

TRANSNATIONAL SUMMARY REPORT ON MOBILITY INCENTIVES AND INNOVATIVE MOBILITY CONCEPTS IN CE REGIONS

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1. Executive summary

The following document summarizes a transnational report on mobility incentives and innovative mobility concepts in Central Europe (CE) regions. For each region/city-region the report makes an investigation which follows an identical structure. First, an analysis is provided to reveal incentives which aim influence locations and trip frequency. Then, the incentives influencing mode choice, route choice as well as departure time choice are investigated and summarized. These are important measures as they are directly related to mobility plan design. Finally, the main innovative mobility concepts in the regions are analyzed, i.e. the reveal of the mobility concepts that have already been implemented and contained measures concerning mobility management. All mobility incentives and innovative mobility concepts applied in CE region are of interest and sought as they potentially contain important elements relevant to future workplace mobility.

The results of the report can be summarized briefly as follows:

- Concerning the incentives to influence locations and trip frequency a similar practice is observable in all city-regions of CE.
- The influence of mode choice is getting more and more important as traffic demand generated by private cars cause everyday congestions. Therefore, appropriate incentives are needed to strengthen the role of public transport and make it more attractive for travelers.
- Incentive measures to influence route and departure time choice are rarely applied in the investigated CE cities, except Budapest and Modena.
- In the CE region innovative mobility concepts exist in a wide manner: SUMPs, demand responsive transport, integrated traffic management, electro-mobility, car pooling, car sharing, and bike-sharing systems. However, these concepts mostly exist as at a planning/testing level except the city of Leipzig.

2. Introduction

MOVECIT - Engaging employers from public bodies in establishing sustainable mobility and mobility planning - started in June 2016 and is a 36 months project supported by the INTERREG Central Europe programme.

MOVECIT aims to make transport more sustainable in times of increasing individual and motorised mobility in central Europe. City representatives, sustainable mobility specialists, environmental and regional agencies as well as NGOs cooperate in the project. City administrations will implement mobility plans for their institutions to change the commuting and business travel habits of their employees. Campaigns will be developed and launched to make cycling, walking, and the use of public transport more popular. At the same time measures like carsharing, bikesharing, e-mobility and improved carpools of city town halls will be introduced in selected cities.

The project seeks to reach a wide audience among municipalities across the Central Europe region, creating a large-scale impact, and in the longterm ongoing training on mobility plan development. In order to achieve this, MOVECIT creates and implements its training transferred to national environment and two Study visits and exploits its outputs for a long-term impact.

Through MOVECIT project selected cities will benefit from mobility plan created for city hall administration. Project partners appointed as know-how provider will work intensely with the



municipalities appointed as know-how receiver. In the stakeholder involvement process several events will be organized to reach the wider acceptance of the plans. The pilot actions and pilot investments will be implemented to test the commitment of the staff employed at the municipality administration.

Communication and promotion activities will target more or less the staff working at the municipality administration. Trendy campaign will influence on heart and mind of the target groups.

3. Synthesis of the regions report

The report is created along the guidelines (see figures below) provided by the article:

Mattias Juhász, Travel Demand Management - Possibilities of influencing travel behaviour. Periodica Polytechnica Transportation Engineering, Vol. 41, No. 1, pp. 45-50, 2013. DOI: 10.3311/PPtr.7096

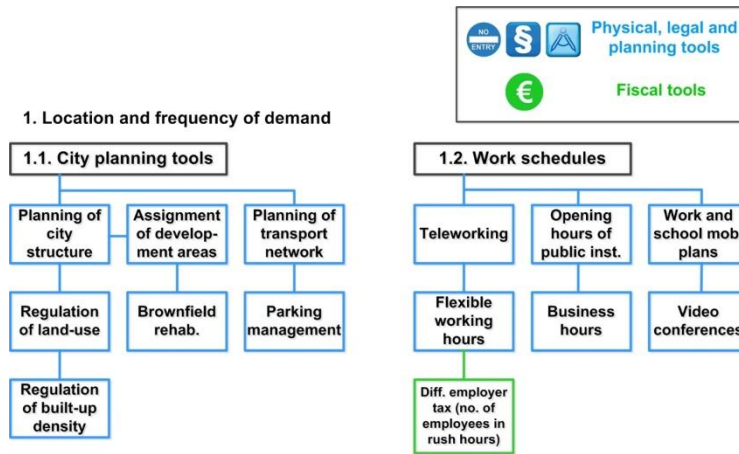


Figure 1 Potential incentives to influence locations and trip frequency

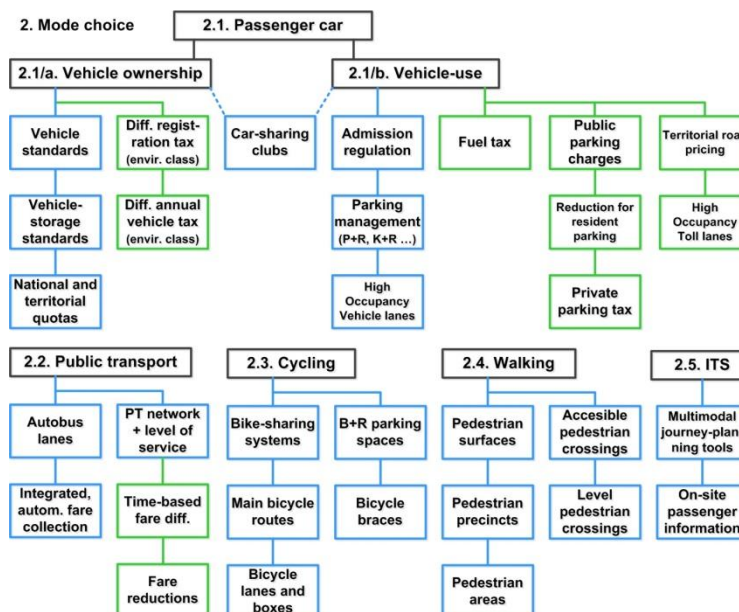


Figure 2 Potential incentives to influence mode choice



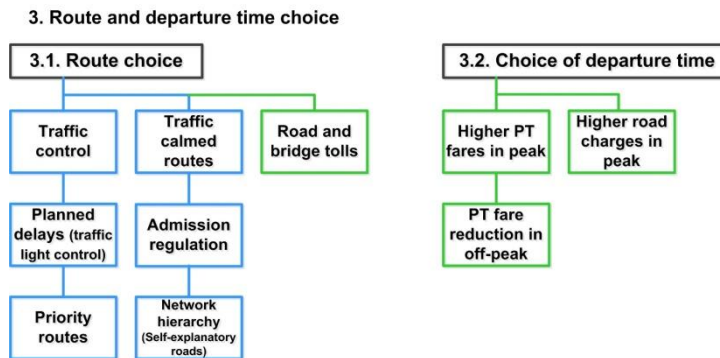


Figure 3 Potential incentives to influence route and departure time choice

Concerning the incentives to influence locations and trip frequency a similar practice is observable in all city-regions of CE. In our days, city center represents more and more a protected area. Generally, one aims to free up the public spaces and tries to find the perfect balance in serving citizens and visitors transportation needs. Accordingly, land use regulation in general and especially parking policy have been recently revised. Appropriate city planning and management are extremely important in order to realize sustainable urban mobility. Accordingly, the following incentive measures are in use in CE cities as city planning tools: parking management, Sustainable Urban Development Plans (SUMP) or simply urban development plans, regulation of land use related to transport. As effective tools in most of the investigated cities bike sharing systems or park and ride systems at train station are available. At the same time, official workplace or school mobility plans have not been realized yet in any the considered CE cities, i.e. general recommendation system for travelers is missing. Of course some pilot projects in the public sector have already been conducted but they represent only specific plans for a given public or municipal company. Private sector is more active by supporting their employees via mobility plans. Typically, multinational companies are open for mobility plan as it helps to create attractive workplace. In Budapest, for example a commercial banking company and a telecommunication company have created and still maintain working mobility plans by encouraging cycling.

In our days, the influence of mode choice is getting more and more important as traffic demand generated by private cars cause everyday congestions. Therefore, appropriate incentives are needed to strengthen the role of public transport and make it more attractive for travelers. The mode choice depends on many factors. Some of the most important of these are the financial opportunities (vehicle operation, maintenance and depreciation costs, fuel price), asset availability (Is there a car in the family?), route options (shortest, safer, better lighted, frequented routes), travel time, distance, parking facilities. The most popular incentive measures mentioned in the report are P+R system, interoperable fare system and tariff community, parking management in public space, bus lanes, public bicycle-sharing service, car sharing or car pooling. In most of the investigated cities the transportation network infrastructure is well-developed, capacity utilization is appropriate. The two cities which would need much more improvements in incentives measures are Banská Bystrica and Békéscsaba. The key element of future developments in their cases should be the passenger orientation and user-friendliness.

Route choice and departure time choice can be influenced separately. However, in most cases the applicable influencing tools exert a common effect on both. Appropriate incentives are indispensable to shape an efficient transportation system with the general aim of travel time optimization. Incentive measures to influence route and departure time choice are rarely applied in the investigated CE cities. Only Budapest and Modena deal with such incentive tools efficiently. The most popular incentive measures applied by these cities are advanced passenger information system, public transport priority, bus lanes, real-time transport information, variable message signs, traffic calming zones.

As innovative mobility concepts the following main fields have been revealed in the CE region: innovative mobility concepts defined in SUMPs, demand responsive transport, integrated traffic management,



electro-mobility, car pooling, car sharing, and bike-sharing systems. Although these are very attractive it must be noticed that they represent new concepts. Therefore, these concepts mostly exist as at a planning/testing level or if they are realized, they are not yet generally exploited. A nice exception is the city region of Leipzig where information and booking platforms to connect public transport, car- and bike sharing are under realization currently.

4. Industrieviertel (Austria)

4.1. Innovative mobility concepts in the region

Both cities, Baden and Mödling have already implemented several measures concerning mobility management. They are both part of the project “smart city”. The project aims to develop as the name already says a smart vision for the region by increasing and making foot traffic, cycling and public transport modes more attractive and implementing an environmentally friendly behavior.

Cities and surroundings should be connected functionally. Therefore, a higher quality of life, security and welfare should be improved and the use of energy and resources should be reduced at the same time. New technologies should be integrated and changing processes and implementing new ones like incorporating citizens as stakeholders. It covers topics in the following areas: mobility, energy, construction, population and economy [1].

Baden has gradually extended its pedestrian zone and has already implemented its first park & ride in 1987. In 2001 the city implemented a bicycle concept and extended it in 2004. Due to investments to promote cycling in Baden, the percentage of bicycle users was increased from 6 to 10% since 2003. Baden entered into a partnership agreement with klima:aktiv to promote cycling. Furthermore, in 2008 a traffic concept for children was implemented. The main cycling route was extended. The train station in Baden is equipped with an innovative manned bicycle service station as well as storage sidings and further bicycle hire stations were installed in the city. [3, 4]

The bicycle concept has already led to implement the following main measures [6]:

- Physical separation of cycle lanes in one-way roads and other roads
- Marking of installation areas for bicycles Markierung vorgezogener Aufstellflächen in der Roseggerstraße, Wassergasse, Mühlgasse und Wienerstraße (2001)
- Extending the bicycle network next to Mühlbach
- Bike & ride installation at the train station in Baden

Baden focuses on daily bicycle traffic and has already been supported by the region “Industrieviertel in cooperation with different partners like Radland-Niederösterreich and Stadt-Umland-Management-NÖ [2].

Further measures are the following:

- Optimizing stationary traffic
- extending its cycling network as well as foot traffic and combined routes
- optimizing parking zones
- optimizing city bus routes
- supporting e-mobility

Mödling is also part of SUM (management of city and its surrounding) cooperating a lot with Vienna and various neighboring municipalities. It supports a better connection of Vienna and its surrounding



municipalities and also contributes to make commuting easier. Furthermore Mödling has implemented 'E-CARREGIO' a car sharing project and two charging stations were installed.

