to reaching the climate and energy targets set by EU leaders and is promoted by the European Commission in relevant documents such as the Transport White Paper and Urban Action Plan. Cities frequently face major barriers while creating their own Sustainable Urban Mobility Plans. Over the course of the next three years, CH4LLERGE (2013-2016) will address the four most pressing challenges in SUMP development and implementation and develop innovative and transferable solutions in the areas of:

- Stakeholder participation and citizen involvement
- Institutional cooperation between sectors and disciplines
- Identification of the most effective policy measures
- Monitoring and evaluation of progress in SUMP development

Nine European cities are involved in CH4LLERGE and are grouped according to their status of sustainable urban mobility planning. The Optimising Cities of Amiens, Dresden, Gent and the county of West Yorkshire have all worked extensively with SUMP and will optimise their SUMP processes in the four thematic areas. The Advancing Cities of Brno, Budapest, Krakow, Timisoara and Zagreb are ambitious partners from New Member States and currently moving towards sustainable urban mobility planning.

This document forms Deliverable 4.1: Reports on local mobility situations (Brno, Budapest, Krakow, Timisoara, Zagreb). The CH4LLERGE Description of Work notes, the ‘best starting point is to have an idea of the mobility problems that potential measures need to address – a milestone in SUMP development’ (p. 39). In particular, the description of the mobility situations outlined in this document will be used by the cities to support their measure identification (WP4.3).

2 Methodology

Miriam Lindenau and Caroline Mullen

The city reports are based on semi-structured interviews conducted with city officials from the five Advancing Cities in December 2013. The one-hour interviews with the cities of Budapest, Krakow and Timisoara were conducted by Rupprecht Consult; the cities of Brno and Zagreb were interviewed by the city partner Gent. The interviews covered seven thematic areas:

- Congestion
- Air quality and noise
- Service quality and fares of public transport

- Accessibility
- Comprehensibility of the transport network, and
- Safety

The majority of questions were open questions so that respondents could answer in detail and qualify as well as clarify their responses. Open questions also allowed the interviewees to find adequate answers to complex local transport issues. Some of the respondents shared additional information and data as a follow-up to the interviews. Appendix 1 presents the interview guideline.

In addition, the questionnaire included questions on public participation and stakeholder involvement. Responses given by the city representatives will contribute to WP2 “Participation” and will not be considered in this deliverable.

Additional information was gathered from an online survey which all CH4LLERGE partner and follower cities completed in November 2013. The survey focused on the cities’ mobility situation, status of sustainable urban mobility planning as well as strategies and solutions to solve local mobility problems. It aimed to understand the cities’ transport needs and priorities, to gain an overview about SUMP practices and understand how CH4LLERGE can assist the cities in developing SUMPs. Subsequent to a pre-test, the five Advancing Cities and 29 other CH4LLERGE cities took part in the survey. Appendix 3 presents the online questionnaire structure and questions.

Following the chapters outlining the mobility situation and transport concerns in the five cities, Chapter 8 reports a study focused on six CH4LLERGE partner cities which was conducted by the Institute for Transport Studies, University of Leeds (ITS) in summer and autumn 2013. The study aimed to understand the cities’ transport objectives and how these sit within wider city objectives. Its further purpose was to identify the transport officers’ (that is professionals’ rather than politicians’) perceptions of the cities’ major transport related problems and to gain an indication of the transport measures which might respond to these objectives and problems, and an understanding of barriers to implementation of potentially relevant measures. The purpose of this study was to inform the development of the measure option generator in WP4, specifically by ensuring its relevance to cities concerns and priorities. Its inclusion as part of this Deliverable is to add understanding of how mobility situations can influence cities’ objectives and identification of problems. The investigation of objectives, problems, and potential measures all involved reference to aspects of mobility situations in the cities, and to other transport related factors and problems (such as poor air quality). Semi-structured interviews formed the main part of the study. The interview design involved topics rather than questions, to enable flexibility for each interview to respond and explore emerging information. The design and conduct was informed by the researcher’s knowledge of theoretical and policy approaches in city transport planning. Significantly, the intention was to avoid straightforward application of either theoretical or policy approaches in the design and conduct of the interviews, or interpretation of interview findings. Instead, the aim was to allow the information gathered from the interviews to inform, frame, and potentially challenge theory and policy (cf. Gläser and Laudel, 2013). The interviews conducted by ITS had been designed as part of a wider study to inform CH4LLERGE work on measure selection. It is important to note that since their

purpose was to inform development of the measure option generator, they were not originally designed to provide descriptions of mobility situations in specific cities, and as such cannot be directly compared to those descriptions. This study of objectives, problems, measures and barriers, would have included an online questionnaire survey including those topics explored by the study's interviews, but trading depth of exploration of topics for the possibility for reaching a wider number of cities and receiving information in a more standardised format enabling a degree of comparison. However that survey was redesigned to form the online survey of 30 CH4LLENGE cities mentioned above. While the responses to closed questions have not contributed to the presentation of findings from this study, some of the responses to open questions where they offer further insight into city transport officers' perceptions of objectives, problems, and their possible solution.

Reference

Gläser, J. and Laudel, G. (2013) Life With and Without Coding: Two Methods for Early-Stage Data Analysis in Qualitative Research Aiming at Causal Explanations Forum: Qualitative Social Research, 14, 2 (5) <http://www.qualitative-research.net/>

3 Analysis of local mobility situation in Brno

Miriam Lindenau and Iva Machalová

All these challenges are listed in Brno Transport Policy, documents approved by City Council and the improvements of these problems are the main goals of the Sustainable Urban Mobility Plan which is being prepared now Brno.

3.1 Executive Summary (CZ)

Město Brno je se svými téměř 380 000 obyvateli druhým největším městem České republiky. Je také centrem Jižní Moravy, a proto je cílem dojížděky do škol a zaměstnání pro 170 000 osob (studie). Ve městě Brně je tak denně přítomno téměř 550 000 obyvatel.

Město Brno má rozsáhlou síť veřejné dopravy. Její páteř tvoří radiální systém tramvajových tratí o délce 86,5 km. Tento systém je doplněn systémem trolejbusových tratí o délce 60,5 km. V okrajových částech města je pak veřejná doprava zajišťována autobusovými linkami. Veřejná doprava je poskytována Dopravním podnikem města Brna, a.s., díky spolehlivosti a také historickým faktorům je podíl veřejné dopravy na dělbě přepravní práce ve městě Brně velmi vysoký – 57%.

Brněnská městská doprava je součástí Integrovaného dopravního systému Jihomoravského kraje. Cestující tak mohou s jednotnou jízdenkou cestovat po celém kraji.

Udržet vysoký podíl veřejné dopravy na dělbě přepravní práce je jedním z cílů schválené Dopravní politiky města Brna (Brno, 2014a). Jednou z cest je poskytování kvalitní, spolehlivé, plynulé a rychlé služby a využívání moderních informačních technologií, které cestování zjednoduší.

Využívání veřejné dopravy také pomáhá dosáhnout dalšího cíle a to je zlepšení životní prostředí ve městě. Doprava je považována za jeden z hlavních zdrojů znečištění ovzduší. V současnosti město Brno hledá vhodné a přijatelné způsoby, jak znečištění ovzduší způsobené dopravou snížit.

Velmi důležitá je také podpora pěší a cyklistické dopravy, která pomáhá nejen životnímu prostředí ve městě, ale také zdraví obyvatel.

Dalším problémem, kterému město Brno čelí, jsou kongesce na důležitých komunikacích, především v ranních a odpoledních špičkách. Použití ITS systému, které zlepší řízení provozu a poskytování informací o dopravní situaci ve městě může být jedním z řešení. Do tohoto ITS systému bude zapojen také management parkování v centru města, systém tak bude moci navádět řidiče na volná parkovací místa.

Řešení výše uvedených problémů je obsaženo v zadání Plánu udržitelné městské mobility, který je v současnosti ve městě Brně připravován.

3.2 Executive Summary (EN)

The city of Brno, with almost 380 000 inhabitants, is the second largest city in Czech Republic. It is also the capital of South Moravian Region and as such is a daily destination for more than 170 000 people from the whole region (Brno, 2013c).

City of Brno has an extensive public transport network, its backbone is a radial tram network with 86,5 km length. This tram network is completed with trolley bus network (of 60,5 km of length) and bus network which is operating mainly at the edge of the city. The quality and reliable service provided by Brno transport Company and also the historical conditions are the reasons for the high modal share (57%) of public transport in Brno.

Brno's public transport is part of the Integrated Public Transport System of the South Moravian Region which enables passengers to travel under one tariff in the whole South Moravia Region.

To sustain the high share of public transport users in modal split is one of the biggest challenges in Brno, it is also one of the goals of Brno Transport Policy (Brno, 2014a). One of the ways is to provide quality service and use of modern information technologies which simplify the travelling with public transport.

A high share of public transport also helps to create better and less polluted city environment, which is another of the city's goals. Transport is seen as the main source of air pollution in Brno. Suitable and acceptable ways of decreasing the pollution are sought.

Very important is the support of walking and cycling which helps not only to improve the city environment but also helps citizens themselves.

Another problem which city of Brno is facing is congestion on the main roads, especially in the morning and evening traffic peaks. The management of the transport and providing of information through ITS system could help improve the situation. ITS system will be used also in parking management, which needs to be improved as well.

All these challenges are listed in Brno's transport policy, documents approved by City Council and the improvements of these problems are the main goals of the Sustainable Urban Mobility Plan which is preparing in Brno now.

3.3 Introduction to Brno

Brno is the second largest city in the Czech Republic with about 380,000 inhabitants and about 80,000 students. A number of national institutions such as national courts are based in Brno and it is the administrative and economic centre of the South Moravia Region. Brno is part of the Integrated Transport System of South Moravian Region which also covers parts of Slovakia and Austria and thus covers an area with more than 1.2 million inhabitants.

Brno has an extensive tram network. Also trolleybuses are in operation in the city and its surrounding areas. They were introduced in Brno in the 1950s which made them one of the first Czech cities using electric buses. Today, Brno has the largest trolleybus network in the Czech Republic with 13 trolleybus lines and a fleet of about 150 vehicles. Brno's mode share mirrors its high-quality passenger transport service well. 57% of travellers use public transport for their trips (2012). Significantly less trips are made by active travel modes such as cycling and walking; intermodal trips combining public transport and active travel are also less common in Brno while private motorised transport accounts for 32% of all trips made.

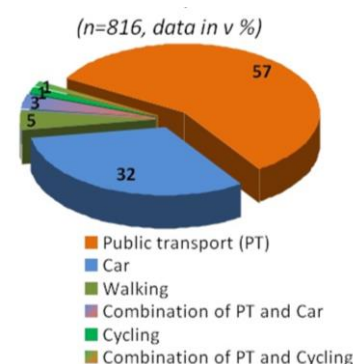


Figure 1: Brno's modal split in 2012
Source: Modal Split Survey 2012 (ppm factum. 2012)

Several separate topical plans for various transport modes have been developed in Brno. In CH4ALLENGE, they will bring all strategies and plans together by starting the preparation of a Sustainable Urban Mobility Plan. A working group (representatives of city administration, public transport operators and other transport organizations) was established to prepare and implement the SUMP. The city administration also works closely with a local NGO which is currently working on the Mobility Plan for the Brno Technology Park.

Congestion

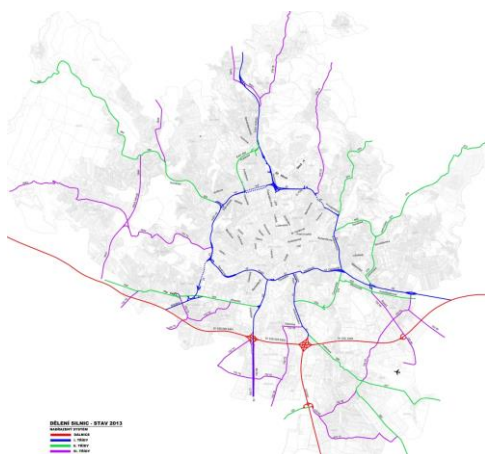


Figure 2: Transport system of Brno
Source: Podklad pro Akční plán městské mobility – Základní ko komunikační systém města Brna (PK Ossendorf, 2014)

Congestion is one of the major problems in metropolitan areas because of its economic and environmental impact as well as its effect on the quality of life. Most cities aim to tackle congestion caused by car traffic and also by public transport and freight.

Traffic congestion is considered as one of the most pressing mobility problems in Brno. High traffic volumes are observed on the main roads connecting the city centre with the surrounding peri-urban areas as well as at the inner city's traffic nodes. Brno suffers most from congested roads during peak hours in the morning and afternoons just like many other cities in Europe. Although the motorisation rate has decreased over the past decades and remained on a constant level (see Figure 3), motorisation is very likely to be one of the main contributors to rising traffic volumes in the city.

The City of Brno is currently preparing an ITS system that aims to ease congestion in the city centre but has not yet been finished.

Brno has a traffic management system (RIS, Řídicí informační systém) in place used by Brno's public company (DPMB) for the monitoring and management of vehicles. Public transport priority at traffic signals is one of the measures in Brno that aims to enhance passenger transport and traffic flow. It is managed through the RIS. It has been observed though that priority is not always given to public transport at intersections in the city centre and that congestion at peak times is still problematic at key nodes. Data on public transportation delays are regularly collected and reported.

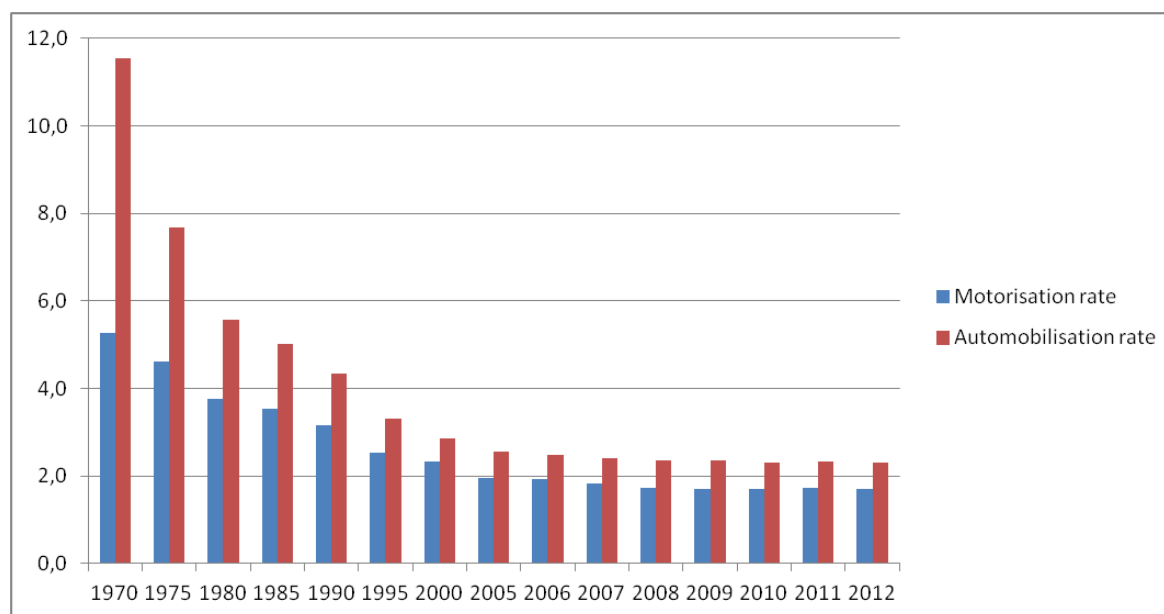


Figure 3: Motorisation rate in Brno

Source: Brno City Municipality; Český statistický úřad

The City of Brno has already taken several actions to tackle congestion caused by cars, public transport and freight. A number of demand management measures have been introduced such as access restrictions in the entrance areas of the core city centre (with some exceptions though) and access limitations related to the tonnage of vehicles. Parking charge policies are in place in Brno to reduce private car use, improve accessibility and land use efficiency, which at the same time create revenues for the local authority. There are also plans to introduce low emission zones to the city in order to lower congestion levels and reduce emissions resulting from the transport sector. Further, a new system for

city logistics might be introduced aiming to ensure more efficient goods distribution and to reduce freight vehicle movements.

Public acceptance is regarded as one of the main barriers to pursuing these pushes measures. Freedom aspects, fears of a violation of privacy and limited problem awareness among citizens are the key concerns and problems are associated with traffic demand management in Brno. In addition, wider political support for these rather unpopular but effective measures is lacking.

3.4 Air Quality and Noise

Reducing emissions in transport is one of the key aims of the European transport policy. One of the arguments for sustainable urban transport planning is that more sustainable mobility directly leads to better air quality and less noise.

The European Union has set several standards and objectives to be met for various pollutants in air (e.g. fine particles and nitrogen dioxide). The City of Brno does not have severe air quality problems and meets the majority of European air quality standards. As in other European cities one of the biggest problems regarding the air quality is the concentration of the dust particles PM₁₀. The local weather patterns and changes in local climate affect air quality though and increase pollution levels from time to time. Higher air temperatures and sunshine in summer in Brno, for example, lead to chemical reactions and raise the number of pollutants; the same applies to temperature inversions during winter time.

Transport is seen as the main source of air pollution in Brno. According to data from air quality measurement stations, emission levels are highest in Brno's main road areas (<http://ovzdusi.brno.cz/>).

Many cities suffer from high noise levels and so does Brno. Here, transport is one of the main noise sources and a result of individual motorised transport on the main roads and highway, and from public transport vehicles using tracks (e.g. tramway tracks and train tracks). Transport noise is particularly serious in residential areas close to the main roads, rail tracks and tramway tracks in the evening and night hours.

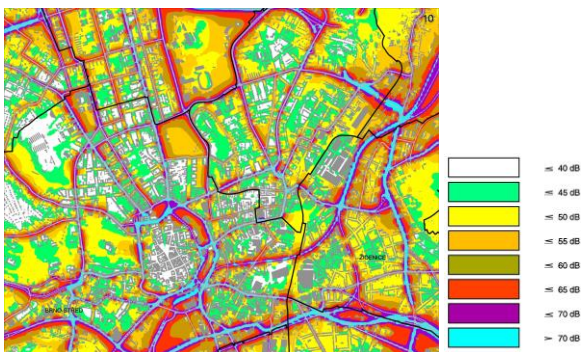


Figure 4: Brno's noise map (2004) – city centre
Source: Brno City Municipality (Brno, 2014b)

Noise is regularly measured with special equipment; a noise map was produced in 2004 showing the sound level distribution based on collected noise data (see Figure 4).

The City of Brno is taking various actions to tackle pollution, emissions and noise caused by transport. Roads and tramway/rail tracks are constructed with noise reducing road surfacing and noise absorbing materials. Further, acoustic construction approaches are implemented including site planning to reduce traffic noise and sound insulation of buildings, e.g. the use of sound insulating windows.

The Czech Hydrometeorological Institute monitors air pollution in the entire country. If air quality standards are not met and maximum values are exceeded, warnings are reported to national TV. This also applies to Brno.

To eliminate the dust particles, especially in dry season, water carts are used. Introducing the emission zone mentioned in Chapter 3.2 to reduce congestion and emission levels would be a large-scale measure with significant effects on air quality. The city is currently considering to implement such a zone.

The main barriers for pursuing air quality and noise measures appear to be financial and legislative barriers.

3.5 Accessibility

In order to ensure economic development and to meet social targets, the enhancement of accessibility of the city centre, neighbourhoods and business districts for people and freight or for large events is one of the key aims of sustainable urban mobility planning.

The City of Brno is very active in preventing inaccessibility caused by transport. The city does not have explicit accessibility standards but meets all standards set by national law. The design of the public space has to enable the mobility of the disabled, e.g. access without barriers or the special guidance system for visual impaired is constructed. Several actions are taken to improve accessibility for mobility impaired people. The number of low-floor vehicles has been increased in the past years now totalling 42% of the entire public transport fleet (2013). Bus and tram timetables indicate the departure of low-floor vehicles. Brno's Public Transport Company is also offering a service called Public Transport Assistant who accompanies passengers with reduced mobility but also parents and their children. Special services are also offered to passengers with hearing and visual impairments. In addition, Brno's tram and bus stops were adapted to fulfil accessibility requirements.

In 2009, minibuses for people with reduced mobility were introduced in a participatory approach. The Brno Public Transport Company consulted mobility-impaired groups to identify their travel needs and routes that should be covered by the new minibus network. The network offers special lines that connect residential areas with the city's hospitals. During the off-peak hours (in the evenings, weekends) the minibuses are also operating on the lines with low demand where the usage of the standard buses wouldn't be effective. At the weekends, the minibuses also can be used for trips of the disabled out of Brno (e.g. for shopping; CIVITAS, 2012a).

Further, special bus services for school children and industrial areas are offered; students, parents on maternity leave, people with disabilities and elderly people have a reduced/free PT tickets.

The City of Brno and the Brno Public Transport Company prepare a transport plan for public transport on a yearly basis. During the preparation of this document the city districts, organisations and major employers can contribute and request services related to accessibility.

3.6 Service Quality and Fares of Public Transport

Public transport is the backbone of every sustainable urban transport system. Its service quality including punctuality, customer information and self-explaining features has large effects on the level of acceptance and usage.

According to the interviewed representative, public transport reliability is high in Brno. If reliability is not given, external factors such as weather conditions or accidents are usually responsible for delays. Also road congestion appears to have an effect on public transport and contributes to delays in public transport. Delays caused by the traffic situation occur in the transport peaks in the mornings and afternoons. However, public transport reliability has overall improved over the past years. There are also benchmarks for Brno's public transport's reliability in place.



Figure 5: Example of the use of GPS data from vehicle monitoring Source: 10 let IDS JMK (KORDIS JMK, 2014)

All vehicles in the public transport system are equipped with GPS as part of the traffic management system (RIS). The vehicles' current locations are tracked and the system also reports whether a vehicle is ahead or behind of its schedule. This information is fed into the freshly introduced ITS-based travel information system so that it is displayed on the real time information panels at public transport stops. It will be used in also Brno's public transport mobile application and reported on the public transport website. Thanks to the GPS system, Brno's public transport company has data on each vehicle's movement (at the spot and in time). Thus potentially problematic traffic nodes can be detected, for example where traffic flows are slow due to spatial difficulties.

3.7 Comprehensibility of the Transport Network

Directing people through a more and more complex transport network should be one of the key aims for a city in order to ensure a smooth and efficient multi- and intermodal mobility.

Understanding Brno's transport and ticket system is unproblematic for both private travellers and public transport users since information is provided through various channels and communication tools.

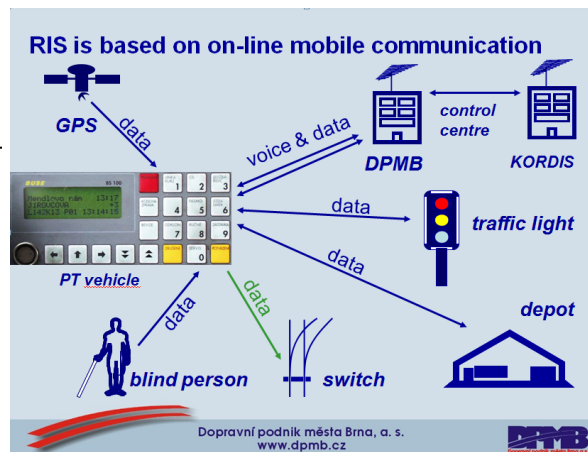


Figure 6: Traffic management system of Brno
Source: Brno Public Transport Company

The public transport system in Brno is incorporated into the integrated transport system of the South Moravian Region. All transport information on public transport, trains and regional buses is gathered and provided to the public through the regional system manager KORDIS JMK. Travel and transport information for the whole region can be found on the internet and with the help of mobile applications.

Information on Brno's transport network is offered to Brno's citizens and visitors at an integrated mobility centre. It provides its clients with all kinds of targeted traffic information as well as tourist information on Brno and the South Moravian Region (CIVITAS, 2012b). Also other information offices operated by Brno Public Transport Company are providing transport information.

For special events or locations (e.g. industrial areas, cultural events) information leaflets with travel and routing information are prepared usually.

The City of Brno is currently introducing an ITS-based travel information system that aims to make public transport more convenient, comfortable, accessible and understandable for everyone. Some elements (e.g. monitoring of the traffic flow, parking places or cameras at the intersections) of the ITS system have already been implemented.

Financial costs are seen to be the most severe barrier for further enhancement of the transport network's comprehensibility.

3.8 Safety

Safety is one of the key cross-sector issues in the sustainable urban mobility planning process and is particularly important for active travel modes such as cycling and walking. In the Czech Republic, the number of accidents in transport is above EU average. In Brno, the interviewed city representative reported, safety issues are generally a less severe mobility problem though.

In Brno, data is collected on the type of accident, place and time, type of injuries and cost of damages. There are particular areas (e.g. crossroads, parts of the highway) that show a higher number of accidents than others. It has been observed over the past years that the number of accidents is slowly decreasing; the number of fatalities is also decreasing evidently.

3.9 Road safety targets set by the National Road Safety Strategy are achieved in Brno.

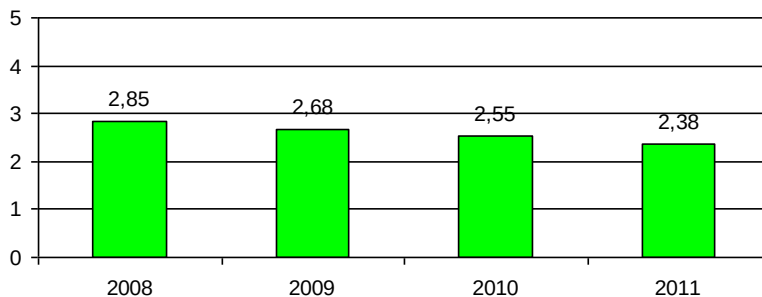
Improvements in technical infrastructure, low speed driving zones and safety information campaigns are implemented by the City of Brno to enhance safety. Also here, financial constraints are named as the chief barrier to pursuing measures to improve safety.

3.10 Crime in the Transport System

Cycling, walking and public transport systems should be as crime-free and safe as possible to attract people to environment-friendly transport modes. Especially vulnerable groups such as the elderly, children and women are sensitive to any kind of aggressive and violent environments.

Crime seems to be a less pressing problem in Brno's transport system. There are some areas in the city where crime levels are higher and public transport is affected. Crime in the transport system is generally also higher during night than during day time. These are common crime patterns observed also in other cities.

Data is collected on the number of crimes; a regularly conducted public transport survey on customer satisfaction includes questions about safety (CIVITAS, 2012c).