There has also been a dialog in order to create mobility guidelines for the district "Neusiedlerviertel". Participants collected their ideas in the course of a world café. Six objectives were identified:

- reducing speed limit and obey the traffic rules
- mobility without owing a car
- continuous cycling network (secure & comfortable)
- PT should increase, individual traffic should decrease
- Superregional solution for transit traffic, decrease truck-transit traffic
- Increase security of foot traffic

It has to be signaled that citizens also play an important role in this project, as they are incorporated in the processes.

5. Cityregion Bruck-Kapfenberg-Leoben (Austria)

5.1. Incentives to influence locations and trip frequency

For both cities, Bruck and Leoben, the urban development plans are the most important sources to gain insight to the plans of mobility incentives. The first important instrument to regulate mobility is a consequent planning policy promoting compact urban framework. Preventing urban sprawl means also means prevention of unnecessary traffic. This is a concern for both of the cities. Further the volume of traffic influences life quality of the people. Here, Bruck's objective is to countersteer with an unbundling of traffic establishing intra-urban "quiet axes" increasing availability of public transport stops through new pavement and bikeway connections [1].

Regarding the parking space management the existing system is not very effective to keep motorized individual transport low. In Bruck, basically, parking is possible for a maximum of 2 hours costing 1€ per hour, in the central parking garage the first hour is without costs [2].

In Leoben parking in the city center is even cheaper: divided green and blue parking zone, the latter allowing a maximum parking duration of 3 hours for 2 Euro or unlimited paying 30 cent per half an hour or 3,30 Euro for the whole day (green zone) [3].

An effective incentive for both cities is the park and ride system at the train station. Combined with the train ticket the parking place costs just 1 Euro per day.

Central sectors for the region's future are tourism and culture management and economy/workplace and education management. The importance of mobility in these sectors is considered in the development plans, still the potential of public and non-motorized mobility can not be found in any concept, e.g. establishing attractive mobility systems to and from cultural events/touristic highlights or facilitating access to important entrepreneurs of the region respectively the Montanuniversität highlighting non-motorized transportation modes. Apart from mobility grants for students living but not studying in Bruck incentives in educational and working world are totally absent. However, technological opportunities of teleworking, skype conferences and Co. open new ways to reduce traffic but are not settled in traffic development plans yet.



5.2. Incentives to influence mode choice

In the region in focus the offer of (inter)regional public transport is not adequate yet. The motorway net is more attractive especially for commuters going to Graz [4] or commuting within the region. However, to keep emissions low in the administration sector the city of Bruck acquired an e-car as company vehicle. It is used regularly, about 2 or 3 times a week, by officers of the building authority. For their appointments they often have to leave the center and as soon as this is the case, public transport is no more attractive. The region is working on this fact working together on concepts for the city region Bruck-Kapfenberg-Leoben [5].

Bruck's prior goal is to become a "city of short ways". The city wants to switch the focus and priority from motorized traffic to pedestrian traffic including the reconstruction of sidewalks, illumination of undercrossings and separate pedestrian bridges over the river Mur.

Individual incentives have been made to reduce motorized traffic in general offering grants for E-Bikes and building E-Bike-loading stations. The park and ride garage at the train station promotes the change from car to train offering attractive parking prices for people with train tickets.

Comparing the prices of tickets for public transport and parking in the cities the costs do not attract for using public transportation. Still, the mentioned mobility grant for students living but not studying in Bruck is a positive incentive to facilitate the use of train, tram and bus.

A planned incentive to keep motorized traffic low in the night times is an attractive connection of the centers Bruck, Leoben and Kapfenberg via night busses.

As mentioned in 4.2 Leoben is already a city of short ways, where important relations are within walking distance resulting in a relatively high percentage of 26% of pedestrians within the modal share. Going one step further, Leoben's objective is a totally car-free city center contributing to a high standard living quality. Measures to support this goal have been started installing a tactile leading system for pedestrians and traffic lights with acoustic signals. Another important milestone is the reconstruction of sidewalks to increase security and the desirability to explore the city per pedes.

As tourism plays an important role especially in the sector bike tourism Leoben also focuses on the promotion of the bicycle as central mobility device not only in touristic matters but also in everyday life. By the offer of charging stations for E-Bikes the city fulfils actual needs of the modern time.

The number of E-car charging stations will also be increased. Here the city is investigating predestined local requirements to define locations where the establishment of charging stations makes sense and to find investors and operators for the charging stations such as companies.

To integrate as many target groups as possible into the public transport Leoben offers a bus on demand system for areas not integrated into the transportations system. A structuring of local and regional mobility, as referred to in the city concept [6], has been reached by the establishment of local city buses connected to the regional bus line system.

Leoben, too, made efforts to reduce CO2 emissions buying a hybrid company car and offering an e-bike pool for common use of the officers.

5.3. Incentives to influence route and departure time choice

Bruck's oneway-system within the city center shows a tendency to hinder motorized vehicles to reach their destination easily. In this case cyclists are favored because they are allowed to go against one-ways. However, the route to the train station for instance is still very unattractive, especially because of the dependence on road crossings over the river Mur, which is in fact just one heading directly to the train station.



5.4. Innovative mobility concepts in the region

There are many projects for innovative concepts run in the region. Especially the University of Leoben is supporting the region developing sustainable mobility concepts for the future. The project “move2grid” analyses how local, renewable resources support the supply of electric mobility in Leoben in the long term and how to integrate it into the municipal distribution grid in a good economic sense [7].

Another innovative way to consider the growing trend of sharing in the mobility sector is the urban living lab *teilen+tauschen* (share+exchange). The main aim is to develop innovative traffic concepts for the movement of travelers as much as for commercial traffic and freight services. The starting point will be the concept of sharing, which offers people a variety of benefits (among themselves, along with companies and administration). For the transportation of goods first ideas are just coming up for more efficient and effective strategies of share and exchange, which opens up a better access and helps to cut costs of logistics. The output of this project will be a roadmap, by which - starting from the basic local/regional conditions - the goals, which are worked out by the participants become more detailed, will be attached by respective importance and define strategies and ways to aim for the goals [8].

As „Smart City” Leoben’s vision 2025 is a population with increased awareness of flexible, event-driven choice of transport (cycling, car sharing, inter-modality are integrated in everyday life). The preference for private cars decreases - especially among the young. Going by public transport is “in”. Leoben is connected to the high-speed train network (TENcorridor of the north-south axis). In everyday life a wide variety of micro and small vehicles (e.g. pedelecs, e-Cars) is used in Leoben in 2025 [9]. A focus in this setting is to develop mobility management in schools and companies and *mobilityXchange*, another project going one step further than mobility management.

mobilityXchange integrates market economic instruments (e.g. a centralized exchange) into a company’s mobility management in order to influence individual mobility behavior. A trading system enables the exchange of mobility resources like company-owned parking spaces, bike repairs or tickets for public transport. Conditional on their specific circumstances, all employees participate in the trading system with equal rights. By trading their mobility resources, they have the flexible opportunity to optimize their transport behavior.

An attractive innovation for pedestrians was the construction of a new cycling and walking path in Leoben. As part of a 2004 installed hydroelectric plant by the Austrian Hydro Power company, a dike was created on the banks of the Mur. Leoben seized the opportunity by running a new cycling and walking path along the top of the dike, creating a traffic-free facility that connects the city’s districts [10].

Leoben has already set a very innovative measure in the administration apparatus: the costs for business trips completed with public transport are being refunded; there is no kilometer allowance for business trips with the car [11].

6. Banská Bystrica (Slovakia)

6.1. Incentives to influence locations and trip frequency

There are no intentional incentives to influence locations of trips implemented today in the FUA Banská Bystrica. The urban structure of town and functions of the urban sub-areas were set in past centuries and authorities don’t change it when plan the town development today. Nevertheless, locations of trips are influenced by some steps and processes but it is not an intention, just consequence (see below).

The town structure is partially supportive for sustainable transportation. Main industrial areas are located on its outskirts and main resident areas are located also only in a few sectors. It would allow solving



transportation for employees in a suitable way (e.g. company buses, influencing of the public transportation network and schedule, etc.). However, no such measures are really apparent, though some steps were done in this way.

The problematic area is the city center. Functions located there induce high transportation needs - administration, education, shopping, leisure. That is why it is target of transportation flows and, as defined in the new zoning plan, it still will be. That is why we still have to expect high intensity of transportation to/from the city center, though transportation infrastructure and services are not sufficient.

The Zoning plan, which was adopted recently (2016), is determined by geographical situation and historical development of the town and its surroundings which it still respects. There is no space and/or plan to change/move functions of functional sub-areas of the town in order to influence transportation flows and, as it is apparent, there is also no will. This statement touches all urbanism aspects of the zoning plan - the city structure, land-use, corridors, and regulations. Simply, transportation, its sources, targets and corridors are subordinated to another aspects and functions of the town and FUA.

The only apparent measure defined in the Zoning plan to change locations of trips is to build several retaining parking lots (park+ride, park+walk). They would redirect some portion of car transportation from the very city center to its edges. However, proposed retaining parking lots are displayed only in outlook plan as the limit of possible other development and no real steps are implemented now and in close future.

Other incentives of influencing of the transportation flows are work schedules. This is widely neglected and underestimated aspect. Banská Bystrica changes from prevailing industrial town to prevailing administration city. Larger and larger part of employees works in administration, education, shopping, leisure and other services. Coming from social tradition of Slovakia and from authoritative system in history of the area there is no real tradition of the flexible working hours. Of course, many companies implement it, but large employers in wider city center are public institutions which stay with traditional rigid system of work scheduling. In addition, those institutions are still conservative and bureaucratic so they don't use benefits of informational technologies like teleworking, tele- and video conferences, etc. their team work still consists of personal meeting and attendance in the institution's seat.

It, of course, amplifies gusty peaks of rush hours in the city center. Waiting times on some most neuralgic intersections are 10-15 minutes exactly in times of commuting.

The situation is getting even worse. One of the biggest employers in the region, the F.R. Roosevelt University hospital (2000+ employees), is launching new attendance system which requires strict abiding of the working hours. While employees were unofficially allowed to come/leave later/earlier (about 20-30 minutes) now they have to check in/out on time. Naturally, in connection with transportation of patients (thousands daily) it results in terrific traffic jams in access streets and adjacent intersections.

Similar situation appears on particular morning hours when hundreds of cars transport hundreds of children to schools located in the city center. Local traffic jams are common every morning in streets adjacent to schools.

6.2. Incentives to influence mode choice

Similarly to influencing of trips locations and frequency there are no substantial intentional incentives of influencing mode choice in the Banská Bystrica FUA. Though relevant public authorities realize excessive amount of individual car traffic, they have not implemented any meaningful measures. Fortunately, as congestions and negative environmental impacts rise, also apparent interest of the city authorities raises to decrease number of cars.



The most efficient way of decreasing individual car transportation is good public transportation network. If public transportation doesn't work well, people are forced to use cars.

Following two aspects are important regarding using of public transportation in the Banská Bystrica FUA:

First to say, there is generally very strong mental tradition of owning and using car in Slovak society and of course also in Banská Bystrica's one. A car is still recognized as a social status symbol and preference of cars traffic and parking is (incorrectly) considered as one of the basic citizen rights. Number of cars per capita increases, more and more families own more than one car. The situation is valid not only in families but also for companies. They usually try to assure their transportation needs by company cars, what often is not economically efficient but is socially required and it is also comfort and flexible (in comparison to other mean of transportation).

Though it naturally has many negative consequences from still raising congestions to polluted environment and occupied public spaces for parking, still social status of car motivates people to use it as a main mean of transport and is preferred to public transportation and other means.