Note: the smaller the number, the higher the satisfaction

Figure 9: Average customer satisfaction with PT services 2008-2011

Source: Barometr spokojenosti cestujících 2011, KORDIS JMK

Brno has experience with crime prevention programmes in transport and initiated a campaign to prevent vandalism in public transport. There is also a new pilot project launched in 2014 called "Preventista" (Prevention) which helps passengers how to react to, for example, aggressive behaviour in public transport.

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4 Analysis of local mobility situation in Budapest

Miriam Lindenau and Tamás Mátrai

4.1 Executive Summary (HU)

Budapest nem csak Magyarország fővárosa, hanem a legnagyobb város az országban, amelynek a népessége mintegy 1,7 millió fő. Az agglomeráció népessége nagyjából 2,5 millió fő, amely 81 települést foglal magában.

A városnak kiemelkedően kiterjedt közösségi közlekedési hálózata van, aminek eredményeként a modal split meglehetősen magas (60% a közösségi közlekedést használók aránya, míg a személyautókat használóké 40%). Az 1100 kilométer hosszú közösségi közlekedési hálózatot ami nagyjából 4700 külön megállót és állomást foglal magában 1,37 milliárd utas használja évente

Budapest Főváros Önkormányzata 2010-ben létrehozta a BKK Budapesti Közlekedési Központ Zártkörűen Működő Részvénytársaságot (BKK), mint a főváros közlekedésszervezőjét. BKK felelős a főváros közlekedésének integrált kezeléséért, ami magában foglalja a stratégiák megalkotását, valamint a közlekedési beruházások előkészítéséért és lefolytatásáért.

A közutakon jelentkező zsúfoltság nagyrészt a városközpontban és néhány főbb közlekedési folyosó mentén jelentkezik, ami a nagyjából 1 millió közúti utazásból következik. A közúti zsúfoltság azonban csak

a reggeli és délutáni csúcsidőszakban jelentkeznek. Megjegyzendő azonban, hogy a zsúfoltság mértéke az utóbbi években csökken köszönhetően több különböző tényezőnek úgy, mint a közgazdasági válság és a közösségi közlekedés fejlesztésének jelentős jótékony hatása.

Budapest sajnos évek óta küzd a levegő tisztasági problémákkal. Néhány levegő szennyezettségi érték az elmúlt években több alkalommal átlépte a megengedett határértéket, ezért az Európai Unió eljárást indított Magyarországgal szemben. A zajterhelés ugyanakkor kevésbé problémás a fővárosban és ez a terhelés is jelentősen csökken köszönhetően a csökkenő gépjárműforgalomnak.

A kiterjedt és sűrű közösségi közlekedési hálózat már most is nagyon jó hozzáférést biztosít a szolgáltatásokhoz, munkahelyekhez és oktatási intézményekhez a város teljes területén. Ugyanakkor az előregedő infrastruktúra és járművek jelentős kihívásokat jelentenek Budapest számára kifejezetten a magas minőségű szolgáltatás nyújtásában és a lakosok közösségi közlekedés használatának ösztönzésében. Számos eszköz áll a BKK rendelkezésére a szolgáltatások megbízhatóságának megfigyelésére, ezek közül az egyik az éves szinten elkészített utas elégedettség mérése. Az új buszüzemeltetési modell bevezetése az egyik lehetséges megoldás a szolgáltatás színvonalának emelésére.

A közlekedési hálózat átláthatósága és érthetősége egy kiemelten fontos területe és célja a BKK-nak, hiszen ez az egyik alapvető feltétele a multimodális utazásoknak és a kényelmes, hatékony átszállás elősegítésének. A Budapest bérlettel a teljes közösségi közlekedési integráció megvalósult, hiszen nem csak a BKK által megrendelt szolgáltatások használhatják az utasok, hanem a MÁV és VOLÁN járatait is a városhatáron belül. Természetesen ez a szolgáltatók között megfelelő együttműködést feltételezi.

A BKK-n belül egy külön közlekedés biztonsággal foglalkozó szervezeti egység felelős a különböző közlekedésbiztonsági kampányok lefolytatásáért és a helyzet folyamatos monitorozásáért.

4.2 Executive Summary (EN)

Budapest is the capital city of Hungary and it is also the largest city in the country, with a population of ca. 1,700,000. The population of the wider metropolitan area, incorporating the 81 settlements within neighbouring Pest County, is around 2,500,000.

An extensive public transport network means that the city has a reasonably high modal split between public transport use (60%) and private car trips (40%). 1.37 billion passengers/year utilize the 1,100km public transport network, which incorporates around 4,700 separate stations and stops.

The Municipality of Budapest has created BKK Budapesti Közlekedési Központ Zártkörűen Működő Részvénytársaság (BKK) to act as Transport Organising Authority. BKK is responsible for integrated transport management, including regional coordination, the development of transport strategy, and the design and implementation of major transport projects.

With around 1,000,000 car trips/day, congestion is experienced in the city centre and along some main roads (particularly at the river crossings), but this currently tends to be limited to the morning and afternoon peak periods. It is thought that, overall, congestion levels are decreasing due to a combination of factors, including the impact of the economic crisis over the past few years, as well as the beneficial effect of incremental improvements to public transport.

With respect to air quality, Budapest has been failing to meet EU standards and therefore a legislative procedure to drive improvements by the city has been launched. Noise pollution is currently less problematic than the levels of air pollution, and is thought to be decreasing over time thanks to reduced traffic levels.

It is considered that the extensive Budapest public transport network already provides good accessibility to services, employment and education within all parts of the city. Ageing public transport infrastructure

is a significant challenge for Budapest with respect to ensuring quality of service and attracting more people to use public transport. BKK does have tools in place to monitor the reliability of public transport services and the transport authority undertakes benchmarking surveys. The outsourcing of bus services has been trialled as one approach for addressing service quality problems.

Ensuring the comprehensibility of the transport network is a principal objective for BKK, which seeks to ensure that multi-modal travel is made convenient and efficient. Integrated ticketing is in place for public transport, which also covers long-distance trains and coaches that travel into and through the city area. This requires cooperation with transport service operators other than BKK.

BKK now have a dedicated safety department and the organisation is starting to introduce campaigns on particular aspects of safety.

4.3 Introduction to Budapest

Budapest is the capital city of Hungary and it is also the largest city in the country, with a population of ca. 1,700,000. The population of the wider metropolitan area, incorporating the 81 settlements within neighbouring Pest County, is around 2,500,000. Located on the banks of the Danube river in the north of Hungary, Budapest was formed by the unification of the separate settlements of Buda and Pest in the nineteenth century. There are now 9 river crossings linking the hilly terrain of Buda on the western bank, with Pest plateau on the eastern bank. Budapest is recognised as the political, financial and cultural centre of Hungary.

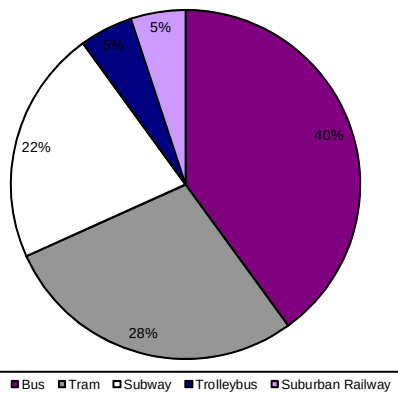


Figure 1: Modal share between different PT modes (2012)

Source: BKK

An extensive public transport network means that the city has a reasonably high modal split between public transport use (60%) and private car trips (40%). 1.37 billion passengers/year utilize the 1,100km public transport network, which incorporates around 4,700 separate stations and stops. Public transport options include bus routes (making up around 40% of total trips), tram routes (with a 28% share of trips), an underground rail system (22% of trips), trolley bus services (5% of trips) and suburban railway lines (a further 5% of trips).

The Municipality of Budapest has created BKK Budapesti Közlekedési Központ Zártkörűen Működő Részvénytársaság (BKK) to act as Transport Organising Authority. BKK is responsible for integrated transport management, including regional coordination, the development of transport strategy, and the design and implementation of major transport projects. With

respect to public transport, specific responsibilities are:

- network and service planning, and the contracting of public services;
- management of the ticketing system;
- central traffic management and coordination of passenger information system; and
- supervision of taxi and boat services.

Looking forward, BKK aims to follow European trends with the establishment of a new strategic planning approach and to be part of the paradigm shift in sustainable urban mobility planning. BKK's goals are to improve the sustainability of Budapest's urban transport system, to increase the liveability of the city and to use the available resources effectively.

Budapest's existing transport development plan, called the "Budapest Közlekedési Rendszerének Fejlesztési Terve", is revised regularly by BKK. The key aim for the current revision phase is to turn the 2009 Transport Development Plan into a Sustainable Urban Mobility Plan during the next three to five years. This will involve improved cooperation between urban planners and transport professionals, having regard to "Budapest 2030", the long term urban development strategy for the city.

4.4 Congestion

As an element of its role as integrated transport management body, BKK is also responsible for the management and maintenance of Budapest's 4,500km network.

With around 1,000,000 car trips/day, congestion is experienced in the city centre and along some main roads (particularly at the river crossings), but this currently tends to be limited to the morning and afternoon peak periods. It is thought that, overall, congestion levels are decreasing due to a combination of factors, including the impact of the economic crisis over the past few years, as well as the beneficial effect of incremental improvements to public transport.

BKK are aware that further information on traffic levels and congestion is required and the organisation is planning to implement a traffic counting routine over the next year. This data is expected to inform consideration of measures to further reduce private car trips, such as the implementation of a congestion charge and restrictions on parking within the city centre.

4.5 Air Quality and Noise

With respect to air quality, Budapest has been failing to meet EU standards and therefore a legislative procedure to drive improvements by the city has been launched. One of the main problems is thought to be the age of the public transport vehicle fleet, which have been an average age of around 16 years when BKK formed. The company did several measures to renew the over deteriorated fleet and in results there are 200 used (over EURO V) and 330 new buses running all over the Budapest. Additional to this BKK introduced 28 hybrid and 37 CNG busses to the fleet.

Noise pollution is currently less problematic than the levels of air pollution, and is thought to be decreasing over time thanks to reduced traffic levels. A Noise Map and Strategy was developed in 2008, leading to the investigation of potential measures to mitigate impacts, such as traffic calming (reduced speeds and traffic restrictions), as well as increased pavement widths. The Noise Map is currently under revision. These initiatives would have further additional benefits, such as increased pedestrian safety.

4.6 Accessibility

It is considered that the extensive Budapest public transport network already provides good accessibility to services, employment and education within all parts of the city. Nevertheless, a strategy for accessibility will form part of the SUMP that is currently being prepared, meaning there is potential for the identification of new measures and adoption of accessibility standards.

To help enhance mobility for disabled persons, public transport measures and services have been implemented in Budapest. Since 2010 the percentage of low-floor busses increased from 25% to 55% (2014) and the aim is that all the busses should be low-floor for 2018.

4.7 Service Quality and Fares of Public Transport

Ageing public transport infrastructure is a significant challenge for Budapest with respect to ensuring quality of service and attracting more people to use public transport. The reliability of services is seriously affected by the number of breakdowns. In particular, one of the busiest metro lines is very old and there are frequent problems. Plans are in place to replace the old coaches and renew the track system, however, this is a very costly process that is expected to take a long time to implement.

BKK does have tools in place to monitor the reliability of public transport services and the transport authority undertakes benchmarking surveys.

The outsourcing of bus services has been trialled as one approach for addressing service quality problems. Some bus services have been outsourced to private operators (currently ~400 of the city's buses), which means that BKK is able to apply penalties if the private operator does not achieve contracted reliability standards. It is now planned that two thirds of the bus fleet will be outsourced. Nevertheless, many public transport services, such as the metro, tram, trolleybus, funicular and boat routes, will continue to be operated by publicly owned organisations (in-house operator).

In terms of public transport fares, BKK has experience of how costs can rapidly influence travel behaviour. During 2007 fare levels were increased and ridership went down. BKK has not increased fares for the last three years and ridership has increased significantly. Additionally, the capital decided to reduce the prices for the seasonal tickets due to the international benchmark and it resulted in an increased rideshare.

4.8 Comprehensibility of the Transport Network

Ensuring the comprehensibility of the transport network is a principal objective for BKK, which seeks to ensure that multi-modal travel is made convenient and efficient. Integrated ticketing is in place for public transport, which also covers long-distance trains and coaches that travel into and through the city area. This requires cooperation with transport service operators other than BKK.

Over 30 different types of tickets and travel passes are covered, but all are integrated and facilitate multi-modal travel. A new electric ticketing will be implemented over the next few years. BKK are taking steps to put in place e-ticket infrastructure, such as gates in metro stations and bus card scanners, with the aim that there will be a paper-free system by 2018.

Steps are also being taken to improve communication with public transport users. Over

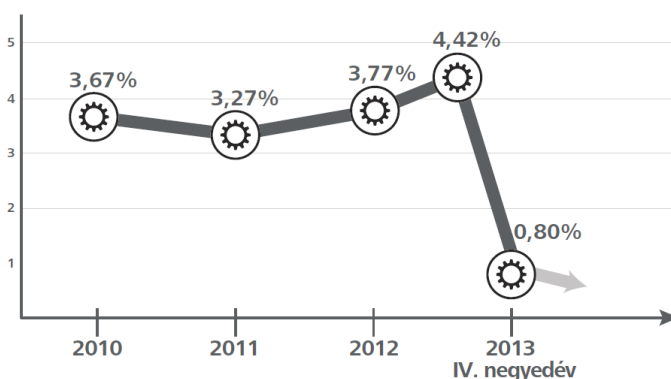


Figure 2: Number of cancelled services due to technical issues
Source: BKK



Figure 3: BKK Rapid Transport Lines and Tramway Network
Source: BKK

the last few years new maps have been produced, designed with the principle in mind that they are for use by the public, rather than only transport professionals. More detailed maps have been produced for each area of the city. BKK also introduced high level passenger orientation systems in the metro underpasses to improve the change experience and help the non-regular users to smooth transfer. While there has been no dedicated survey, feedback about the revised maps tends to be positive.

A further important initiative has been the introduction of more than 260 electric signs providing real time information for public transport users. BKK started a new service called BKK info where drivers are advised where there are lane closures or congestion. This information system will be extended to provide a multi-modal journey planner. This is available online and as a smartphone app.

4.9 Safety

Information on accidents is currently high level and therefore it is intended that the Budapest SUMP will set out more detailed data collection procedures and standards. During 2012 there was a total of 29 deaths, 580 seriously injured people and 2,500 light injuries on the transport network in Budapest. There is no further information on the causes of these mortalities and injuries and therefore it is not possible to deduce at this time if there are particular problems for certain transport modes or users.

BKK now have a dedicated safety department and the organisation is starting to introduce campaigns on particular aspects of safety. One example is a promotional campaign for cycling (STARS project). The city is keen to increase the numbers of cyclists, as this has been shown to have overall safety benefits as their visibility increases and drivers become more accustomed to giving them space on the road.

4.10 Crime in the Transport System

Cycling, walking and public transport systems should be as crime-free and safe as possible to attract people to environment-friendly transport modes. Vulnerable groups such as the elderly, children and women are especially sensitive to any kind of aggressive and violent environments.

BKK are in the process of collating data on crime and the perception of risk from crime in order to inform planning processes. It is considered that there are some problems with crime on the network, particularly at night. Some control measures have been implemented, such as it is now not possible to enter at the back door of buses, but it is intended this matter will be considered further through SUMP preparation.

5 Analysis of local mobility situation in Krakow

Miriam Lindenau and, Tomasz Zwoliński

5.1 Executive Summary (PL)

Położony w południowej Polsce, posiadający ok. 760.000 mieszkańców, Kraków jest drugim co do wielkości miastem w kraju. Jego unikalny charakter historyczny, kulturalny i naukowy nadal determinuje rozwój gospodarczy i turystyczny miasta. Kraków odwiedza około 8 milionów turystów każdego roku. Uniwersytet Jagielloński, na którym uczy się ok. 140.000 studentów, jest jednym z najstarszych uniwersytetów w Europie Środkowo-Wschodniej.

Kraków był pierwszym miastem w Polsce, które przyjęło zrównoważoną politykę transportową w 1993 r. Miasto wprowadziło szereg programów i działań dotyczących wykorzystania przestrzeni i dostępności dla

różnych form transportu: wprowadzono strefy piesze i strefy o ograniczonym dostępie dla samochodów, zmodernizowano infrastrukturę i flotę transportu publicznego. Polityka transportowa miasta, zaktualizowana w lipcu 2007 r., ma na celu stworzenie wydajnego, bezpiecznego, ekonomicznego i przyjaznego dla środowiska systemu transportu dla pasażerów i towarów.

Kraków słynie z bardzo dobrze rozwiniętej sieci transportu publicznego. Obecnie funkcjonuje 132 linii autobusowych oraz 24 linii tramwajowych obsługujących ok. 1 milion pasażerów dziennie. Jakość taboru i infrastruktury stale się poprawia, oferując nowoczesne, elektroniczne rozwiązania biletowe i na przykład rozwiązania transportowe reagujące na popyt (Tele-Bus).

Na podstawie ostatnich Kompleksowych Badań Ruchu (2013/14), około 50 % gospodarstw domowych w Krakowie dysponuje co najmniej jednym samochodem. Tylko 5,6 % respondentów zamierza kupić samochód w ciągu najbliższych 12 miesięcy. Co do podziału zadań przewozowych, obecnie ok. 39 % podróży odbywa się transportem publicznym, 30 % samochodem prywatnym, 28,5% pieszo i tylko ok. 2 % rowerem. Kraków był pierwszym miastem w Polsce, które wprowadziło system wypożyczalni rowerów publicznych (2008), który jest obecnie ulepszany i powiększany. Kraków jest aktywny we wprowadzaniu strategii i środków w zakresie współpracy międzynarodowej w ramach projektów unijnych (np. Civitas Caravel, Civitas Catalyst, Aeneas, Transport Learning, Stars).

Najbardziej palące problemy transportowe to m.in. szybki rozwój wskaźnika motoryzacji, a w konsekwencji negatywny wpływ na środowisko - w szczególności w zakresie jakości powietrza i poziomu hałasu. Narastające problemy kongestii są postrzegane jako istotne ograniczenia ekonomicznego rozwoju miasta i realizacji jego funkcji turystycznych. Brak jest odpowiedniej infrastruktury dla rowerzystów i pieszych, zwłaszcza poza historycznym centrum miasta. Mimo, że transport publiczny jest dobrze rozwinięty, nadal gęstość sieci nie odpowiada potencjalnemu popytowi.

Wobec tych wymienionych problemów, główne strategie i działania obejmują: stałe rozszerzanie strefy płatnego parkowania i strefy ograniczonego ruchu, działania na rzecz udoskonalania transportu publicznego, w tym integrację w obszarze metropolitalnym, lepsze standardy usług (w tym nowoczesny tabor), poprawę połączeń komunikacyjnych na poziomie krajowym i europejskim oraz inwestycje dotyczące dworców autobusowych, zintegrowanych węzłów przesiadkowych, centrów logistycznych i miejskich systemów sterowania ruchem. Wdrażane są również strategie dla lepszego zarządzania parkowaniem (w tym realizacja systemu Park & Ride).

5.2 Executive Summary (EN)

Located in southern Poland and with ca. 760 000 inhabitants, Krakow is the second largest city in the country. Its unique historical, cultural and scientific character still dominates the city's economic and tourism development. Krakow welcomes around 8 million tourists each year and the Jagiellonian University, with some 140,000 students, is one of the oldest universities in Central and Eastern Europe.

Krakow was the first city in Poland to adopt a sustainable transport policy in 1993 and implemented a series of programmes and measures that referred to the use of space and the availability for different transport modes: pedestrian zones and zones with limited access for cars have been introduced and the

infrastructure and public transport fleets have been modernised. The city's transport policy, updated in July 2007, aims to create an efficient, safe, economical and environmentally friendly transport system for passengers and goods.

Krakow is known for its very well developed public transport system. Nowadays, there are 132 bus lines and 24 tram lines serving ca. 1 million passengers daily. The quality of rolling stock and infrastructure is improved constantly, including offering modern, electronic ticketing solutions and demand responsive bus transport for example.

Based on the last comprehensive analysis (2013/14), around 50% of Krakow's households own at least one car. Only 5,6% of respondents intend to buy a car within 12 months. Concerning modal split, currently ca. 39% of trips is made by public transport, 30% by private car, 28,5% on foot and only ca.2% by bicycle. Krakow was the first city in Poland to introduce the public bike rental scheme (2008), which is nowadays being improved and enlarged. Concerning different mobility issues, Krakow is active in introducing strategies and measures with international cooperation within EU projects (e.g. Civitas Caravel, Civitas Catalist, Aeneas, Transport Learning, Stars).

Most pressing mobility problems include rapid development of private car ownership, and as a consequence, negative impacts on the environment – especially concerning air quality and noise. Increasing congestion problems are perceived as important limitations to economical development of the city and realisation of its touristic functions. There is a lack of proper infrastructure for cycling and walking, especially outside historical city centre. Although the public transport is well developed, still the density of network does not meet potential demand.

In response to the problems mentioned above, main strategies and measures involve: constant extension of paid parking zone and limited traffic zones, actions towards improvements in public transport, including its integration with the metropolitan area, better service standards (including modern rolling stock), improvement of public transport connections on the national and European level and investments concerning bus hubs, integrated PT nodes, logistic centres and urban traffic control systems. There are also strategies towards better parking management (including implementation of Park & Ride).

5.3 Introduction to Krakow

Located in southern Poland and with ca. 760 000 inhabitants, Krakow is the second largest city in the country. Its unique historical, cultural and scientific character still dominates the city's economic and tourism development. Krakow is listed as a UNESCO World Heritage site and was the Cultural Capital of Europe in 2000. It welcomes around 8 million tourists each year and the Jagiellonian University, with some 140,000 students, is one of the oldest universities in Central and Eastern Europe.

For several years the focus of rigorous industrial restructuring has been to reduce the environmental footprint, to stimulate the transition towards innovative and more efficient technologies and to decrease production costs. Despite growing car ownership, Krakow still demonstrates a very positive modal split with approx. 50% of all journeys being made by public transport (trams and buses). However, city

growth, increasing vehicle numbers, the desire for greater mobility and years of neglecting road maintenance have made road infrastructure and public transport the most challenging policy areas in Krakow.

Krakow was the first city in Poland to adopt a sustainable transport policy in 1993 and implemented a series of programmes and measures that referred to the use of space and the availability for different transport modes: pedestrian zones and zones with limited access for cars have been introduced and the infrastructure and public transport fleets have been modernised. The city's transport policy, updated in July 2007, aims to create an efficient, safe, economical and environmentally friendly transport system for passengers and goods.

It acts as a framework for a comprehensive master plan which encompasses the transport concept, project management and considerable investment in road and public transport infrastructure. Key priorities for this policy are bus lanes, tramway tracks, efficient traffic control ensuring priority for and punctuality of public transport and access restrictions to the old city centre.

5.4 Congestion

Congestion is one of the major problems in metropolitan areas because of its economic and environmental impact as well as its effect on the quality of life. Most cities aim to tackle congestion caused by car traffic and also by public transport and freight.

Congestion in Krakow has significantly risen in the past decades and has reached a serious point now. High traffic volumes are observed particular in the city centre as well as on the first and second ring roads (see Figure 1). The entire region with its many corridors shows high congestion levels as well; only very few areas are not congested. It has been observed that rush hours prolong now up to four to five hours in mornings and afternoons which is a considerable rise in peak hours when traffic is at its highest.

The increased motorisation rate is considered as one of the most important causes of congestion problems. Krakow's motorisation rate (total number of vehicles/1,000 residents) is comparably high in the European context with 644 vehicles/1,000 residents in 2012 (City Development Department of the Municipality of Krakow, 2012). Further, the historical lack of infrastructure and the fact that the city is following a road infrastructure-led approach by still developing ring roads contribute to high congestion levels. Last but not least, it has been reported that the high number of students causes additional traffic since a large number of them own and drive cars.

Public transport is less affected by traffic congestion showing a better flow of vehicles and only minor delays.



Figure 1: City of Krakow and its ring roads

Source: City of Krakow

The City of Krakow has already taken several actions to tackle congestion caused by cars, public transport and freight. A number of demand management measures have been introduced such as the introduction of parking restrictions (fee-based) and access restrictions separating the city in zones A,B,C; entering zones A and B is only allowed for inhabitants and for delivery vehicles during certain time windows. The creation of new links between districts by building new ring roads also aims to ease congestion. However, road infrastructure development might be seen contradictory to sustainable mobility and might stimulate rather than reduce car-use.

Parking standards (e.g. parking-space-to-unit or -inhabitant ratios) are set in local development plans but only about a third of the city's area is covered by such local plans; implementing parking requirements in the remaining areas is not regulated in a uniform way.

Public acceptance is regarded as the main barrier to pursuing these push measures. Although the level of acceptance has improved over the past five years and it has become easier to pursue push measures, it remains one of the key challenges in transport policy implementation in Krakow.

5.5 Air Quality and Noise

Reducing emissions in transport is one of the key aims of the European transport policy. One of the arguments for sustainable urban transport planning is that more sustainable mobility directly leads to better air quality and less noise.

Krakow is one of the most polluted cities in Europe and does not meet European or national air quality standards. It was reported that air quality standards are exceeded on about 200 days a year. A 2012 study, for example, showed that the PM2.5 (PM – particulate matter; fine particles that have diameter of 2.5 micrometres or less) and PM10 (coarse particles fraction in addition to the PM2.5 fraction) levels were exceeded at all measuring points in Krakow. Also the average NO2 (nitrogen dioxide) emissions measured at a station on the second ring road were 80% above the standard allowed (*Source: Department of Environmental Development, City of Krakow*).

Poor air quality is a result of various factors including heavy industrial activities until the 1980s and 1990s, domestic coal burning, which is common practice in Krakow, and its geographical position. The city is located in a valley leading to a concentration of pollutants and an increase in smog levels due to the lack of winds and ventilation. Transport accounts for about a third of pollutants.

The regional authority took a step towards better air quality and approved a strategy to stop coal heating in 2013; however, public acceptance appears as the major barrier also in this case since a large part of

Krakow's inhabitants refuse to invest in new heating.