The second important aspect is a state of a public transportation in Banská Bystrica FUA. It is mixed, there are good and bad things. On positive side are modern and reliable vehicles. Banská Bystrica is not behind in age, shape and technologies of buses and trolley-buses, all vehicles are relatively new (a few years as a maximum) and in good shape. Another positive aspect is relatively good public transportation services in a few biggest living quarters. The numbers of lines as well as appropriate time tables allow citizen to adjust their travel habits and use public transportation for everyday commuting. Of course, only if they want, what is not obvious (see above).

However, in general situation of public transportation in Banská Bystrica is not so good. Though there is appreciate number of buses and lines, they are very slow. Lack of public transportation preference in streets (bus lanes) and in traffic steering (bus preferences on signals) as well as lack of direct lines make buses much slower in door-to-door transportation than cars. Simply, buses have to wait in the same congestions than cars and in addition they have to stop often and they drive in complicated lines. Of course, slowness is attribute owned by most public transportation systems, but in case of Banská Bystrica this drawback is far more apparent and makes it apparently disadvantaged comparing to cars.

In addition, smaller living quarters of Banská Bystrica and all its hinterlands have very poor public transportation connection. One bus per hour is pretty common in those locations what - together with low prices of cars and petrol - force people to use cars to drive to the town.

In result, availability of public transportation itself doesn't motivate citizens to change the travel mode.

Need to say that there is some effort to improve public transportation and increase its importance in Banská Bystrica's society. The City Hall realized its responsibility and declares further readiness to improve it. Not insignificant aspect is also the fact that the president of the Slovak Union of Bus Transportation and the vice president of the international UITP (Union Internationale des Transport Publics) lives in Banská Bystrica, he is member of its parliament and the head of its transportation committee.

However, willingness to invest in public transportation development is limited by political issues. Though the City hall subsidies public transportation by 4 million euro annually and it is still not sufficient, we cannot expect higher subsidies and even investments from the municipal budget as far majority of population prefer cars and they - as voters - expect improving of conditions for car driving, not public transportation. This is one of the most hindering aspects.

A need of subsidizing of public transportation is yet higher and higher. The Banská Bystrica Region administration indicates collapse of public bus system in the region soon as far raising number of cars means fewer people transported by bus and thus need of higher subsidies. However, the regional budget is coming to the edge and breakdown is pretty real threat. It is not so urgent in case of Banská Bystrica FUA,



because it is the wealthiest area of the administrative region, however it indicates possible development in close future.

Based on discussions and observation we know that there is one phenomenon which force people to leave a car at home and commute by bus - a lack of parking lots.

There are 65 parking areas in the city (this is not the number of parking places). Paid parking is organized in the city center and near areas. Paid parking is divided in 3 zones with differentiated tariffs, depending on the distance from the historical city center. Paid parking is managed by external company EEI. Park parking in wider city center is not paid.

Most of free parking places get occupied early morning, whereas paid parking places are too expensive for work time parking. That is why many residents of bigger living quarters which have good public transportation access and/or are not relatively close to the city center (like Sásová, Fončorda, Radvaň) don't use a bus instead a car.

The city representatives declare they don't want to build new parking place in the city center. No such promise was declared in election programmes of winning political parties, either. Contrarily, city management realized that lack of parking lots (or even decreasing of their number) in the city center would be one of a few incentives to motivate citizens to travel to work not by car. In addition, this "measure" would costs almost no public many so it would be efficient.

Reliable way of changing of transportation mode in last mile is retaining parking lots (park + ride, park + walk). As it is mentioned above, such parking places are stated in the Zoning plan to avoid inappropriate development of given areas, however no real steps are being implemented now and in a close future.

Taxi is often mean of transportation. There are 6 taxi companies what makes good competition and press price down. Flat rate price of most of companies is 2,50 for driving to/from the city center to living quarters what is reasonable price for occasional commuting to work, particularly if more persons share a taxi. Further development of supportive environment for taxi transportation would incentive some part of population to change the mode, however the potential is still not used.

As mentioned above, there are no reserved streets lanes in Banská Bystrica. No bus lanes or multi-use lanes (bus, taxi, bicycle, car pool). It demotivates changing to another mode of transportation as far buses and cars (taxi, car pool) are as slow as all another cars and cycling is not pleasant.

Various financial instruments of detracting of car using are not very efficient. They are road taxes (for cars used for enterprising), registration fees, etc., however though they are not low they are not significant obstacle to buy and use car.

Car sharing schemes are not present in Slovakia at all at the moment.

Another mode of transportation in Banská Bystrica is walking. It is not large city; large living quarters are in extended walking distance from the city center and also from adjacent industrial centers. There are no surveys on how many people commute by walk, we estimate that it is still not significant part of commuters. The city management doesn't pay too much of attention to motivate people to walk. Just a few "pedestrian corridors" exist and they are not prioritized. The main pedestrian routes are still just sidewalks along streets, what is noisy solution, people are breathing polluted air, often it is not safe for families. No pedestrian level crossing, almost no „walking promenades“ and protected walking zones. The only pedestrians zone is the central Square SNP and two adjacent streets, what is however not incentive for walking commuting.

The most of a public effort in area of walking is dedicated to maintenance of sidewalks, unfortunately still not sufficient. Thus it all walking is still generally considered as something strange, not comfortable, and not pleasant. People, who prefer walking as main mean of commuting, do it not thanks to supportive conditions but due other motivations (e.g. lack of parking lots in the city center, healthy life style, etc.).



Shortly, no substantial incentives to change the travel mode to walking are implemented by the city authorities, no walking policy and known further plans.

Cycling is rising in Banská Bystrica significantly. It might be result of global trends as well as of the fact that Banská Bystrica is the birth place of Slovak national wide competition Bike to work. Also local activists are very active in advocacy, awareness raising and cycling infrastructure development. The city authorities pay some capacity and funds to development of the cycling infrastructure. There are bike lanes or bike paths in the town except not important 1, 5 km attempt of bike lane from SC Europa to the Štiavničky stadium. Several quality bicycle stands were installed in the city center, they are moderately used. The big incentive was allowing cycling in the pedestrian zone of the central square. It not only allowed shorter cycling routes but also showed respect of local authorities to cycling. The positive element is also cycling municipal police patrol.

Today, first six cycling paths are under projecting and the chance of their constructing is rather high (it depends on the EU funds). They are proposed very suitable for commuting from larger living quarters, they should be safe and pleasant and we can expect relatively large increase of commuting by bicycle when (if) finished.

6.3. Incentives to influence route and departure time choice

Not only Banská Bystrica, but Slovakia at all doesn't use any substantial incentives to influence commuting route, perhaps except the traffic news in radio broadcasting. New technologies and approaches are still to be introduced in Banská Bystrica. Today, the main paradigm in transportation policy in the town is not to decrease number of cars and of need of individual car transportation but to assure higher throughput and flows of traffic. It is officially stated mission and it is significant that the only "smart" technology implemented in the town's traffic is an infrared technology which assures higher throughput of three intersection in the city center.

At the end mostly hard measures are implemented, like increasing of numbers of car lanes, widening of streets, changes in traffic signatures, improving of intersections, etc. Almost no soft measures are implemented by public authorities, any innovative know-how and technologies.

There are more reasons of this situation. The traffic authorities are still old-fashioned and conservative, persons in charge are not able to overcome their own mental preference of car transportation (sentences about mental preferring of cars stated above are fully valid also for persons who are responsible for transportation in region).

The very important aspect is a price of technologies. Banská Bystrica is not wealthy town and faces many problems in many areas. Traffic complications caused by individual car transportation (congestions, pollution, occupying of public spaces, etc.) are still not more important and more urgent than many other problems (local education system, social care, maintenance of street surfaces, winter maintenance, etc.), thus transportation competes for funds with all other municipal agendas. In addition, the City hall subsidies public transportation already today (about 4 millions € annually) and significant funds are invested in the street infrastructure maintenance what is a must in order to prevent total transportation collapse.

Similarly to situation in public transportation and parking policy (mentioned above) there are also political obstacles of implementing of car reduction measures. Majority of population loves cars. That is why local politicians are not very keen to implement measures to decrease number of cars and to complicate their operation. To give example: repairing of surface of an intersection is much more urgent and much more appreciated in eyes of voters than implementing of preference of public transportation on the same intersection so elected authorities provide funds for „hard“ repairs, not for „soft“ smart solutions.

In addition, the 4-years election period is too short to show real benefits of such measures.



6.4. Innovative mobility concepts in the region

As indicated above, Slovakia is not country with innovative transportation sector and it is valid also for the Banská Bystrica FUA.

Car pooling is not officially supported by any part of public administration; however it is used to some extent, mostly by commuters from hinterlands and other villages and towns around. Popular applications (blablacar, spolujazda) are used in Slovakia but the FUA is too small to make meaningful use of them. It is known that groups of employees organize car pooling by themselves on very basic level, usually via Facebook groups. However, we do not suppose significant amount of pool cars of commuters. Anyway, it is very promising mode, what is even strengthened by development of IT applications and by need of employers to solve transportation to/from work.

Car sharing is not present at all. There is an initiative of company based in Bratislava which is deliberating pilot implementation of car sharing service and is looking for pilot area. Banská Bystrica is in wider selection.

Bike sharing is either not present in Banská Bystrica. The town is probably too small for profitable bike sharing system. However, there are initial intentions of community bike sharing schemes (like „white bicycles“, etc.).

New perspectives of electro mobility rise after recent governmental approving of electric cars subsidizing. Though electro mobility plays no important role at the moment, hybrid or even plug-in electric cars are still not often either in Slovakia and in Banská Bystrica FUA, they raise or they will rise faster. Anyway, the Municipal Police of Banská Bystrica which uses one electric car even today.

We are aware of 4 publicly accessible charging stations in the FUA. Let's mention interesting fact that the only proprietary Tesla charging station in Slovakia is located in nearby town Zvolen.

As mentioned above, there are several taxi companies in the FUA. They play active role in urban mobility thanks keenly prices, however we have no information to what extend are they used for regular commuting and if employers use them for transportation of employees from/to the workplaces.

So called "social taxi" is available in the town, it is subsidized by the town hall. However, it is not used for commuting as far it is aimed on senior, disabled people, etc.

In general, a societal demand for innovative solutions is not high. Slovakia, including Banská Bystrica, is consumer society, so majority of people is not interested in efficiency, environment, sustainability, etc. It was mentioned above that society still respects owning of good car as symbol of good status and public life and decisions are determined by this phenomena. The public awareness about sustainable and smart mobility is close to zero.

The situation gets even worse thanks wide affordability of quality cars. They are not as expensive as years ago (comparing to average income). It results not only in increase of families owning cars but also increase of number of cars in families and companies. So, if people buy car they want to use it as much as possible either to utilize investment and to show status. So, if people want to use cars they request (from politicians and decision makers) better conditions for car driving not for car reduction. Of course, politicians are listening to them.

7. Békéscsaba (Hungary)

The capacity of the road network doesn't reach the maximum in Békéscsaba micro-region. Congestions and traffic jams are not typical in this area, the roads can be used without any delay and problem. The lines, density and timetable of public transport (in this case it means only bus transportation) are



optimized with the capacity usage. The network infrastructure has a very good level of service, there is no lack of it, but we can improve always the current level. The transport behavior is fundamentally formed by the mobility incentives. The mobility incentives can be influenced, therefore the travel habits of the city and micro-region can be controlled.

“With some simplification, in certain periods of time (e.g. in peak hours) and at certain places (e.g. city center) when transport demand is higher than the supply, traffic problems occur.” However, in the region’s towns, this is not typical, but the current level always can be improved.

“Conventionally, supply-generative measures aim to resolve the bottlenecks of transport networks. It can be resolved with an increase in capacity (e.g. widening of an existing road or creation of new parking places) or with the creation of a new link (e.g. build of a new bridge or a bypass road). These measures are effective to resolve bottlenecks or recover missing connections, but the followings have to be taken into consideration.

Conventional supply-generative measures cannot be only interpreted negatively. Certain missing connection, for example bridges, extension of ring roads or interconnected trams can seriously improve the transport system of a city. At the same time there are also supply-generative measures in the innovative sense. They could be vehicle or infrastructure improvements, which can help to make the system safer, more economic or environmentally friendly.

It is also possible to influence passenger transport demands. These measures can balance demand and supply and minimize protrusive differences in order to reach the optimal usage of the transport network. We can influence in more ways. According to the subject and the method there can be two different classifications:” [1]

1) Possible fields of demand management:

- Location and frequency of demand
- Mode choice
- Route and departure time choice

2) Possible tools of demand management:

- Physical
- Legal
- Planning tools
- Fiscal tools

These groupings can help to measure the current situation, then each item can be modified accordance with the stated goals, if it is necessary.

In addition, the integration of urban and suburban transport systems is very important and highlighted, which in this case is still not working in Békéscsaba micro-region.

7.1. Incentives to influence locations and trip frequency

The travel habits are affected in the highest degree by the location and trip frequency. The journeys usually have a starting and an arrival locations (e.g. home and workplace), but sometimes there is an intermediate station between this two (e.g. to take the children to school, or to go to shopping on the way from work to home).

Depending on where our residence, workplace, other places (e.g. shopping), school or kindergarten is located, regarding the structure of the town, these places may locate in the centrum, suburb, industrial



area or in other town as well. Ideally, the starting and ending point are in the same of a part of the city, however, in practice this is rarely a case. It used to be typical that the students go to learn to the nearest school from their home. Nowadays, this practice tends to disappear and the parents choose the school for their children according to the popularity of the institutions. Thus the travel habits of students have changed as well, which affect to the mode choice and travel parameters.

In the city of Békéscsaba the free time and recreational activities are in the city center, however, there are also shopping centers in the suburban industrial area.

The most frequent recreational activity is doing the shopping. While large shopping are increasingly carried out in the center, till then the everyday small purchases are typical in the nearby small shops close to their homes. According to the frequency of these, the large shopping activity happens on weekly basis, in contrast the small purchases can happen several times a week, even every day.

In term of travel frequency we can make a clear distinction between everyday (weekday) and weekend travel. While during weekdays the workplace mobility and the going the school are typical rather than the free time and recreation travels on the weekend. The most visible result is for example the timetable of the local and regional public bus transport. In addition, there is a difference between school teaching period and the period of school holidays, namely during summer the number of passengers are greatly reduced in the lack of students. The reduced timetable is valid from mid-July to late August, which compensates for the loss of student traffic in the summer.

7.2. Incentives to influence mode choice

The mode choice depends on many factors. Some of the most important of these are the financial opportunities (vehicle operation, maintenance and depreciation costs, fuel price), asset availability (There is a car in the family? More?), route options (shortest, safer, better lighted, frequented routes), travel time, distance, parking facilities (easily possible to find a parking space? How much time to search?), comfort, etc.

The most popular mode is the passenger cars. In this regard, the question arises, that who has a car or how many cars are owned by the family. This can be individually and also in groups, either using in sharing system, but the latter is not typical in the micro-region. While in the city of Békéscsaba the car using is popular, until then in the further towns it is much less. In addition to the morning and afternoon home-work-home line, even shopping is typical in the car use. Heavily influenced by the free parking spaces in the center (in this case small, not enough, which is a problem), well as the current fuel prices and to a lesser extent, the car maintenance costs.

The bus travel is characteristic mainly among the municipality of the micro region and other surrounding towns, as regional services. The primary server of the workplace mobility and school traffic is the bus transport. As a result, in the summer months during the school holiday the capacity utilization is lower, so the number of timetable frequency is reduced. Besides the regional bus services there is only local public transport in the city of Békéscsaba (as a bus transport). The occupancy rate of this is low, especially popular among students and pensioners.

Between the settlements there is passenger rail transport too, however, this affects negligible number of passengers. The railway in the region has a major role just in country level.

There is a very high rate of bicycle use due to the size of the municipalities and the geographical location of micro region. While in the settlements this is the preferred means of transport, it is popular in Békéscsaba as well. The choice of the bike has a strong influence by the weather, ownership of bike, the path length in distance and time. The existence of possible routes for cyclists is not so important here, because motorists and cyclists are accustomed to share the road. Bike sharing system is not operating in the region, this is a plan for the future.



Walking surfaces are available for walking, footway, pavement, in fact, pedestrian areas (closed for cars) can be found in the center as well. The choice of walking is clearly influenced by the purpose and length of the walk (and of course the weather).

In the transportation development concepts, current and future plans of micro region and city of Békéscsaba, the primary focus is on the improvement for the conditions of non-motorized transport modes. The guidelines are affected by the sustainability theme. As a result, there are a lot of cycle development project, the distances and time of journeys are reduced, so people can choose the bike, as vehicle, more willingly and more frequently.

It was mentioned that the transportation network infrastructure is well-developed, capacity utilization is appropriate, but only with continuous improvements can be ensured the enhancement of level and reliability of service. The key element of future developments and plans are the passenger orientation and user-friendliness.

7.3. Incentives to influence route and departure time choice

During the planning of the travel, besides or because of the mode choice, route and departure time (travel time) choice has a major role. A shorter route can take more time and a longer route may take less time.

In the case of travel by car the traffic light control often counts. The drivers prefer to avoid the red light, instead they prefer the routes with traffic signs. The quality of the trip is influenced by parameters of the road (e.g. the width of the road, the lane, possibly more lanes on the road), which usually depends on the network hierarchy. On lower-level roads, such as residential areas, there can be located traffic calmed and speed reduced routes. The drivers especially use to avoid these roads. In the micro region there is no road and bridge toll, and even there is no any motorway nearby, which use would be paid.

In some cases (e.g. going to work or school) the departure time cannot be chosen, because the arrival time is fix, so this was mainly influenced by the travel time duration. But in other cases (e.g. shopping, pensioners going to doctor or market, etc.) we can calculate with the departure date of travel. This would especially applicable in the public transport. The aim is clearly to equalize the capacity during the day. Currently the public transportation company does not use this kind of influencing tools. The solutions may include a higher public transport fares in peak hours or fares reduction in off-peak hours. But most of the passengers have monthly tickets and the pensioners travel free.

“To sum it up: we need to use transport-organizing measures that optimize the traffic loads on the transport network with regards to the land-use, traffic safety and environmental aspects. So we have to apply measures:

- adjusting to local needs;
- fitting to current (national, regional, local) regulations;
- in harmony with urban and transport planning;
- in coherence with stick and carrot principle;
- considering main and side effects;
- according to multimodal, regional strategic planning approach.” [1]

7.4. Innovative mobility concepts in the region

In the micro region mainly Békéscsaba is where is a huge traffic (mainly due to the size of the settlements). Unfortunately, currently there are no any already existing innovative concepts.



Mobility car sharing absolutely does not work on regional level, on nation level there is some attempt, especially the route between Budapest and Békéscsaba, but that does not mean too much passenger number. There are forums on social networking sites where opportunities can be found or on car pooling websites, but the number of these services is insignificant.

For the electromobility the appropriate infrastructure is not available yet in the micro region and economic situation in the region is not ideal to choose the most expensive solutions and innovations.

The passenger information system in the bus stops is older type, printed timetables. Dynamic passenger information systems can be found only in major cities' bus and railway stations.

One thing can be found in Békéscsaba, which is considered relatively innovative and not spread in other cities. This is the second countdown clock under the traffic lights in the traffic light intersections. Thus the drivers can see how many seconds it takes even the current signal (red, red-yellow, green, yellow).

So we are at the beginning of the innovative concepts and solutions, but for now the current traffic situation has a good level of service.

8. Budapest (Hungary)

The Balázs Mór Plan of Budapest [1] (i.e. the Sustainable Urban Mobility Plan (SUMP) named after a famous Hungarian transport engineer who launched the first tram service in Budapest in 1887) represents Budapest's transport development strategy. The document contains the main features of innovative concepts for transport development between 2014 and 2030. Accordingly, in the following sections, the local incentives are reviewed based on the Balázs Mór Plan. On the other hand, local experiences and expert knowledge as well as the facts of recent changes (note that the Balázs Mór Plan was created in 2014) are also used to sum up the mobility incentives and innovative mobility concepts in Budapest metropolitan area.

8.1. Incentives to influence travel demand and trip frequency

Appropriate city planning and management are extremely important in order to realize sustainable urban mobility. Accordingly, incentive measures (which have been realized in Budapest and related agglomeration) are listed and then elaborated below.

City planning tools:

- Parking management
- SUMP of Budapest
- Regulation of land use related to transport

Work schedules:

- Opening hours
- Work mobility plans

8.1.1. City planning tools

Parking management

The parking management of Budapest has been reorganized in 2011. The basics of the Budapest parking in public space are regulated by Municipality Law No. CLXXXIX of 2011, Law No. I of road transport of 1988, as well as Regulation No. 30/2010 of Budapest Committee.



Parking management is operated by Budapest Közút Zrt. (Budapest Road Ltd). The main aims of Budapest parking management to achieve a coordinated transportation system, i.e. to realize a supply-demand balance of parking spaces via appropriate coordination of private and public transport. By using proper parking fees, parking zones and time periods, the following impacts are expected: reduction of traffic congestion, increase of the ratio of public transport and cycling, reduction of emission.

As an incentive tool to help orderly functioning of the Budapest parking system, mobile phone based payment is available. Mobile parking in Hungary provided as a public service operates as part of a uniform system from July 1, 2014. National Mobile Payment Plc. operates as integrator between parking service providers and resellers providing mobile payment services.

SUMP of Budapest

The SUMP of Budapest (Balázs Mór Plan) itself defines economic and administrative incentives for mobility in general. The transport system of Budapest may be shaped not only with technical, but also with financial and regulatory instruments. In order to implement the future vision of the metropolis and to achieve the strategic goals, several currently used economic incentives and regulatory measures must also be reviewed and transformed. Concessions, such as free residential parking, affecting public space use for transport purposes in Budapest must be reviewed, and a new concept must be developed for introducing congestion charging to prevent urban congestion and its harmful effects.

Through economic and administrative regulations, encouragement must be given to major traffic generating urban developments to be implemented near fixed-rail facilities. If any such property development project is implemented on a site that is not served by a high-capacity - primarily fixed-rail - transport service, then a suitable high-capacity line should be extended as a mandatory contribution by the developer, or the required funds need to be transferred to the public sector.

Regulation of land use related to transport

Concerning the regulation of land use in Budapest metropolitan area, the national Law No. LXIV of 2005 as well as its modification by national Law No. LXXXVIII of 2011 are valid [3].

This law regulates new build-up areas in cities and agglomerations. A build-up area bigger than 5 hectares with at least 300 apartments housing can be only assigned if the stop point of any fixed-track public transport is closer than 5 kilometers (considering the available public roads). Moreover, newly built commercial and service buildings having bigger than 7000 m^2 sales spaces can be only realized if the related nodal public transport station is closer than 300 meters.

Budapest's land use is also regulated by an official plan for settlement structure [4].

The built-up density is controlled based on the maximum permitted density, average density values depending on the land use functions, and the parking density within the buildings.

Finally, the land use for technical infrastructure of transport is also ensured by regulation [4] within the whole metropolitan area. This means that the transportation of Budapest is strongly influenced by the land use of the given transport modes and related infrastructure elements.

8.1.2. Work schedules

Opening hours

A few of private and public companies in Hungary provides information about optimal schedule of opening hours. This helps people to choose better timing to get to these companies. Moreover, it also contributes to a more balanced service provided by the companies.

Typically, bank branches share their availability data on their websites suggesting the optimal time periods for customers.

Another example is the Magyar Posta (Hungarian post company): post offices only provides real time information about their actual occupancy (long or short queues).