Krakow is also experiencing noise problems. Noise emissions are particularly high in the city centre and along the ring roads. Noise is regularly measured with special technical

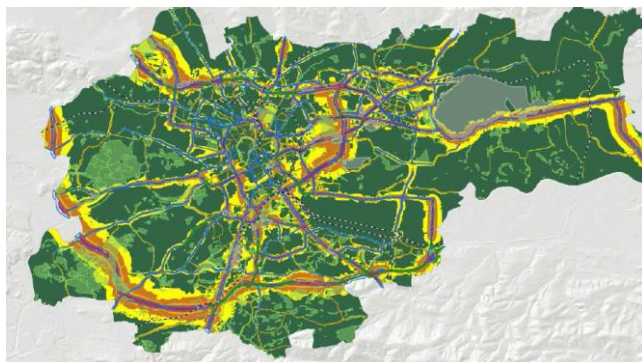


Figure 2: Krakow's noise map in 2012

Source: Department of Environmental Development, City of Krakow

equipment; noise maps are produced (or updated) every one to two years representing the sound level distribution and being based on the noise data collected (see Figure 2).

5.6 Accessibility

In order to ensure economic development and to meet social targets, the enhancement of accessibility of the city centre, neighbourhoods and business districts for people and freight or for large events is one of the key aims of sustainable urban mobility planning.

There are no accessibility standards in Krakow; inaccessibility does not appear to be a problem in Krakow. The interviewee reported that accessibility to services and employment is good, and so is accessibility to education (although it is considered problematic that a number of kindergartens and schools are being closed due to the decreasing birth rate and consequently, a lower number of children requiring education).

5.7 Service Quality and Fares of Public Transport

Public transport is the backbone of every sustainable urban transport system. Its service quality including punctuality, customer information and self-explaining features has large effects on the level of acceptance and usage.

Significant public transport improvements were undertaken in the past ten years in Krakow leading to an effective public transport system and a positive image of it. According to an independent study, Krakow's public transport is the best across all Polish cities (based on various data and indicators; *(Source: Report Deloitte/Millward Brown SMG/KRC, zikit.krakow.pl, 2011)*).

Reliability and punctuality of public transport is high; in addition, regular surveys of customers conducted by the local public transport operator show high satisfaction rates that have steadily increased. The number of public transport passengers is relatively stable; no major shifts to other transport modes, cars in particular, have been observed.

For the most part, public transport is run by the public transport operator MPK which has a share of about 90% of the lines. In addition, Krakow is served by one private transport operator. In January 2013, it was decided to put a stronger focus on the tram network while the bus system is seen rather as an additional, complementary service. This controversial decision was not in favour of all local actors.

Integrated ticketing is available for all services including tram, bus, and national rail in the region.

After having remained unchanged for many years, public transport fares were raised recently. The fares are now higher than in other Polish cities, which is widely accepted due to the good fare-to-quality ratio.

5.8 Comprehensibility of the Transport Network

Directing people through a more and more complex transport network should be one of the key aims for the city in order to ensure a smooth and efficient multi- and intermodal mobility. Understanding

Krakow's transport system is unproblematic for both private travellers and public transport users since information is provided through various channels and communication tools.

Printed information is available at tram and bus stops (e.g. timetables), and at key information points in the city. In addition, several online services are offered: a smartphone mobility application has been developed; a public transport ticket app is provided; electronic ticket cards were introduced; an online portal for route finding is available.

In addition, real-time passenger information about arrival times is available for the tram network (on selected stops).

5.9 Safety

Safety is one of the key cross-sector issues in the sustainable urban mobility planning process and is particularly important for active travel modes such as cycling and walking. The interviewed city representative reported that safety issues are generally a less severe mobility problem in Krakow. Collisions between motorised transport and cyclists as well as pedestrians are a significant problem though, especially in Krakow's river area. Presumably, several reasons contribute to this safety problem: the cycling network is still rather fragmented and cycle routes' infrastructure is partly incomplete; awareness of cycling is still on a rather low level so that cycle paths and cyclists are occasionally overlooked; also, drivers do not comply with the 30km/h speed limit in Krakow's city centre.

A safety team of Krakow's police is collecting and analysing safety data on a regular basis and advises on changes for improving safety. Safety figures from 2011 and 2012 show that the number of collisions (2011: 8657 collisions, 2012: 7400) and accidents (2011: 1219 accidents, 2012: 1350) declined and so did the number of fatalities (2011: 40, 2012: 27). The city has not set any short-term or long-term safety targets but the road authority tries to react to safety issues by, for instance, improving signalisation of dangerous intersections and developing new algorithms, used for better and safer traffic flow.

5.10 Crime in the Transport System

Cycling, walking and public transport systems should be as crime-free and safe as possible to attract people to environment-friendly transport modes. Especially vulnerable groups such as the elderly, children and women are sensitive to any kind of aggressive and violent environments.

Crime seems to be a less pressing problem in Krakow's transport system. No particular crime problems are known to the interview respondent.

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6 Analysis of local mobility situation in Timisoara

Miriam Lindenau and Loredana Sibian

6.1 Executive Summary (RO)

Timișoara are o populație de 350.000 locuitori, este al doilea oraș din România, ca importanță, și este situat în partea de vest a țării, aproape de granița cu Ungaria și cu Serbia.

Orașul are o rețea de transport public dezvoltată, compusă din autobuze, troleibuze și tramvaie. În ultimii ani a fost proiectată o rețea de piste de biciclete, rețea care va fi mărită în cursul anului viitor. Mai mult, sunt implementate proiecte care încurajează mersul pe bicicletă și mersul pe jos: noi facilități pentru mersul pe bicicletă, cum ar fi: noi piste, noi stații de închiriere a bicicletelor, precum și zone pietonale.

În urmă cu câțiva ani, ca urmare a colaborării dintre Institutul Fraunhofer, Primăria Municipiului Timișoara și Universitatea Politehnica Timișoara, a fost adoptat un concept strategic pentru dezvoltarea orașului și a diferitelor moduri de transport din oraș și din zonele peri-urbane, inclusiv calea ferată, transportul public, aeroportul și drumurile.

Timișoara are o rețea de transport public bine dezvoltată, compusă din nouă linii de tramvai, șapte linii de troleibuz și douăzecișidouă linii de autobuz. Transportul public în Timișoara este asigurat de compania locală de transport R.A.T.Timișoara, care este în coordonarea Consiliului Local al Municipiului Timișoara.

Principala problemă în Timișoara sunt congestiile în trafic, al căror număr a crescut semnificativ în ultimii zece ani și a atins un nivel îngrijorător în prezent. Nivelul congestiilor în trafic este ridicat în diferite zone ale orașului; totuși, volume ridicate de trafic au fost observate în special în centrul orașului.

Accesibilitatea la locurile de muncă, în mod deosebit la zonele industriale din afara orașului, este destul de redusă în Timișoara; accesibilitatea la educație și servicii este mai bună deoarece acestea sunt localizate în părțile mai centrale ale orașului.

Cu toate că transportul public este afectat uneori de congestiile în trafic, numărul întârzierilor mijloacelor de transport din Timișoara pare să fie destul de scăzut.

Înțelegerea sistemului de transport din Timișoara este facilă atât pentru călătorii privați cât și pentru utilizatorii transportului public deoarece informațiile sunt furnizate prin diverse canale și modalități de comunicare.

Primăria Municipiului Timișoara implementează diverse proiecte care să rezolve unele din aceste probleme. Este în implementare un sistem de management al traficului care va ajuta la organizarea mai eficientă a traficului, reducând astfel emisiile de CO₂ și nivelurile de poluare. În domeniul parcarilor este prevăzută creșterea tarifelor de parcare, astfel încât, în centrul orașului, prețul unui tichet de parcare să

fie mai mare decât prețul unui bilet pentru transportul public, precum și contruirea de parcuri la intrările în oraș.

Municipiul Timișoara pune în aplicare măsuri care să încurajeze mersul pe bicicletă și mersul pe jos: zece străzi și trei piețe vor fi transformate în zonă pietonală. De-a lungul Canalului Bega, care traversează orașul de la est la vest, se construiesc noi piste pentru biciclete.

6.2 Executive Summary (EN)

The City of Timisoara has about 350,000 inhabitants, is the second most important city in Romania and it is situated in the Western part of the country, close to the Hungarian and Serbian border.

The city has a large public transport network comprised of buses, trolley-buses, and trams. Over the past few years, a cycling network was designed in the city that is planned to be enlarged in the next year. Additionally, new projects that encourage cycling and walking are implementing: new cycling facilities such as new lanes, new stations for hiring bikes, pedestrian area.

A few years ago, as a result of the collaboration among Fraunhofer Institute, Timisoara City Hall and Timisoara Polytechnics, Timisoara adopted a strategic concept for the city's development and the development of various transport modes in the city and peri-urban areas including railway, public transportation, airport and roads.

Timisoara has a well developed public transport network consisting of nine tram lines, seven trolleybus lines and 22 bus lines. Public transport in Timisoara is provided by local transport company R.A.T. Timisoara in coordination with the Local Council of Municipality of Timisoara.

Main problem is congestion in Timisoara that has significantly risen in the past decades and has reached a serious point now. Traffic congestion levels are high in various areas in the city; however, high traffic volumes have been observed particularly in the city centre.

Accessibility to employment, especially to industrial sites in the outskirt areas, is rather low in Timisoara; accessibility to education and services is better since these are located in more central parts of the city.

Although public transport is affected by congestion from time to time, the number of transportation delays in Timisoara appears to be reasonably low.

Understanding Timisoara's transport system is unproblematic for both private travellers and public transport users since information is provided through various channels and communication tools.

Timisoara City Hall is implementing various projects in order to solve some of these problems. There is a traffic management system in implementation that will help to organise the traffic more efficiently thus lowering CO2 emission and pollution levels. In the field of parking management it is planned to further increase parking charges so that the parking ticket exceeds the price of a public transport ticket, in the city centre, and to build parking places at the entrances of the city.

The City of Timisoara is developing measures to encourage biking and walking: ten streets and three squares will be transformed into pedestrian area. New cycle lanes are being built alongside the Bega Channel that crosses the city from East to West.

6.3 Introduction to Timisoara

Timisoara is the second largest city in Romania (ca. 350,000 inhabitants) and situated near the Western border of the country in the Banat region. The main priority for the Municipality of Timisoara is to develop mobility and transport in the city and in particular, to improve public transport both on local and peri-urban level by increasing the reliability and quality of the existing public transport system and to introduce new public transport services. In order to reach these goals, the municipality has framed and approved the study “Timisoara – Vision 2030”. It is a strategic concept for the city’s development and the development of various transport modes in the city and peri-urban areas including railway, public transportation, airport and roads.

In 2008, Timisoara was assigned the growth pole for the Western region of Romania covering the urban area of Timisoara and 14 surrounding administrative units. The strategic planning tool for the metropolitan development is the Integrated Plan of Development for the Timisoara Growth Pole, which coordinates the sectoral politics including economy, transport and environment, for example, with territorial politics and highlights priority investment projects such as the promotion of clean transport modes.

Timisoara has a well developed public transport network consisting of nine tram lines, seven trolleybus lines and 22 bus lines (see Figure 1). Public transport is provided by the local public transport company R.A.T. Timisoara in coordination with the Local Council of the Municipality of Timisoara. The city’s modal split reflects Timisoara’s high motorisation rate though; 41% of all trips are made by private motorised transport while only 35% of trips are made by public transport, 5% by bike and 19% by walking.

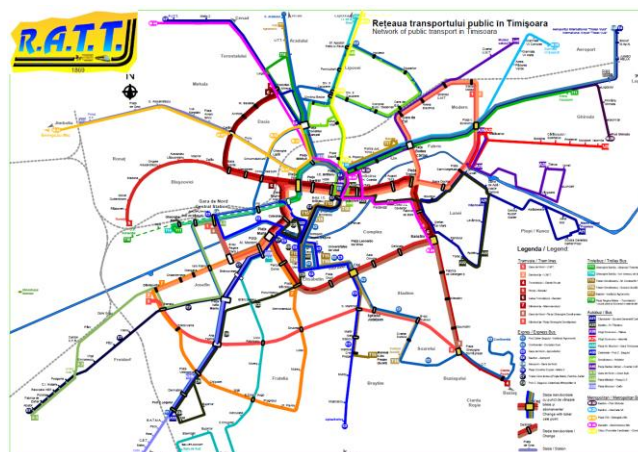


Figure 1: Public transport network of Timisoara

Source: City of Timisoara/R.A.T.T.

6.4 Congestion

Congestion is one of the major problems in metropolitan areas because of its economic and environmental impact as well as its effect on the quality of life. Most cities aim to tackle congestion caused by car traffic and also by public transport and freight.

Congestion in Timisoara has significantly risen in the past decades and has reached a serious point now. Traffic congestion levels are high in various areas in the city; however, high traffic volumes have been observed particularly in the city centre. The situation has become even more acute since large-scale

infrastructure works in the city centre commenced: ten streets and three squares will be transformed into pedestrian areas. This generally very beneficial redevelopment scheme has a large temporary effect on traffic flow. Temporary closures of the city centre will occur for at least two more years. In addition, close to the central area of the city there are also important construction works, since a 600 metre underground passage (underpass) is being built.

The City of Timisoara is trying to ease and, at best, avoid through traffic in the city centre by building new roads in the urban and urban-regional areas where peripheral ring roads are missing. Due to structural enlargement problems, road network expansion possibilities are limited though.

Timisoara's congestion problems affect also public transport reliability leading to delays in timetables especially for the local bus system.