Workplace mobility plans

Work or school mobility plans have not been realized for Budapest officially, i.e. general recommendation system for any travelers is missing. Of course some pilot projects in the public sector have been conducted in Budapest but they represent only specific plans for a given public or municipal company. Private sector, however, is more active by supporting their employees via mobility plans. Typically, multinational companies are open for mobility plan as it helps to create attractive workplace. In Budapest, for example CIB Bank (commercial banking company) and Magyar Telekom (a Hungarian telecommunication company) created and maintain working mobility plans by encouraging cycling. Magyar Telekom's community bike service system, (in cooperation with the Hungarian Csepel Zrt.) called TeleBike has launched specifically for employees but only for commuting in working hours among the four office buildings in Budapest.



Figure 4 TeleBike of Magyar Telekom in Budapest (www.telekom.hu/about_us/company/telebike)

On the other hand, an official guide for work mobility plans has also been published by the Ministry of National Development [2] in 2012. This guide defines the main principles and process steps of mobility plan design.

8.2. Incentives to influence mode choice

In our days, the influence of mode choice is getting more and more important as traffic demand generated by private cars cause everyday congestions. Therefore, appropriate incentives are needed to strengthen the role of public transport and make it more attractive for travelers. Accordingly, incentive measures (which have been realized in Budapest and related agglomeration) are listed and then elaborated below.

- P+R system
- Interoperable fare system and tariff community
- Parking management in public space
- Bus lanes
- Public bicycle-sharing service “Bubi”

8.2.1. P+R system

A primer tool for influencing mode choice is provided by P+R parking system, especially if P+R car parking lot is close to a fixed-rail transport or other high capacity transport line.

P+R car parks in Budapest are operated by Budapesti Közlekedési Központ Zrt., Budapest Közút Zrt., municipalities and private companies, see figure below. Currently, 5200 P+R car parking places are available. As a long term goal 10 000 P+R car parking places are planned to be built up.

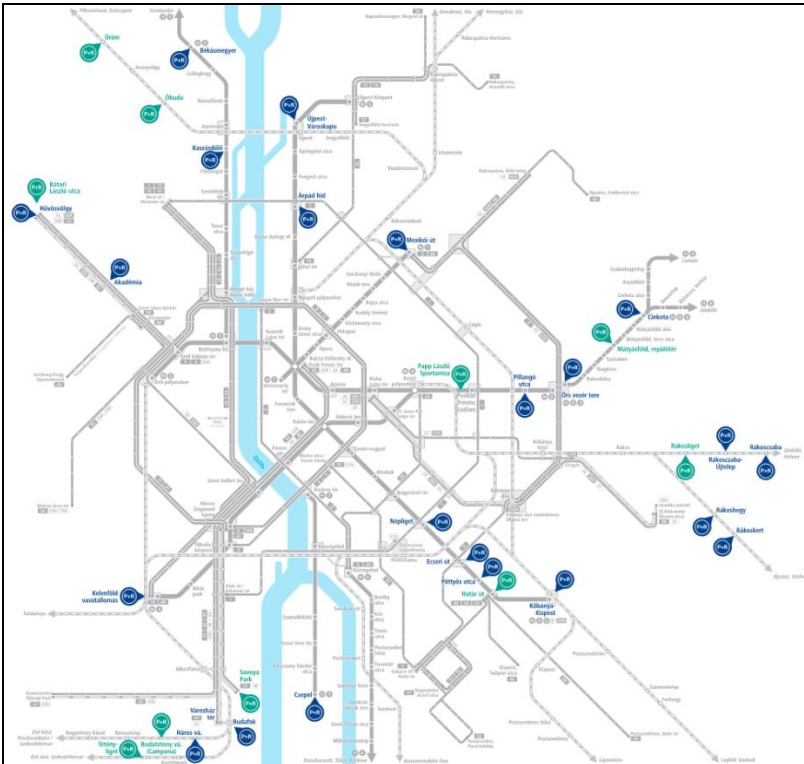


Figure 5 P+R car parks in Budapest marked by blue bubbles (www.bkk.hu)

8.2.2. Parking management in public space

Through appropriate parking management travel mode choice can be influenced. Typically, two important factors have strong incentive influence to mode choice. On the one hand, a parking fee (per hour) more expensive than one or two public transport tickets might encourage travelers to decide to use public transport alternatives. On the other hand, the proper time period helps to maintain a healthy supply-demand balance of parking places.

8.2.3. Bus lanes

Bus lanes represent traffic lanes dedicated for the exclusive use by buses taking part in scheduled public transport.

Prioritizing public transport vehicles contributes to mitigate the level of daily car use. Real priority must be given to public transport continuously. Instead of limitations and surcharges, the increased use of public transport is encouraged by efficient services that are apparent and convincing on their own (direct services, bus corridors, high-speed, separated tram tracks and bus lanes, priority in traffic).



An interesting action introduced in 2012 concerning the bus lanes is that bicycles can use bus lanes if it is assigned for cycle use. This regulation also contributes to a better mode choice in Budapest transport system.

8.2.4. Interoperable fare system and tariff community

An integrated fare system efficiently helps users to make a better mode choice during their travels. Although an overall Budapest fare system would make public transport modes competitive with individual transport, complete interoperable fare system and tariff communities are still missing in Budapest metropolitan area. It would be especially important in regional transport, and therefore the suburban services of MÁV (Hungarian State Railways) and VOLÁNBUSZ must become parts of the integrated system.

Nevertheless, tariff community is partly realized. A public transport pass called Budapest-pass are in operation. Budapest-passes are valid within the administrative boundaries of Budapest on metro lines and suburban railways, on designated commute services of MÁV national railways and VOLÁN regional bus lines.

By coordinating suburban and urban timetables and strengthening the feed capacity of the lines the urban sections of the regional rail services may have a more active role in the mode choice in Budapest. This type of integration, however, is still missing.

8.2.5. Public bicycle-sharing service “Bubi”

MOL Bubi, the public bicycle-sharing service introduced in Budapest, is a new, alternative public transport service with affordable public bicycles, easily accessible for everyone in the inner, most densely populated parts of Budapest encouraging individual cycling. The MOL Bubi consists of 99 docking stations and 1,150 bicycles. By launching the MOL Bubi public bike sharing scheme, a new chapter has been opened in Budapest’s public transport. By improving the conditions of cycling, more passengers will opt for cycling as their travel mode to reach their destinations within a short distance in Budapest.

Bubi bicycle-parking facilities were installed at a distance of at least 200 meters in the center and district centers, on office, service and work sites and in the vicinity of municipally-owned public institutions.

8.3. Incentives to influence route and departure time choice

Route choice and departure time choice can be influenced separately. However, in most cases the applicable influencing tools exert a common effect on both. Appropriate incentives are indispensable to shape an efficient transportation system with the general aim of travel time optimization. Accordingly, incentive measures in this field (which have been realized in Budapest and related agglomeration) are listed and then elaborated below.

- FUTÁR system
- Public transport priority and bus lanes
- Real-time transport information
- Variable message signs
- Traffic calming zones



8.3.1. FUTÁR system

In 2014, a modern information system, called FUTÁR, was delivered for Center for Budapest Transport. FUTÁR system provides three main services, i.e. real-time transport information at stops/stations, on public vehicles and at passenger through mobile application.

FUTÁR is the most important and direct tool for route and departure time choice influence in public transport. The system provides a modern satellite-based positioning with 24 hours monitoring in order to maintain the timetables and quick intervention in case of incident. On the passenger side, the aim of FUTÁR system is to guarantee the fastest routes. This is achieved through the web based, door-to-door route planning service which take into consideration all public traveling mode and real-time traffic.

Another important option of FUTÁR mobile application is provided by the warning service, i.e. user is informed in case of real-time incident or long-term problems (usually constructions) which influence public vehicle schedule or routes.

8.3.2. Public transport priority and bus lanes

FUTÁR system encompasses a transport priority system for buses as well. In more than 30 intersections public buses may obtain priority as “green corridor”, i.e. the free crossing of the oven junction is ensured. This feature realizes a complex algorithm as several factors need to be considered when priority is calculated, e.g. only buses with delay or appropriate timing benefit the priority, several constraints need to be considered in the system in order to avoid unexpected effects (unbalanced queuing of private vehicles). Beside priority, bus lanes also help fast public transportation.

Of course transport priority and bus lanes means a direct tool to influence public vehicles. Nevertheless, the consequences of their use also result in appropriate route choice for travelers as a public bus with priority and/or bus lane can be very attractive due to the travel time benefit on it.

Real-time information about road traffic can significantly contribute to proper road and departure time choice. In Budapest two information systems are maintained by public companies. One (<http://kozut.bkkinfo.hu>) is operated by Center for Budapest Transport providing (see figure below) a map view with additional text information about lane or street closure, road construction, other incidents influencing traffic as well as the relevant time period of problems.

Another traveler information system (<http://szakrendszerek.bkk-kozut.hu>) is operated by Budapest Road Ltd providing (see figure below) online information about traffic light operation (working, flashing amber or out of service), dynamic information tables (variable message signs), cameras (with camera view), and other traffic information.

8.3.3. Real-time transport information

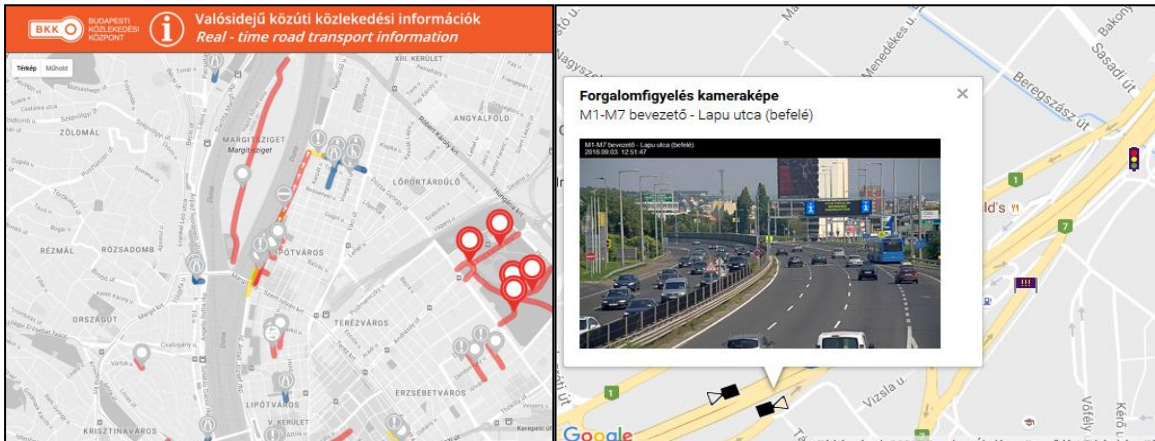


Figure 6 Screenshot of the real-time information service of Center for Budapest Transport (left) and that of Budapest Road Ltd (right)

8.3.4. Variable message signs to help route choice

The variable message sign displays in Budapest metropolitan area (in urban and freeway area as well) serve to inform travelers of private vehicles about travel times of specific destination points, parking information (P+R) and other relevant information related to Budapest road traffic.

The displays have direct impacts on route choices and due to the real-time traffic information efficiently influence drivers. Therefore, significant rerouting is achieved which also helps to obtain a more balanced traffic and reduce congestion.



Figure 7 A screenshot of the variable message sign display in Budapest Transport (www.budapestkozut.hu/forgalomtechnika)

8.3.5. Traffic calming zones

Traffic calming zone serves as indirect influencing tool of route decisions. The goal of a traffic calming area is to enforce reduced average speed of vehicles in order to reduce noise emission and to avoid



accidents (e.g. children playing in a recreation area). Typically traffic speed limits and other physical instruments (e.g. speed bumps, curb extension) are in use in a traffic calming zone. Such area strongly influences route decisions as crossing a traffic calming zone typically causes significant increase of travel time compared to alternatives routes.