As the motorisation rate in Timisoara is high (575 cars per 1,000 inhabitants, the second highest rate in Romania after Bucharest), the city administration promotes sustainable transport and active travel by, for example, encouraging people to walk and cycle. For instance, the City Hall implemented the European financed project **PIMMS TRANSFER (Transferring Actions in Sustainable Mobility for European Regions)**, a project that aimed at promoting the use of alternative means of transport such as cycling and walking. During the 35 months of implementation they organised public campaigns that involved both children and adults in order to encourage walking and cycling instead of using the private cars.

In addition, a parking management has been implemented; it is planned to further increase parking charges so that the parking ticket in the city centre exceeds the price of a public transport ticket, and to build parking places at the entrances of the city.



Figure 2: Noise levels in Timisoara (2012)
Source: City of Timisoara

6.5 Air Quality and Noise

Reducing emissions in transport is one of the key aims of the European transport policy. One of the arguments for sustainable urban transport planning is that more sustainable mobility directly leads to better air quality and less noise.

The City of Timisoara does not have problems with air pollution and meets all European air quality standards. A traffic management system is being implemented that will help to organise the traffic more efficiently thus lowering CO₂ emission and pollution levels. In order to

further reduce emissions and to turn towards renewable sources, it is also planned to substitute diesel with bio-fuels in bus transportation.

The interview respondents assessed the severity of traffic noise in Timisoara as medium to high. Noise maps illustrate noise levels in the city (see Figure 2). Noise levels are particularly high in the morning's and afternoon's peak hours when traffic is at its highest. The city centre currently suffers most from traffic noise due to the combination of congested roads and the infrastructure works mentioned in Chapter 3.2. When the large-scale project is completed and major parts of the city centre are pedestrianised, it is hoped for significant noise reductions in the inner city.

6.6 Accessibility

In order to ensure economic development and to meet social targets, the enhancement of accessibility of the city centre, neighbourhoods and business districts for people and freight or for large events is one of the key aims of sustainable urban mobility planning.

Accessibility to employment, especially to industrial sites in the outskirt areas, is rather low in Timisoara; the interviewees assessed accessibility to education and services as better since these are located in more central parts of the city. As public transport is less well developed in Timisoara's suburbs and outside the city, it is planned to create new public transport lines (tram, trolleybus, bus) to industrial areas and to offer minibus transport services for school children that live in the outskirts.

Timisoara has taken action to improve the transport situation for mobility-impaired people. All busses and trolleybuses are accessible for wheelchair users; due to the age of the tram cars, these cannot be transformed into accessible trams though. Accessibility of urban spaces for visually impaired and blind people has been improved in the past years; however, wayfinding cannot be ensured in the entire city centre yet.

In addition, the local public transport company has a service for mobility-impaired people: 4 minibuses for transporting disabled people from their homes to the places where they need to go (school, doctor, shopping, etc.). The service is provided for free by the Municipality. Those who need the service need to call one day in advance to plan the trip.

Accessibility standards are not set by the city or on any higher level; according to the interview respondents accessibility standards would be beneficial though.

6.7 Service Quality and Fares of Public Transport

Public transport is the backbone of every sustainable urban transport system. Its service quality including punctuality, customer information and self-explaining features has large effects on the level of acceptance and usage.

Although public transport is affected by congestion from time to time, the number of transportation delays in Timisoara appears to be reasonably low. Public transport satisfaction is measured twice a year through the conduction of passenger surveys. The customer survey for the second semester of 2013, for

example, revealed that 8,43% of the respondents were very satisfied with the RATT services, 61,64% of the respondents were satisfied, and 24,07% of respondents were dissatisfied with the RATT services. The overall satisfaction rate is 70,07%. The survey was anonymous, 362 customers took part (both paper-based and online). The majority of respondents were aged 31 to 40 years.

For several years now, Timisoara has an electronic and integrated ticketing system in place which allows both using a smartcard (for commuters and those who travel regularly) and buying individual tickets (for those who travel occasionally). The smartcard is valid for all trams, busses and trolleybuses.

Timisoara also has a real-time information system providing real-time departure information and real-time progress information to transportation managers and passengers (all means of public transport are equipped with GPS system).

6.8 Comprehensibility of the Transport Network

Directing people through a more and more complex transport network should be one of the key aims for the city in order to ensure a smooth and efficient multi- and intermodal mobility. Understanding Timisoara's transport system was assumed by the interviewees to be unproblematic for both private travellers and public transport users since information is provided through various channels and communication tools.

Apart from traditional information provision such printed timetables, Timisoara also uses new technologies. A public transport smartphone application is available and so is an online travel planner. Information from the real-time information system, for example delays and closure of lines, is fed into the web-based and mobile information tools.

6.9 Safety

Safety is one of the key cross-sector issues in the sustainable urban mobility planning process and is particularly important for active travel modes such as cycling and walking.

The interview respondents reported that accident and casualty levels are low in Timisoara. The number of accidents and casualties was significantly reduced as a result of various infrastructure measures: new signal systems, redesign of intersections to enhance safety, introduction of traffic calming zones and an increase in pedestrian crossings. These measures had strong positive effects on the number of accidents which decreased by 60% from 2008 to 2011 according to the Traffic Police Annual Reports.

In 2007, Timisoara signed the European Road Safety Charter thus committing to carry out safety actions and initiatives (e.g. new traffic lights at intersections, new crosswalks, installation of radars, headlight flasher at pedestrian crossings near schools). The city has not set itself quantitative road safety targets but has developed a safety strategy. Since cyclists and pedestrians are considered the most vulnerable road users in Timisoara, cycle network improvements have taken place and the city is constantly trying to enlarge the network. It is also planned to install traffic cameras and video surveillance at complex and unsafe transport nodes.

It has been reported that Timisoara's police is extremely active in promoting and enhancing safety, and that there is active exchange and cooperation between the police and transport department on this.

6.10 Crime in the Transport System

Cycling, walking and public transport systems should be as crime-free and safe as possible to attract people to environment-friendly transport modes. Especially vulnerable groups such as the elderly, children and women are sensitive to any kind of aggressive and violent environments.

The risk of crime in public transport appears low to Timisoara's interviewees. The most common crime action is probably pick pocketing. The transport department initiates campaigns regularly together with the local police. The latter also checks buses and trams on a regular basis, especially at night time.

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7 Analysis of local mobility situation in Zagreb

Miriam Lindenau, Ana Magdic and Matija Vuger

7.1 Executive summary (HR)

Zagreb je glavni grad Hrvatske, sa oko 800.000 stanovnika, a ujedno je i važno europsko prometno čvorište. Grad ima 116 km tramvajskih pruga (sa oko 204 000 prevezenih putnika godišnje), autobusne linije u dužini 1352 km (sa oko 83 000 prevezenih putnika godišnje) i 56 km željezničke mreže koja osigurava urbani regionalni prijevoz putnika. Održivo urbano planiranje transporta predstavlja važnu ulogu u gradskim strateškim dokumentima.

Zagušenje u cestovnom prometu ima srednji do visoki utjecaj na kvalitetu života gradskih stanovnika, poduzeća, okoliša i javnog prijevoza. Neka područja Zagrebačke županije ne karakterizira dobra prometna povezanost što rezultira i povećanjem prometa kroz zagrebački urbani prostor. Nepovoljna je i činjenica da vozila javnog prijevoza dijele ulični prostor sa svim drugim oblicima transporta.

Motorizirani prijevoz uzrokuje oko 25% zagađenja zraka Zagrebu.

Iako je prometna dostupnost uslugama, radnim mjestima i obrazovnim ustanovama dobra, prostora za napredak ima, unatoč standardu dostupnosti koji grad već posjeduje. Veći problem je nepouzdanost javnog prijevoza iako i standardi pouzdanosti javnog prijevoza postoje.

Zagreb ima problema sa sigurnosti u prometu, iako nisu ozbiljnije izraženi; broj nesreća i posljedice koje iz njih proizlaze se nadziru. Posebno izražen problem s kriminalom u prometu nije poznat.

Grad se pokušava uhvatiti u koštac sa prometnim zagušenjem pomoću mjera podupiranja i promicanja korištenja javnog prijevoza, kao i aktivnih modela kretanja. Fokus je na modernizaciji i prioritiziranju korištenja javnog prijevoza, energetske učinkovitosti i racionalizacije korištenja automobila, integracije čitavog sustava javnog prijevoza u jednu tarifnu uniju, i – konačno - boljeg korištenja postojeće željezničke infrastrukture.

Grad trenutno priprema strateški dokument koji se bavi kvalitetom zraka u gradu i ima za cilj doprinijeti ostvarivanju europskih standarda o kakvoći zraka.

Kako bi se unaprijedila prometna dostupnost, Grad Zagreb provodi aktivnosti poboljšanja javnog prijevoza i promicanja aktivnih modela kretanja. Glavne aktivnosti za poboljšanje pouzdanosti zagrebačkog prometnog sustava su poboljšanje prometne infrastrukture, obnova vozila i unaprijeđenje regionalnog prijevoza. U cilju postizanja što pristupačnijih cijena u sustavu naplate, nastoji se uvesti jedna tarifna unija za autobusne, tramvajske i regionalne željezničke mreže.

Postavljeni su mjerljivi ciljevi unaprijeđenja sigurnosti cestovnog prometa. Poduzimaju se i aktivnosti za smanjenje kriminala i povećanje sigurnosti putnika u javnom prijevozu, kao što su uvođenje programa prevencije kriminaliteta teobrazovanja najranjivih skupina sudionika u prometu.

7.2 Executive Summary (EN)

Zagreb is the capital of Croatia with about 800,000 inhabitants and it is an important European transport hub. Zagreb has a 116 km tram network (about 204 000 passengers yearly), bus system of 1352 km (about 83 000 passengers yearly) and 56 km of railway network that ensures urban regional transportation. Sustainable urban transport planning represents an important part in strategic documents.

Road traffic congestion has a medium-to-high impact on the city's inhabitants, businesses, environment and public transport system. The Zagreb County areas are not well connected to each other resulting in increased traffic through Zagreb's urban area and public transport vehicles share the street space with all other transport modes. Motorised transport accounts for about 25% of Zagreb's air pollution. Accessibility to services, employment and education is good but could be improved, even though the city has accessibility standards. Transport unreliability is a problem although standards for the public transport reliability exist. Zagreb has safety problems but is not highly serious; the number of accidents and resulting consequences are monitored. No particular crime problems are known.

The city tries to tackle congestion by supporting and promoting public transport usage as well as active travel modes. Focus is on the modernization and prioritizing public transport, energy-efficiency and car

use rationalisation measures, integration of public transport systems into a single tariff union and better use of existing railway infrastructure.

The city is currently preparing a strategic document for air quality which aims to contribute to achieving the European air quality standards. Public transport improvements and promotion of active travel are actions taken by the City of Zagreb to enhance accessibility. The main activities to enhance reliability of Zagreb's transport system are infrastructure improvements as well as fleet renewals, and regional transportation enhancements. In order to improve fares and fare structures, a single tariff union for the bus, tram and regional train network was introduced.

The city has set itself quantitative road safety targets. The city has taken actions to reduce crime and enhance security such as the introduction of crime prevention programmes and the education of vulnerable groups.

7.3 Introduction to Zagreb

Zagreb is the capital of the Republic of Croatia with about 800,000 inhabitants living in the administrative area and 688,000 in the city's denser urban area. It is located in the south-western part of the Danube region, bordering major geographic regions of Europe, the Alps as well as the Central European and Mediterranean Dinaric areas. Zagreb is an important European transport hub with three major pan-European corridors passing through (one road and two railway corridors). Being a capital city, Zagreb is the country's cultural, scientific, economic, financial and administrative centre. Apart from its favourable geographic position, it has a leading economic position in Croatia.

Zagreb has a 116km tram network with 270 vehicles operating on 19 lines. About 204 million passengers use the tram system every year. The city's public transport modal split mirrors the tram system's importance for passenger transport (see Figure 1). It is complemented by a bus system of 1,352km and 129 lines that transports about 83 million passengers yearly. The 56km railway network ensures urban-regional transportation. Further, the City of Zagreb has introduced a public bicycle sharing system.

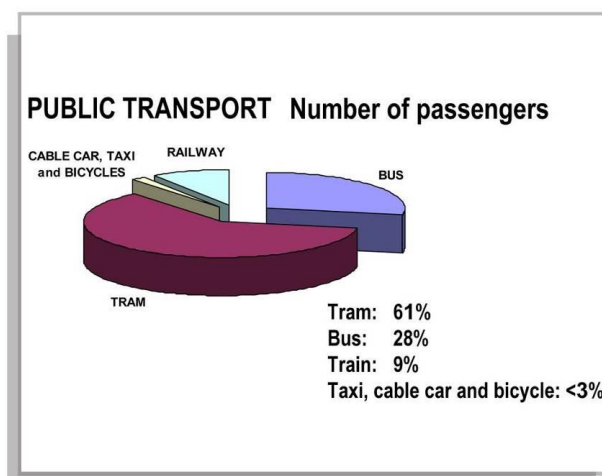


Figure 1: Public transport modal split in Zagreb in 2011
Source: City Office for Strategic Planning and Development of the City

Mobility is one of the main strategic issues in Zagreb, and sustainable urban transport planning represents an important part in its strategic documents such as the City of Zagreb Development Strategy, the Zagreb City Master Plan, or the city's spatial plan. All these documents strongly advocate alternative means of transport including public transportation, cycling and walking.

7.4 Congestion

Congestion is one of the major problems in metropolitan areas because of its economic and environmental impact as well as its effect on the quality of life. Most cities aim to tackle congestion caused by car traffic and also by public transport and freight.

Road traffic congestion is a common problem in Zagreb and has a medium-to-high impact on the city's inhabitants, businesses, environment and public transport system. Traffic is at its highest in peak hours in the morning and afternoon. High congestion levels in Zagreb are a consequence of a variety of reasons. The Zagreb County areas are not well connected to each other resulting in increased traffic through Zagreb's urban area. The main street network of the city is characterised by an insufficient capacity in peak hours, an insufficient number of bridges crossing the Sava River, and the lack of an overall traffic light coordination system. Due to the lack of public transport priority lanes and traffic lane separation, public transport vehicles share the street space with all other transport modes including car transport leading to high traffic volumes and priority conflicts. This clearly affects public transport reliability and public transport vehicles' traffic flow. In addition, it is seen difficult to develop new transport plans and strategies for the historic city centre.

In Zagreb, the severity of congestion is measured by data collection on the number of vehicles per hour at the transport nodes and main routes.

The city tries to tackle congestion caused by motorised transport by supporting and promoting public transport usage as well as active travel modes (cycling and walking). Also push-measures are implemented such as parking restrictions that divide the city into three different tariff zones and access restrictions so that only vehicles with a special permission can enter the pedestrian areas of the historic city centre.

It has turned out problematic though to implement push-measures, access restrictions in particular, in Zagreb's city centre since all important administrative, cultural and touristic facilities are located here.

The city's strategic mobility projects and programmes focus on the modernisation of public transport, prioritising public transport in intersection management, energy-efficiency and car use rationalisation measures, integration of public transport systems into a single tariff union (bus and tram network, regional train), better use of existing railway infrastructure by providing improved service and building new stops, introduction of a light rail system and the completion of the bicycle network within the city and in the region.

7.5 Air Quality and Noise

Reducing emissions in transport is one of the key aims of the European transport policy. One of the arguments for sustainable urban transport planning is that more sustainable mobility directly leads to better air quality and less noise.

Motorised transport accounts for about 25% of Zagreb's air pollution (56.5% general consumption sector including e.g. households, utility sector and agriculture, 18.5% industry sector; data from "Zagrebplan 2020", June 2013). The city is currently preparing a strategic document for air quality which aims to contribute to achieving the European air quality standards. It is anticipated that most of the EU's standards are met at the moment; however, since consistent and measureable air quality data is lacking and national and European standards vary, this cannot be confirmed yet.

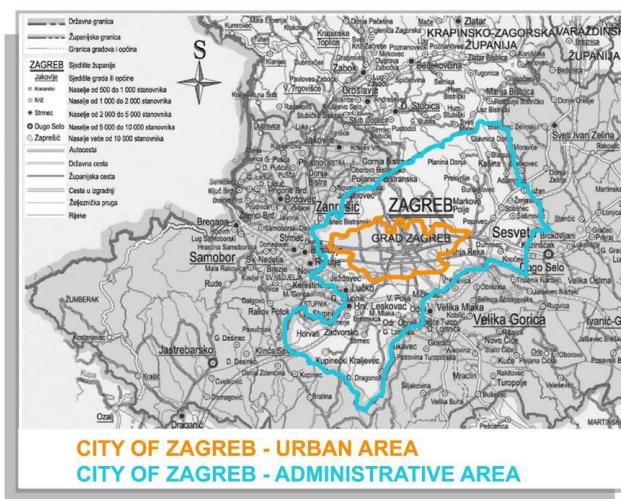


Figure 2: City of Zagreb: administrative definition

Source: City office for strategic planning and development of the City

Until the overall strategic document for air quality is finalised, the 2010 Sustainable Energy Action Plan developed by the City Office for Energy, Environmental Protection and Sustainable Development is the key strategic document in place. It aims to improve air quality and reduce energy consumption which is why Zagreb's city officials expect the air quality situation to improve and not to get worse over the next years.

The City of Zagreb suffers from traffic noise emissions. Noise levels are highest along the main roads, key intersections as well as tramway and railway tracks. Data from noise observations on the severity of noise is not available at the moment; however, the city is currently preparing a strategic noise map which is planned to be finalised in 2015.

7.6 Accessibility

In order to ensure economic development and to meet social targets, the enhancement of accessibility of the city centre, neighbourhoods and business districts for people and freight or for large events is one of the key aims of sustainable urban mobility planning.

According to the interviewed city representatives, accessibility to services and employment is good and accessibility to education is very good in Zagreb. The city does have accessibility standards. Vulnerable groups such as pensioners, mobility-impaired people, young children and unemployed people benefit from zero-fare public transport. In addition, public transport vehicles were made accessible for elderly and disabled persons, pregnant women and mothers with young children. Data collection of accessibility indicators to evaluate accessibility levels is not in place though.

Public transport improvements and promotion of active travel are actions taken by the City of Zagreb to enhance accessibility.

7.7 Service Quality and Fares of Public Transport

Public transport is the backbone of every sustainable urban transport system. Its service quality including punctuality, customer information and self-explaining features has large effects on the level of acceptance and usage.

Transport unreliability is a problem in Zagreb but less severe than other problems. It is particularly serious at the city's key intersections and during rush hours. Standards for the public transport's reliability are set by the City of Zagreb being the owner of the public transport operator. Based on a variety of indicators, data is collected to measure the severity of unreliability; evaluation results are not available at the moment though.

It has been observed that the cost and complexity of public transport fares are disincentives to using Zagreb's transport system. This is of course not intended; however, as a consequence of the global and local economic crisis, not all inhabitants can afford public transport in Zagreb. Nevertheless, the city is still trying to make public transport as accessible as possible.

The main activities to enhance reliability of Zagreb's transport system are infrastructure improvements as well as fleet renewals, and regional transportation enhancements. In order to improve fares and fare structures, a single tariff union for the bus, tram and regional train network was introduced.

Just as many other European cities, also Zagreb has been hit by the economic crisis. Its consequences are seen to be the main barriers to public transport improvements. At the same time, Zagreb is going through a political, social and economic transition. A combination of all these factors is currently resulting in a long-term weakness of the economy, uncertainty of funds and austerity budgets.

7.8 Comprehensibility of the Transport Network

Directing people through a more and more complex transport network should be one of the key aims for the city in order to ensure a smooth and efficient multi- and intermodal mobility.

There is a long term tradition of public transport usage in the city since it was established long time ago when the city had much less inhabitants as well as cars. Today a lot of people use the public transport system and usage is still increasing. The growth of the city has generated higher numbers of inhabitants and at the same time cars, but it has not generated a strong economy that is needed for achieving major changes in transport infrastructure though. As a consequence, the number of cars is growing although the public transport has been adapted and improved over time.

Understanding Zagreb's transport system is a problem of medium impact for private travellers and public transport users. Traditional direction and routing methods are applied in the city; real-time displays and e-ticketing are available, further ITS-based travel information systems or smartphone applications are not in use.

Also here, as a result of the economic downturn, financial constraints are assumed to be responsible for problems to implement measures that enhance the transport network.

7.9 Safety

Safety is one of the key cross-sector issues in the sustainable urban mobility planning process and is particularly important for active travel modes such as cycling and walking.

Zagreb does have safety problems; these are not highly serious though. The number of accidents and resulting consequences such as damages are monitored. The number of accidents has decreased due to restrictive transport measures that were implemented. The city has set itself quantitative road safety targets to achieve a significant reduction in accidents.

7.10 Crime in the Transport System

Cycling, walking and public transport systems should be as crime-free and safe as possible to attract people to environment-friendly transport modes. Especially vulnerable groups such as the elderly, children and women are sensitive to any kind of aggressive and violent environments.

Crime seems to be a less pressing problem in Zagreb's transport system. . No particular crime problems are known to the interview respondent. The city has taken actions to reduce crime and enhance security such as the introduction of crime prevention programmes (e.g. installation of CCTV cameras, provision of educational material and the education of vulnerable groups such as pensioners, children, women and mobility-impaired persons).

7.11 References

ZAGREB PLAN, City of Zagreb Development Strategy, Strategic Development Directions for the Period Ending in 2013

ZAGREBPLAN 2020, BASIC ANALYSIS / Summary, City Office for Strategic Planning and Development of the City, June/2013

8 City transport officers' perceptions of objectives, problems, solutions and barriers.

Caroline Mullen

8.1 Introduction

Report of a small study focused on six CH4ALLENGE partner cities and conducted by the Institute for Transport Studies, University of Leeds (ITS) in summer and autumn 2013. This study aimed to understand the cities' transport objectives and how these sit within wider city objectives. Its further purpose was to identify the transport officers' (that is professionals' rather than politicians') perceptions of the cities' major transport related problems and to gain an indication of the transport measures which might respond to these objectives and problems. Investigation of these objectives, problems, and potential measures all involved reference to aspects of mobility situations in the cities, and to other transport related factors and problems (such as poor air quality). An account of the method is given in the earlier chapter on methodology. The following account offers a simple presentation of key findings from the study.

8.2 Objectives

A prominent objective was using transport with the aim of contributing to economic development and competitiveness. This emphasis on economy, and the role of transport in economic development, is identified by a number of cities as being a major objective, and some considered among the top three overarching objectives. Further, although carbon reduction remains a significant objective, there is suggestion by some cities that it can be addressed by measures which will enhance economic development.

Several cities identify transport objectives such as quality of life, and liveability. The discussion indicated that these objectives would be understood in a broader context, and that as a means of achieving an aim of quality of life or liveability, they would need to be interpreted in particular ways (we might illustrate this by comparing concern for accessibility to jobs as an objective that contributes to economic ambitions, or as one that addresses concern for social welfare – the measures applicable to each might differ (e.g. the latter might involve large investment to secure accessibility for a few people).

Similarly a number of cities identified objectives directly concerned with mobility for all citizens (expressed in some cases as removing barriers to travel). While this again will encompass accessibility, respondents indicated a further concern with ensuring that travel is affordable (e.g. using concessionary fares).

Most cities recognised air quality as an objective: We can note that while transport is a direct cause of poor local air quality. For some cities it is the major cause. For others it remains a significant cause, but other factors including industrial pollution, energy generation and residential heating systems are also major polluters. In relation to transport planning, these further causes of local air pollution are especially relevant where electricity used for transport, especially public transport, is generated in a very

polluting way. The implication would be that to realise the objective may require shift to cleaner electricity production in some cities.

Finally we might note that some cities identified more focussed 'objectives', including increasing influence on land use planning; reducing car use; increasing active travel - walking and cycling; promoting electric and hybrid vehicles; and increasing participation in transport planning. It is worth noting that describing these focussed plans (e.g. increasing cycling) as objectives is very problematic where there is no explicit or stated rationale for their adoption. Two points can be made here. First is that the study has revealed that there is a tendency to think of the focussed plans as objectives. If that is problematic then it indicates an area for debate with transport officials. Second, when these focused plans are identified as objectives, it may be that there is a more-or-less developed rationale for that which is simply not stated.

8.3 Problems

First, a number of respondents identified insufficient cycling infrastructure, low levels of safety for cyclists, or poor pedestrian environments as specific problems. Other potentially related problems are health impacts of sedentary lifestyles.

A striking feature of the responses is the identification of problems associated with governance. This operates at different levels:

(a) Problems resulting from the geographical structure of administrative boundaries –for instance, a city might face transport problems which originate in a neighbouring area (and may originate in developments in that other area); or areas over which transport planning operates may be small with the consequence that planning is disjointed.

(b) Problems associated either with privatised (or nationalised) transport services, or with regulation of public or privately operated services – for instance, problems with encouraging increased bus passenger numbers where private companies find it uneconomic to operate on certain routes.

(c) Autonomy for organisations: questions of whether city or regional planners can determine priorities independently.

Social, political and planning cultures are also identified as problems: social cultures can act as a barrier to use of sustainable modes; political cultures can impede governance; and planning cultures may be considered not to be rigorous. Geography, built and natural environment feature as further prominent sources of problems. These include cities facing problems because their historical centre cannot accommodate the number of vehicles there; bridges over river crossings tend to be points for congestion and constrain options for planning; valleys can exacerbate poor air quality.

8.4 Consideration of types of transport measure

Behavioural and attitudinal interventions Demand responsive transport was held to have several functions, in one case as central to ensuring social inclusion, and in another as a site of experimentation,

for instance, in providing space for mountain bikes on certain forms of public transport in order to support tourism. Flexible working, and particularly prospects of remote working, frequently associated with developments in technology, also appear prominent. We might note that some transport authorities do not think that they can intervene in suggesting how other organisations work. In other places, organisational co-operation might make this feasible. Travel planning, in schools, workplaces and at individual level are quite prominent. Again the findings suggest that sometimes there is a distinction between travel planning in private organisations, who engage because they see the benefits to their organisation, and travel planning as promoted by municipalities in order to help meet objectives.

It is interesting to note enthusiasm for cycle sharing schemes and promotion of cycling to employees within organisations. In contrast car-pooling, including formal car clubs, and informal practices of car sharing or lift sharing, appear less significant. Finally, several cities described the importance of promotional activities aimed at encouraging more sustainable travel practices. These include car free days; travel behaviour change associated with health promotion; campaigning for ‘mutual respect on the road’; sustainable transport to school and work.

Infrastructure interventions

The interviews suggested that while new roads are considered in different cities, the extent to which they are a priority varies. Emphasis on cycle infrastructure were more consistent across respondents. The approach to other measures can depend again on governance structures. So, for instance, lorry parks and transshipment are held to be outside the remit of some transport planners; likewise some municipalities have little if any control over rail development.