8.4. Innovative mobility concepts in the region

As innovative mobility concepts the following main fields are considered in Budapest metropolitan area (elaborated below).

- Innovative mobility concepts defined in SUMP of Budapest
- Demand responsive transport
- Integrated traffic management

8.4.1. Innovative mobility concepts defined in SUMP of Budapest

The Balázs Mór Plan (SUMP) [1] focuses on four transport intervention areas as the basis for innovative concepts, i.e., infrastructure, vehicles, services and the system of institutions. Integrated infrastructure development, by the more efficient utilization of the existing infrastructure, leads to well-managed public spaces and community places where all transport modes are accessible and can be used safely. In accordance with the EU guidelines, one of the objectives of future developments is to reduce the level of environmental impacts caused by public transport vehicles. In the public transport system of Budapest, more stress is planned to be put on accessible informational technology applications that assist travelers and influence their needs and the usage, as well as on advanced traffic control and passenger information systems. The main task for the subsequent years will be to ensure the operation as an integrated system of the currently separate public transport services, which operate within the city and on the metropolitan area networks.

8.4.2. Demand responsive transport

Not all urban transport needs can be served effectively by scheduled services especially in new residential areas with low population densities. In such places, the alternative for individual motorized transport is a demand responsive passenger transportation public service (Telebus) or the extension of the existing scheduled transport services in space or time (extended travel time or route length of the line). By definition, demand responsive transport is an advanced form of public transport with flexible routing and scheduling of public vehicles which are operated in shared-ride mode between pick-up and drop-off locations according to passengers' needs.

BKK Center for Budapest Transport has launched new on-demand public transport services since November 2013 in two suburban areas in the hilly Óbuda part of Budapest, where due to territorial circumstances until recently no service could be provided (see figure below).



Figure 8 A screenshot of the variable message sign display in Budapest Transport (www.emta.com)

The current demand responsive transport of Budapest is continuously reviewed and potentially will be extended on an ongoing basis.

In the future, this type of transport service will mean the most innovative solution beside autonomous vehicle technology in public transportation. Accordingly, in the near future, autonomous and demand responsive transportation service is expected to be evolved in a large measure.

8.4.3. Integrated traffic management

The integrated approach of traffic management is one of the most important elements in ITS concepts.

In Budapest the preparatory works of ITS applications have been started in 2006, which mainly resulted in feasibility studies and pilot projects. These works were supported by CONNECT project (Co-ordination and stimulation of innovative ITS activities in Central and Eastern European Countries), an EU funded project. As a continuation of CONNECT, EasyWay and CROCODILE projects have been launched aiming to support ITS system developments in Budapest and its agglomeration. As result of these development projects a new framework has been established in 2015. This called the Integrated System for Traffic Management and Control with modern software and hardware technologies. This system assures a common and integrated framework for traffic monitoring, traffic measurements and checking functions. Moreover, due to the integration new functionalities have been added to the ITS system. The services of the system are available on a common operating platform. The communication protocol is also an important element of the integrated system. A general DATEXII communication protocol is applied which enables standard data transfer with any stakeholders.

9. Modena (Italy)

9.1. Incentives to influence locations and trip frequency

The city of Modena has a General Regulator Plan to manage the regulation of the built-up density and the land-use. In particular, the City of Modena is committed in defining plans about recovery and conversion of dismissed industrial areas, to commute them in residential or service areas.

The old town center of the city is restricted to circulation, with the exception of residents, bikes and public transport; also vehicles for loading and unloading goods can enter in the limited traffic zone, but only for few hours per day.



In these days, the Municipality is implementing a new electronic system, to check the respect of the circulation rules in Limited Traffic Zone.

The technical service of the City is in charge of LPT policies and, since 2001, it has entrusted, together with the Province of Modena and other local authorities, Modena Agency for mobility and local public transport (aMO) with the task of planning and promoting LPT.

9.2. Incentives to influence mode choice

Apart from the National annual vehicle tax, in Modena there are several assets to influence the mode of choice:

- 19 parking areas in the city are organized with a public transport stop and with bike-sharing racks, to improve the intermodality;
- 13,5 km of bus-reserved lanes to improve buses speed and, first of all, frequency regularity. In these days, a new electronic system has been testing on two bus lanes in the heart of the city, near the UNESCO site, to read the license plate of unauthorized vehicles driving on bus lanes;
- different forms of public transport subscription with related fare reduction (students, elderly, persons with disabilities);
- In these months, the public transport company is testing the possibility for cyclist to bring their bike on extraurban bus.
- Since 2003 there is a bike sharing service with 316 bikes and 44 pick-up points. All the bikes have to be returned in the same place where they have been picked up, and they can be used for free just from 7 a.m. to midnight.
- Since 2010 there is also another bike sharing service 7/7 24h/24h made by 24 bikes in 3 strategic locations: central train station, university center and old town center.
- In the city of Modena there are also three types of bike storage:
 - I. 7 closed storage: the cages can be opened only from the subscribed users with their own key. The service is free of charge;
 - II. 1 closed storage with magnetic access: the storage is located on the first lane in the central train station and can be opened from subscribed users with their own magnetic card. The service is free of charge;
 - III. 1 safeguarded storage managed by volunteers, where damaged bikes are repaired.



Figure 9 Closed storage at the train station of Modena

- In the historical center more than 1.000 new special racks, to fix not only the wheel but also the chassis of bikes, have been installed.
- The City of Modena has over than 37.000 m2 of pedestrian areas, recently increased by including also Piazza Roma: the square in front of the Duke Palace (where there is also the Military Academy) was a big parking area until a couple of year ago; after a long period of work for its requalification, now it is an open space where to stay and have a walk. Part of the works were co-funded by the ERDF (European Regional Development Fund)
- Every year, according to the regional rules, the City of Modena organizes and implements anti-pollution measures in the municipal area: the Limited Traffic Area for more polluting vehicles (Euro 0-1-2 both unleaded petrol and diesel) includes 25% of the whole municipal built-up area, during working days, from 8.30 to 18.30.
- Metrominuto, a map to guide pedestrians in the old town center.
- 11 points for vehicles electric charge located in the most attractive parking areas of the city

9.3. Incentives to influence route and departure time choice

The City of Modena is adopting a series of interventions for the review and reorganization of the mobility in the old town center, including measures as the closure of one of the main square of the City (Piazza Roma) and also the strengthening of monitoring and control on access and exit to and from the Limited Traffic Zone. In order to avoid the unsuitable traffic flows in the old city center, two bus lanes have been setup, so to create a physical interruption of the direct street axis North-South and Est-West.

In Modena there are 141 traffic lights, all continuously connected to a central server that allows the technical service to monitor the different sites conditions and to detect eventual malfunctioning. Seven of them have a system giving priority to Public transport means. For other 45 traffic lights the timing is defined by the detection of the traffic flows in the area.

The City is planning to update a new service that is even more functional and capable to adapt to the number of vehicles circulating in a single moment, in order to reduce the waiting time of each node.

86 km of speed limited streets (30km/h) have been implemented in the whole municipal area, especially in residential zones, including the entire old town center (19km).



Table 1 Length of the 30 km/h road network

	length of 30 km/h road network	length of urban road network	length of the entire municipality territory network	% <u>30 km/h Zone</u> urban road network	% <u>30 km/h Zone</u> entire road network
District 1	24	62	62	38,71%	38,71%
District 2	17	149	220	11,41%	7,73%
District 3	27	143	254	18,88%	10,63%
District 4	23	157	330	14,65%	6,97%
TOTALE	86	511	866	16,83%	9,93%

9.4. Innovative mobility concepts in the region

The technical services always share ecological vehicles for work trips.

Since march 2015, the municipality fleet includes also 6 electric small car, introduced in order to test a model of electric car sharing for civil servants. The initiative, that will foresee the use of other electric cars for the old town center, aims at promoting an alternative and sustainable solution to the use of the private car. This action is promoted in the frame of the EU project “*Transition Cities*” (<http://www.climate-kic.org/projects/transition-cities/>)

It is important to underline that the City of Modena also allocates financial resources addressed to those citizens purchasing sustainable means of transport as electric, LPG an methane vehicles.

Finally, very recently the City Administration illustrated to the modenese citizens its idea for the rearrangement and reorganization of the old railway zone, where a route for pedestrians, cyclists and public means of transport will substitute the old rails, an area where technical solutions adopted can be, at the same time, effective for city mobility and sustainable and where car traffic will be very limited.

The Municipality promotes also several applications for smartphones that could be useful for citizen in order to define their trips within the city. In particular, in the frame of the EU project “*Transition Cities*” (<http://www.climate-kic.org/projects/transition-cities/>) the City of Modena started a collaboration with *Wecity* who developed a smartphone application to map all sustainable trips....

During the next months, with other funds from Transition cities, *Wecity* will develop an upgrade to include information about the safety of the cycle-lane collected from the users themselves, in order to create a real-time navigation device for cyclists.

The Mobility and Traffic Service of the City of Modena is equipped with traffic models: one about the complete road network of the city; the other one able to create simulations of small part of the network, especially in case of new infrastructures or structural rearrangements of the street project.

10. Ljutomer (Slovenia)

10.1. Incentives to influence locations and trip frequency

Parking management:

Case from Ljubljana: Smart parking system using sensors embedded in each parking space, detects the occupancy of each parking space. Through signs to inform drivers installed at intersections, the system provides drivers with information on available parking spaces at street level. Through the central



administration is the operator of urban parking areas you control over the occupancy of parking spaces for the entire territory of the Municipality of Ljubljana. Central control of the parking areas to reduce the number of offenders as urban stewards through the mobile app provides a quick overview of what is happening on the ground in order to optimize the work of each city stewards.

The company Q-Free Traffic design for the Ljubljana City Council made a pilot scheme in the area Cigaletova and Trdinova Street. Drivers who lead the Tavčarjeva street, the variable sign at the intersection Tavčar and Cigaletova street inform about available parking spaces at Cigaletova (to the junction with Trdinova) and Trdinova (from the junction with Cigaletova to Slovenian road) street. Another variable mark is placed at the intersection Cigaletova and Trdinova and shows the number of free parking spaces on the street Trdinova both car drivers as well as taxi drivers.

Implementation activities within PUSH & PULL

Parking Space Management (push):

The Faculty of Economics will develop a new parking regulation with differentiation among users according to their needs for parking and pricing policy. Current parking regulation encourages students to travel to university by car by offering low price for all day parking. The new regulation will focus on promotion of other modes while assuring parking availability for occasional use and emergency situations. Long term parking will be discouraged by incremental pricing.

The current parking is managed by a private company for the Faculty of Economics. The exact amount/share of the collected parking fees that will cross finance sustainable transport measures will be negotiated between the Faculty of Economic and the managing company.

The Faculty is committed to a Mobility management plan from 2012 which foresees also to develop parking space management.

Measure title: Fast extension of controlled on-street parking in Ljubljana

Stage 1: First on-street parking controls were implemented until year 2006 in city center with 2164 parking places at that time. This was in the area about 700 m in diameter around city center. This area is parking zone 1 with highest prices and strict time regulation (max. 2 or 4 hours).

Stage 2: year 2012 - 2015 new ticket machines in areas around the city center and some high density residential areas. This was done as a result of high parking over-spill from the controlled city center into the surrounding areas. Some of these areas are in parking zone 2 and some in zone 3.

Stage 3: year 2014: 70 ticket machines in mostly residential areas. The ticket machines entered service in January. These areas are 1-2 km from the city center and are all in zone 3. After this stage a total of 6640 on street parking spaces were available in all three zones.

Stage 4: year 2014: 53 new ticket machines are planned in residential areas in zone 3. More controlled parking zones are planned in the future including some streets around major traffic generators (e.g. schools, bigger employers) with only limited time parking and with no permits for residents.