Management and operational interventions

It is worth emphasising the importance given to parking measures. While high occupancy vehicle lanes feature as possibilities for only a few cities, the qualitative results indicated some interest in other types of priority lane – for instance for electric vehicles. Cultural factors, such as practices of single occupancy are identified as influencing prospects for priority lanes.

Focus on public transport services can be influenced by governance structures: if there are private transport providers, transport planners may need to provide subsidised services to support social goals. There can also be a concern to regulate privately owned buses.

There was some discussion of the ways in which packages of measures can have a focus on specific aims, such as preventing good vehicles from crossing the city centre.

Information interventions

The interviews indicate, perhaps not unexpectedly, that there is some interest in the potential from developments in information technology. This might include information in timetables and real time running via smartphone, and possibly crowd sourcing as a means of gathering information. Cost is cited

as a constraint on development. A further related use of IT is in providing running time, and other information at bus stops

Pricing interventions

Some cities noted political problems and perceptions of public acceptance surrounding road user charging, and to a lesser extent, ideas of increasing fuel tax. The interviews indicated for at least some of those who consider integrated ticketing do, this is held to be a particularly important measure. Several cities identified fare structures as significant, both in supporting social inclusion, and in seeking to make public transport appealing to the public. A further measure suggested was subsidies for cleaner vehicles

Law and regulation

This would incorporate at least two types of measure identified as significant by respondents in the study:

1. There is substantial interest in measures on traffic law and enforcement, particularly on speeding, also on other aspects of traffic law. If measures of this sort are added, we might take account of the variability in jurisdiction. So some city authorities might have powers to set traffic regulations (e.g. on pavement parking; speed limits) and in other places it might be entirely national government decision.
2. Repeatedly, respondents identified the significance questions of whether public transport is managed or owned by private sector or public sector. Certain measures are considered as a response to issues associated with these questions – for instance, needing to subsidise non-profitable bus services, or needing to regulate privately owned buses. Given this we might consider measures identified as being regulatory: such as quality contracts; public ownership of services; regulation of public transport vehicle standards.

8.5 Barriers

Governance, regulation and autonomy

As discussed above, matters of governance arise frequently in considering transport problems and objectives and the potential measures which might address them. We have seen that concerns vary according on one hand to the remit and autonomy of the transport authority concerned, and on the other to matters of whether transport services are publicly or privately owned and regulated. We might be cautious in suggesting that governance problems are simply a matter of a transport authority having too little autonomy – consider for instance, problems for one city or area which stem from the autonomous decisions of a neighbouring authority (who might, for instance, have supported development with far reaching transport impacts). Instead, barriers associated with governance and regulation might need to consider barriers to implementation associated with a number of different governance and regulatory configurations.

Public acceptability

The interviews identified several ways in which attitudinal factors act as barriers to increasing sustainable travel practices. Some cities cite attitudinal barriers to using sustainable transport modes. Further perceptions of lack of safety of some transport modes, especially cycling, are identified as barriers to uptake or more sustainable transport. There is a perception of lack of public acceptance of measures including road user charging and increased parking charges or parking restrictions. This is closely associated with a view that these measures lack political acceptability –see below.

Political acceptability

Road user charging is clearly identified as presenting political challenges, even where work to assess benefits had begun there is strong indication that it would not be a viable measure. Interestingly, 'local' road user charging is considered not to be feasible even in places where motorway tolls exist. Parking charging and restrictions on parking also face political problems.

We might add to this section, comments that cultural practices by planners can act as barriers to implementation of measures on sustainable transport.

Stakeholder objections

In addition to governance and regulatory problems, there can be further barriers to implementing measures stemming from objections from private service providers. For instance, these might involve objections to including less profitable public transport routes among the set of routes operated by a private provider.

Financial barriers

Ability to implement measures might depend on availability of finance from national government, and this can involve convincing national governance of the case for the measures. Alternatively national government funding can mean it is they rather than local transport authorities who determine what measure are implemented. Cost was cited as a barrier to implementing information systems. One specific example of financial constraint comes from a comment that while recognising the benefits of attitudinal and behavioural measures to support walking and cycling, the cost of implementing them prevents their use.

9 Conclusion

Tony May

This report has summarised the results of two surveys. The first, conducted in mid 2013, was designed to inform the development of the Measure Option Generator and, in doing so, obtained information on objectives, strategy and barriers in 34 cities. The second, in late 2013, was a more focused survey of the problems experienced in the five advancing cities. While it did not focus on strategy or barriers, some aspects of these were covered in the responses.

The first survey highlighted the role of transport in stimulating economic development as a dominant objective in most cities. Mobility for all was also a significant concern, both to support development and to tackle social inequalities. Most cities were concerned to stimulate greater quality of life and enhanced liveability. To this end there was frequently a concern to enhance air quality, although transport was not always the dominant source of pollution. Safety and personal security were less frequently mentioned as key objectives.

To some extent these findings were supported by the second survey's review of problems. Four of the five cities saw congestion as a serious and growing problem; only in Budapest was it thought to be decreasing. Despite congestion, most cities considered public transport unreliability to be only a minor to moderate problem, and in Budapest, where it was more serious, this was due to an ageing bus fleet. Equally, the five cities generally considered accessibility to be satisfactory, though they all accepted that they would benefit from introducing formal accessibility standards; only Timisoara identified an access problem, particularly to outer suburban employment. Perhaps surprisingly, given the first survey's focus on air quality, only Budapest and Krakow considered that they had a serious air quality problem; conversely, all five cities considered noise a moderate to serious problem. The general view in all five cities was that difficulties in understanding the network, accidents and crime were much less serious problems, although it may be that safety and crime were less direct responsibilities of the respondents. It was suggested that cities could do more to collect and analyse accident statistics.

The first survey highlighted the wide range of solutions being considered under the broad headings of mobility management, demand management and information technology. Mobility management measures included frequent use of personal, school and company travel planning, general promotional campaigns, bike sharing and demand responsive transport. Demand management measures focused on parking controls, pedestrian streets and access restrictions, which were also mentioned in all five cities in the second survey; the first survey also highlighted the importance of effective enforcement for all of these. Many cities, including three of the five in the second survey, were actively pursuing the use of real time information for users of all modes. By comparison, there was less mention of infrastructure measures, improved service provision or pricing.

Among barriers, the first survey particularly highlighted governance, acceptability and, to a lesser extent, finance. Key governance issues arose from lack of autonomy from higher levels of government, inconsistent policies across local government boundaries and, in many cities, a mismatch between public policy objectives and those of private operators. Interestingly none of these was mentioned in the second survey. Lack of acceptability was particularly evident in public and political attitudes to demand management and pricing; three of the five cities in the second survey also highlighted this as a barrier to the use of demand management. Finance was predominantly a problem for public transport services, coupled in part with a reluctance to increase fares and hence growing pressure for subsidy; both Brno and Zagreb in the second survey highlighted this as a concern.

Overall, the surveys demonstrate the importance which cities place on enhancing economic development and quality of life. There is a clear need for more effective monitoring and interpretation of problems associated with air quality, noise, inaccessibility and accidents. The cities demonstrate an innovative approach to the use mobility management, demand management and information provision, which

bodes well for the future development of SUMPs, but which could potentially be reinforced by enhanced guidance on packaging of such measures. Governance and public acceptability are dominant concerns, and it is clear that all cities could benefit from further guidance on public participation in strategy formulation, and on effective stakeholder involvement. These are all areas in which the project's four Challenges will be able to make a significant contribution.

10 Appendix 1: Interview guideline for D4.1 Reports on Local Mobility Situations

Congestion

Congestion is one of the major problems in metropolitan areas because of its economic and environmental impact as well as its effect on the quality of life. Most cities aim to tackle congestion caused by car traffic and also by public transport and freight.

- 1.1 How serious is congestion in your city?
- 1.2 Is congestion particularly serious in certain areas or at certain times of day?
- 1.3 Is the problem getting worse over time?
- 1.4 Is there a particular problem for public transport?
- 1.5 What data do you collect to measure the severity of congestion?
- 1.6 What do you consider are the most important causes of these congestion problems?
- 1.7 What are the main activities in your city to tackle traffic congestion caused by cars and public transport and freight?
- 1.8 What kind of “push-measures” are in place (e.g. parking fees, city centre pricing or access restrictions)?
- 1.9 What are the main barriers to pursuing such “push measures”?

Air Quality and Noise

Reducing emissions in transport is one of the key aims of the European transport policy. One of the arguments for sustainable urban transport planning is that more sustainable mobility directly leads to better air quality and less noise.

Air Quality

- 1.10 Does your city meet the European air quality standards?
- 1.11 If not, where are the locations where standards are not met, and by how much are they not met? Are these problems getting worse over time?

- 1.12 To what extent is motorised transport, among other sources (e.g. industry), responsible for air pollution in your city?

Noise

- 1.13 How serious is noise as a problem in your city?
- 1.14 Is noise from traffic particularly serious in certain areas or at certain times of day?
- 1.15 Is the problem getting worse over time?
- 1.16 What data do you collect to measure the severity of noise?
- 1.17 What are the main activities in your city to tackle pollution, emissions and noise caused by transport in your city?
- 1.18 What are the main barriers to pursuing such measures?

Accessibility

In order to ensure economic development and to meet social targets, the enhancement of accessibility of the city centre, neighbourhoods and business districts for people and freight or for large events is one of the key aims of sustainable urban mobility planning.

- 1.19 How serious is inaccessibility in your city regarding...
- a. accessibility to services?
 - b. accessibility to employment?
 - c. accessibility to education?
- 1.20 Is it particularly serious in certain areas or at certain times of day or for certain groups of people?
- 1.21 Is it a particular problem for public transport?
- 1.22 Is the problem getting worse over time?
- 1.23 What data do you collect to measure the severity of problem?
- 1.24 Are there accessibility standards in your city?
- 1.25 What are the main activities in your city to tackle inaccessibility?
- 1.26 What are the main problems your city is facing when trying to enhance accessibility?

Service Quality and Fares of Public Transport



Public transport is the backbone of every sustainable urban transport system. Its service quality including punctuality, customer information and self-explaining features has large effects on the level of acceptance and usage.

- 4.1 How serious is public transport unreliability in your city?
- 4.2 Is it particularly serious in certain areas or at certain times of day?
- 4.3 Is the problem getting worse over time?
- 4.4 What data do you collect to measure the severity of unreliability?
- 4.5 Are standards and/or benchmarks for the public transport's reliability in place?
- 4.6 What are the main activities in your city to enhance reliability of your public transport system?
- 4.7 What are the main barriers to pursuing such measures?

Fare

- 4.8 Is there evidence that the cost or complexity of public transport fares is a disincentive to using your public transport system?
- 4.9 What are the main activities in your city to improve the fares and fare structure of your public transport system?
- 4.10 What are the main barriers to pursuing such measures?

Comprehensibility of the Transport Network

Directing people through a more and more complex transport network should be one of the key aims for the city in order to ensure a smooth and efficient multi- and intermodal mobility.

- 4.11 How serious is the problem for users in understanding the transport system in your city?
- 4.12 Is it a particular problem for private travellers (e.g. route finding) or for public transport users (e.g. timetables)?
- 4.13 Is it particularly serious in certain areas or at certain times of day?
- 4.14 Is the problem getting worse over time?
- 4.15 What data do you collect to measure this problem?
- 4.16 What are the main activities in your city to tackle these problems?
- 4.17 Does your city use new technologies (e.g. ITS based travel information systems, Smartphone Apps) for directing people through the transport network?

4.18 What are the main barriers to pursuing such measures?

Safety

Safety is one of the key cross-sector issues in the sustainable urban mobility planning process and is particularly important for slow transport modes such as cycling and walking.

- 4.19 How serious are accident and casualty levels in your city?
- 4.20 Is it particularly serious in certain areas or at certain times of day?
- 4.21 Is it a particular problem for certain types of road user?
- 4.22 Is safety a particular problem in walking and cycling networks?
- 4.23 Is there a difference between peoples' perception of safety and actual safety data?
- 4.24 Is the problem getting worse over time?
- 4.25 What data do you collect to measure the severity of the problem?
- 4.26 Has your city set quantitative road safety targets?
- 4.27 What are the main activities in your city to enhance traffic safety?
- 4.28 What are the main barriers to pursuing such measures?

Crime in the Transport System

If you want to attract people to environment-friendly transport modes, cycling, walking and public transport systems should be as crime-free and safe as possible. Especially vulnerable groups such as the elderly, children and women are sensitive to any kind of aggressive and violent environments.

- 4.29 How serious are crime and the perception of risk from crime on transport systems in your city?
- 4.30 Is it particularly serious in certain areas or at certain times of day?
- 4.31 Is the problem getting worse over time?
- 4.32 What data do you collect to measure the severity of the problem?
- 4.33 Does your city have experience with crime preventions programs in public space and transport?
- 4.34 Has your city set quantitative targets for tackling transport crime?
- 4.35 What are the main activities in your city to reduce crime, perceptions of crime and enhance security in your city's transport system?
- 4.36 What are the main barriers to pursuing such measures?

11 Appendix 2: Interview topics study of transport objectives, problems, solutions and barriers.

1. The aims that city authorities have for the city
2. The aims for travel and transport you have as city transport authorities
3. Your transport objectives
4. Transport problems in your city
5. Does your city have a transport plan?
6. Please can you say something about the transport measures which you use in your city or which you might like to use – and about those which you would not use?