Teleworking:

There are only few companies already practicing telework, but a lot of them are thinking about introducing it. Although the US is currently the leader in this process, interest in the rest of the world, particularly Europe, is accelerating. Interest in telework is seen also in Slovenia. In the empirical research among Slovene organizations carried out in summer 1997, it was found out that managers and employees



are interested in telework. It was found out that technology needed for telework is not the basic problem in introducing telework and that almost all of potential teleworkers have their own for teleworking needed equipment. The survey also showed that technological factors and the content and way of work performed within a specific working place determine its suitability for telework and that telework is strongly affected by psychological and sociological factors. We also found out that managers are sometimes troubled by the idea facing the prospect of managing a team of remote workers and they know that their tasks will partly change and that also the way of control and way of policy making will change. Managers are also concerned about employment contracts, most of them think that it would be necessary to legally define the working conditions of teleworkers and clearly state the unique responsibilities of both parts.

Source; Research on Telework in Slovenia, 1998

10.2. Incentives to influence mode choice

10.2.1. Car sharing

Ljubljana, from 1 July 2016 joins European cities boast of so-called car sharing system, car rental. In the vehicle fleet of Avant2GO system will initially be involved 30 cars exclusively on electric power, until the end of the year is expected to provide up to 50 vehicles. Plans until 2018 include the network as 500 cars in order to reduce the number up to 10,000 equity cars on the streets of Ljubljana.

10.2.2. Parking management

Particular cases from the whole Slovenia: The Ministry of Infrastructure is July 2013 published Public tender "Park and Ride". Within the Operational Programme of Environmental and Transport Infrastructure Development for the period 2007 - 2013, the second development priority "Road and maritime infrastructure - Public transport" are predicted 8 million in funds from the EU Cohesion Fund, to which they could apply the local community. In the event that the P + R parking lots reasonably placed in the area in terms of passenger and connected with public transport, municipalities were eligible for 85% co-financing. In 2013, the project is intended to € 150,000 the following year 3 million. In 2015, it was at the disposal of 4,850,000 million €. At the tender it has been successful twelve projects in nine Slovenian municipalities. In the first application period have approved for funding six projects in five municipalities (two municipalities of Koper, Ig, Škofljica, Murska Sobota and Ptuj), in the second application period (deadline: October 11, 2013) however, two municipalities (Domžale and Vrhnika). Finally, in a third period in which the county could apply until 30 January 2014, the four projects were approved for the co-financing, two projects of MOL and one municipality Zagorje ob Savi and Koper.

With the help of the European Cohesion Fund are at the center of Škofljica arranged 88 parking spaces for P + R system with two electric rechargeable stations and 21 parking spaces for bicycles. Similarly, in 2014 a parking lot in the municipality of Ig. After previously conducted survey found that must provide at least 34 parking spaces for users of P + R system near the bus stop. Both projects have received a total of around € 450,000 of assets.

The project "Providing calming traffic at the Park & Ride parking lot at the hospital Rakičan" is one of those approved in the first application deadline for tenders. Around € 500,000 worth project of asphaltting of gravel parking lot at the hospital Rakičan has provided 237 new parking spaces from where the commuters in the city itself abolished with the city card bus Sobočanec.

In the municipality of Domžale in 2014 began construction of "park and ride" parking garage on three floors with 228 parking spaces, including 12 spaces reserved for physically handicapped. At the end of July 2015, in the center of Domžale started operating a new parking garage, otherwise it is also the part of the network of the Ljubljana Urban Region. Upon first entering the city acquires the card, which is loaded



with two free tickets to use public transport (bus Kam) on the same day. Card issuance shall be included in the parking fee, but because the cashier the money is not refundable - payment is also possible with debit or credit cards - it is possible to be ordered to credit.

In the municipality of Vrhnika, specifically on two planes during the most busy road in Sinja Gorizia in 2014 also planned arrangements P + R parking lots. It was gained 149 parking spaces for cars and 20 to 60 parking spaces for bicycles.

In June 2015 they started construction work for the P + R parking in Ptuj. Zadrūžni market is changing into Sustainable Mobility point and place for 102 parking spaces, of which 5 points for the physically handicapped, four parking and charging stations for electric cars, six buses and two bus stops for public transport. In the supplementary facility on the southwest side are: INFO point, public sanitation, shelter for waiting passengers and space for bicycles. Also, the Municipality of Ptuj received just over € 515,000 grant for € 760,000 worth project.

The system "Park and Ride" is perhaps best accomplished in the Municipality of Ljubljana and its surroundings. 15 municipalities from the area of Central Slovenian statistical regions Ljubljana Urban Region (municipalities of Ljubljana, Brezovica, Dobrepolje, Dobrova-Polhov Gradec, Domžale, Grosuplje, Ivančna Gorica Kamnik, Litija, Medvode, Moravče, Škofljica, Trzin, guidebooks and Vrhnika) in the framework of regional development Agency of the Ljubljana urban region (RDA LUR) successfully registered the project "Network of P + R assembly centers in LUR". By setting up 23 assembly centers "Park and interchange" (P + R car parks) continue carefully planned policy of sustainable mobility which has been implemented for several years in this region.

In the municipality of Ljubljana already have four car parks in the system: P + R Stožice P + R Dolgi most (successfully logged in the invitation to tender), P + R Studenec and P + R Ježica, which together offer 1,704 parking spaces. By the end of 2015, with the help of almost € 1.5 million of European money at Barjanska Street at Barje the municipality established the fifth P+R parking plot. This will be in addition to the final bus stop offering 340 parking spaces, charging stations for electric vehicles, toilets and bicycle.

10.2.3. Public parking regulation

The case presented for city of Bohinj and Bohinj Lake, which is one of the main and very popular touristic center in the region of Gorenjska. It is also the part of the national park with its rules and laws to be respected for the protection of the nature. The replacement of parking meters along Lake Bohinj will enable the use of the Intelligent Transport System (ITS) that will provide information on the occupancy of car parks, public transport, programmes on viewing and exploring natural sights etc.

For parking in short-term parking zones (blue zones) drivers must indicate the time of arrival with an in-vehicle parking meter visibly placed in the vehicle. Parking for vehicles is allowed only in marked car parks. Parking fees for the Lake Bohinj area apply every day from 6:00 to 20:00, i.e. from 1 April to 31 October, except for the car park in front of Bohinj Tourist Association offices in Ribčev Laz, where parking fee must be paid all year round.

Bus lines:

Case from Ljubljana: Ljubljana Public Transport (LPP) is responsible for the safe, reliable and convenient public transport in the City of Ljubljana and the area of 16 suburban municipalities. 280 buses transport more than 200,000 passengers a day. Modern and environmentally friendly low-floor buses are controlled from the traffic control center of LPP using satellite tracking system buses. They have electronically controlled payment system, air conditioning, indoor and outdoor displays, digital information displays, video system for preventive prevention of violence, voice trailers for blind and visually impaired and equipment for persons with disabilities. Passengers can enter more than 900 stops, the most frequently are equipped with displays arrivals of buses.



Bike sharing system:

It exist is in Murska Sobota city. In the frame of the project **Establishment of the city center**, the Municipality of Murska Sobota obtained an European funds for the automated system for renting bicycles. The project covers the system "Take the wheel in one place and drop off at another."

The planned project on automated bicycle rental system is designed that a registered user can access the system through its identification, took a bike at one station and hung on the other. Accordingly, five automatic stations are planned to establish to rent bicycles, which would allow users to anywhere in the city take a bicycle, drive to the desired destination, and drop it at the finale station. As they say in the municipality, seeking thereby to encourage the use of bicycles and bicycle transport also enable those who do not have enough space or other reasons they are unable to store your bicycle at home.

In Bohinj city:

Two bicycle rental sites with a total of 14 trekking bikes and additional equipment (helmets, child seats) is available for guests to visit and explore the nature of Lake Bohinj.

10.2.4. Main bicycling routes

In Pomurje: it is presented mostly recreative cycling routes. The bicycle lines are mostly within the bigger regional cities, within the city borders (such as Murska Sobota, Ljutomer, Lendava and Gornja Radgona). Some of them are connected with the hinterlands and often ends in the middle of the road or right after the city border.

Bike routes in Prlekija (which is the part of the Pomurje region) together comprise 135 kilometers, the routes are thematic and divided according to difficulty level.

In Prekmurje (the second part of Pomurje) jointly presents the 6 main routes, it is around 200 km of marked bike routes.

10.2.5. Traffic calming area

In Ljutomer:

The establishment of Juršovka neighborhood as an area of friendly traffic is one of the measures taken by the Municipality of Ljutomer identified in the SUMP 2012, by which the municipality has ranked among the top three integrated transport strategy in the EU in 2013. It is a pilot project for conversion of residential neighborhoods in more user-friendly and attractive, with a high proportion of non-motorized travel. It tested good practice in the EU since the municipality has the ambition to become a model rearrangement of the future regulation of residential areas in Slovenia and this part of Europe. The basic principle of traffic rearrangement in Juršovka the reduction of the speed of motor traffic on all streets in the neighborhood of 30 km / h or less and create a secure environment for pedestrians and cyclists. Speed is calmed by rearranging street space - with strictures using designated parking or green islands. Intersections in the neighborhood have turned into a mini-roundabout, which reduces the speed, increases the safety of vehicles passing and reduces the attractiveness of transporting the cars.

Parking is allowed only on their own car parks and at the designated places on the roads, which are uniformly distributed throughout the village. The main street through the settlement has throughout a one-sided pavement. All other side streets are arranged as areas of light traffic without sidewalks, where the speed is so moderate (up to 10 km / h), that pedestrians and cyclists can safely use the whole width of the street. On the side streets are green islands equipped with a playground or benches. Low speeds enable safe cycling everywhere, without specially marked bike lanes. Restructuring project was held in regular communication with substantial involvement of residents of the neighborhood. They were carried out interviews, surveys, workshops and public disclosure. In the neighborhood traffic counts was conducted and speed information and establish a good data base to monitor the performance of the



project in the future. The basic idea of conversion of neighborhoods in the area friendly transport, promote the use of sustainable transport modes in the municipalities, while energy savings and reduction of CO2 emissions in the foreground.

In Piran:

In the context of regulation of calming traffic in Piran Public Company ENVIRONMENT Piran l.t.d. perform free transport of passengers between parking Fornače - Tartini Square - Fornače, and twice a day to the cemetery in Piran. Free Shipping is performed by two buses that shuttles every 15 minutes. On Fornače and on Tartini Square in Piran are electronic displays, where customers can check the timetable (time of arrival or departure of the bus).

10.2.6. Pedestrian areas

In Ljubljana:

Currently, there are 21 streets in the Old Town of Ljubljana or in its immediate vicinity intended only for pedestrians and cyclists.

On the pedestrian area the delivery can only take place within the specified delivery time in Ljubljana valid from 6:00 to 9:30. In 2007, for access to the pedestrian zone instead of non-electronic permits he city introduced electronic identification card in order to increase the effectiveness of the introduced technology for automatic access control with retractable bollards, which was a major part of this area carried out previously. It has also set up an electronic record of entries and exits as well as dwell time of cargo vehicles on the pedestrian area. To use the stabling places, the use of which requires a valid permit access to the pedestrian area to the payment of an annual or daily fee of which the amount determined by the competent authorities of the Municipality of Ljubljana.

The prescribed amount of fees for access to the pedestrian area promotes the issuance of annual permits, because the purchase of longer-term is favorable. Despite the payment itself the amount of fees for access to the pedestrian area is not comparable with the actual external costs by using his driving causing lorries. Environmentally friendly vehicles for the implementation of delivery in a pedestrian area otherwise exempt from tax, but without additional measures that lack of incentive airlines to actually use the environmental performance of the vehicle, when compared with other, non-organic vehicles, very high purchase price.

10.3. Incentives to influence route and departure time choice

There are no incentives to influence route and departure time choice in Slovenia.

10.4. Innovative mobility concepts in the region

10.4.1. Mobility sharing

Two bicycle rental sites with a total of 14 trekking bikes and additional equipment (helmets, child seats) are available for guests to visit and explore the nature of Lake Bohinj.

10.4.2. Web site for Carpooling

A group of students of computer science and social sciences one day realized that in Slovenia there is no simple way to coordinate the transport, so they started the project prevozi.org. Website prevoz.org (translated: shipping.org) is designed to assist in coordinating the transportation of students in Slovenia.



Registered users may add new posts and reviewing existing ones. Contact information due to privacy is only available to registered users. Registration is free.

Municipality of Trzin is an example of good practices in the field of sustainable mobility, which can be divided into three groups. The first is cycling, where the main measured presents the covered bicycle shed on the station of public transport.

Another group of good practice is public transport, where they increased frequency of public transport (additional trains during peak hours to Kamnik, neighboring municipalities are discussing the introduction of a new public transport route between Domžale and Ljubljana), they built a new station in Trzin, existing stops are equipped with canopies and waste bins, combined tickets - possibility of transportation with various public transport operators - are offered to citizens. In coordinating schedules cooperate with the Slovenian Roads Agency (timetables are otherwise hung in the shelter of individual stations). Municipality of Trzin, where PT is implemented by company Kam-bus, d.d. from Kamnik, is involved in collusion or coordination of the implementation of public transport in the area.

A third group of good practice is environmentally friendly automobile transport because they built the parking lot P & R, in planning is additional near railway station. As an innovation in the field of mobility, it is necessary to mention the introduction of the card for free parking in the parking lot P & R. The citizens can service their vehicles on gas at a petrol station. The municipality is also involved in Gorenjska e-network - building the recharging station for electric vehicles. In addition, the municipality conducts dissemination through the website of the municipality and the municipal bulletin Odsev.

The Municipality of Piran is an example of good practice in the field of sustainable mobility, which can be divided into two groups. The first group of good practice is public transport, which reduced the price of public transport, the introduction of smart cards, 5 new buses in accordance with the Euro 5 emissions standards. Another group of good practice is the limitation of car transport, because the city center is almost completely closed to traffic. They built a car park P & R from which a bus departures, ticket is included in the price of parking.

Ljubljana is an example of good practice in the field of sustainable mobility, which can be divided into three groups. The first is cycling, where the major measure is an introduction of the bicycle rental system called Bicike (lj). It is a network of 31 stations with 300 bicycles, the use of which is up to one hour free. The project was very well received. Another group of good practice is walking, because in a few years greatly increased surface areas for pedestrians, and where older people can be transported by the electric vehicle, so-called Cavalier. In addition, four new bridges and footbridges were built, designed for pedestrians. A third group of good practice is public transport, which is the main achievement of the city and introduced single ticket Urbana, extension of bus lines and the introduction displays the real-time bus arrivals.

Municipality of Nova Gorica (since 2006), Velenje (Lokalci, since 2008) and Murska Sobota (Sobočanec since 2007) offers to residents free urban public transport. All municipalities have decided to take this step in order to relieve traffic in city centers, reduce air pollution and provide accessibility for all.

10.4.3. Integration

Mobile application Urbana

Users of the service of uniform urban Urbana card can install on their Android smart phones mobile application Urbana, which serves as a virtual value card. Urban mobile application enables quick and easy pay for:

- Travel by bus (LPP)
- Service parking (JP LPT)
- the funicular (Ljubljana Castle)



- using the services Bikelj (Europlakat) and
- The use of SMS parking.

The app offers a friendly and simple user experience to holders of smart phones equipped with NFC and Android 4.4 or higher.

For the services of public transport app offers everything what can enable the value card Urbana. It can be contactless paid bus ride, for multiple passengers at the same time, a free crossing within 90 minutes and a full account of the card. Also in the app monitors your account balance and history of validation and schedule arrivals of buses planned route around the town and access to travel information.

Application Urbana is the innovation of the Municipality of Ljubljana, Ljubljana Public Transport (LPP) and Telekom Slovenia, which for contactless payment services system unique digit card Urbana uses NFC technology.

10.4.4. Call on the demand

In Ljubljana

The passenger calls traffic center LPP on 01/58 22 425 or 051/44 99 92, where request for transportation on a certain day at a certain time and obtain immediate feedback on the possibility of transport, and consequently also the confirmation of transport within the given opportunities carrier LPP. Traffic center LPP announce traveler to drivers, latter welcomes at a specific time and place in an appropriate manner a passenger on the bus. With this a person with a disability can avoid unnecessary stress, the driver is informed in advance with the passenger who needs assistance and can act accordingly. In addition, the driver can also help such passengers in case of exceptional circumstances (detours, accidents ...), which means that he / she monitors and ensures that it arrives safely home or to the attendant.

The request for transfer by SMS can give deaf and hard of hearing, deafblind and people who use sign language.

10.4.5. Intermodality

In Ljubljana:

More and more passengers of Ljubljana Public Transport (LPP) follow the trends in the major cities dictate intermodal travel, among other forms of travel; they can also travel by bus and at the same time with a folding bike.

Folding bike can be taken with the passengers on all city lines. More than 90% low-floor buses in the fleet of LPP allow quick and easy entry and exit, which can perform both the first gate and the middle door.

10.4.6. Eco-mobility

In Ljubljana the modernization of the LPP city passenger transport fleet of 280 buses in the last five years has significantly contributed to comfortable travelling and simultaneously to an improved healthy living environment. Hundred new environment friendly buses bought in recent years, meeting the Euro 5 or Euro 6 standards, among them 36 methane buses for a nicer and healthier environment, cleaner air and lower noise levels, will convince even the most zealous advocates of travelling by private cars in urban areas. By setting up a methane filling station with Energetika Ljubljana we also obtained ideal conditions for our methane fleet.

Municipality of Ljubljana has in recent years updated and green their fleet. If a few years ago exposing their achievement of 10% of green vehicles in the city fleet were two years ago decided to green the



majority of company fleet. In 2014 the Municipality of Ljubljana replaces the vehicles with petrol and diesel engines with environmentally friendly vehicles. From a total of 51 new vehicles 43 vehicles is driven by methane.

11. Ústecký Region (Czech Republic)

11.1. Incentives to influence locations and trip frequency

In following chapters we will talk about Ústecký Region. We will also focus the most at Litoměřice town (district capital), which is the project partner in the MoveCit project and the pilot action takes place there too. The region takes many actions in regional, transport and mobility planning. This subchapter is dedicated to the actions which are trying to change the location of demand of the transportation.

The actions that are quite visible and that need to be obeyed are the parking regulations. Let's take a look at the Litoměřice town, which is trying to find the perfect balance in serving its citizens and visitors and in the same time having quality and livable public spaces, functional traffic and safe streets. In general, the parking policies are trying to change the travel behavior (to make people use other modes of transportations than cars as well), to gain substantial income into the city coffers for investment in public transport, public space and for cyclist and pedestrian support. Another reason is also to free up the public space for another usage than parking in the town and also by certain fees the town can regulate to which locations the residents or visitor go to.

Litoměřice apply two forms of parking - parking for visitors and parking for residents. The visitors parking is served by parking machines in defined areas. The parking can be used for shorter or longer period of time, while the maximum is 24 hours. This parking requires a fee to be paid (via the parking meters or via SMS parking service).

The second form of parking is for residents and subscribers. The subscriber can be a person with permanent residency or any legal entity established in a given locality. This form of parking requires a prepaid parking card, which can be used 24/7, but only in defined locality.

By this the town can control the parking localities which are available and by that also control the destination of daily trips. By offering the parking places outside of the downtown - but still close to the homes of residents or workplaces of subscribers - the town officials can dedicate the use of the town center for other purposes.

The location of destination is also altered by financially diversified parking zones in a similar way. There are 4 parking zones with different fees, which are graduated towards the center of the town. There will be changes during the September and also more expensive parking in the zone number one (the downtown). The goal is to motivate drivers to park their cars in the downtown only for time which is necessary for running all the errands and not for the whole day.

Similar parking practice is quite common also in other towns and cities in the Ústecký Region or the Czech Republic. That doesn't change the fact, that this system is functional and contributes to the towns, their traffic and the quality of life of their residents.

11.2. Incentives to influence mode choice

For the choice of the mean of transportation it is crucial to offer the passengers certain alternatives whether it concerns public or private transportation.



Ústecký Region provides public passenger transportation on its territory as a public service. Integrated transport system of Ústecký Region (Integrovaný dopravní systém Ústeckého kraje - by Czech shortcut IDS ÚK) was created to meet the demand of the inhabitants and visitors. It is continuously spreading over the region. It was established in 2015 and it is presented to public by name Doprava Ústeckého kraje (DÚK) = Transport of Ústecký Region. The extensive net is created by system of regional train and bus lines with mutual coordination of routes of connections. The core positive aspects (and the main aims) of the system are single tariff, unified transport policies, optimization of the traffic and rising of the quality standards.

There are many towns and cities in Ústecký Region which are running public transport within their urban area. They do this by their own transport company or contracted private transport companies. The goal of Ústecký Region is to integrate all of the individual transport systems.

The integrated tariff is the tariff zone-relational. That makes the tariff zones the basic element of the system. The zones are defined by this principle: one municipality = one zone. The municipalities or towns which occupy bigger area are divided into more zones. The price of the ticket is defined by the zone and their mutual distance. It was crucial to create a mutual settlement of finances between the transport companies to establish this system. The tariff allows purchasing time framed tickets and prepaid passes for 7, 30 and 90 days. These passes have form of electronic cards which are made by the towns and the transport companies so the unified design is not necessary. Cards can be personified (concrete holder, photography and other personal data) or non-personified (anonymous, limited range of the tickets). The cards can be used as a ticket, electronic wallet or prepaid pass for the transportation. International tickets for Elbe-Labe and Euro-Nisa routes are also part of the integrated tariff of DÚK.

The support of public transportation system and its unification can strongly influence the travel behavior of the residents and visitors of the region. It can also make the traveling easier to those, who are not used to the public transportation systems. The interconnection of the public systems with other means of transportation can be also crucial.

For example, the municipality of Litoměřice is also trying to promote cycling. The town has created a document called "Plan of cycling infrastructure and touristic trails of Litoměřice region in Bohemian Central Uplands" in 2009. This document states that the town transport politics should support alternatives to use of automobiles especially biking and walking. The core of this politics dwells already in master plan. This plan of cycling contributes to the smart mobility approaches that has been set in master plan and elevates them to the next level. It includes the sustainable mobility approaches without extra need of consumption of non-renewable energy sources and creation of CO₂, NO_x and other emissions. Another substantial impact of the plan is in development of sustainable tourism. Ústecký region also has a Marketing study for cyclotourism.

In order to raise the share of cyclist on the total traffic there are new safe and comfortable cycling tracks created. Building of new infrastructure for bikers is supported (for example the biketower mentioned below). The separate bicycle lanes, the mixed paths for cyclist and pedestrians, residential zones and less used roads are used for cycling. Also there are one way roads which can be used on bike both ways. The informative horizontal marking for cyclist which advises them which part of the street use is also part of the changes.

One of the ways how to promote cycling is to build the infrastructure which is very important for this mean of transportation. Bikers are usually the users of infrastructure which is primary build for other vehicles or for pedestrians. Usage of roads and pavements could lead to safety problems, which is why it is getting more common to build separate lanes for bikes or cycling routes.

The town also plans to build parking tower for bikes, which will be more than 11 meters high and its capacity will be 188 bikes. The system of storing bikes will be fully automatized and self-serving and it will guarantee the safe and dry storage for the bikes and also for some bags which can be hanged on handlebars. This extra space can also motivate people to use the safety helmet, because they don't need

to carry them around once they park the bike. The users of this parking tower can store in there also their e-bikes, because the charging slots are part of the biketower as well.

The biketower will be situated nearby one of the train station and bus station, which enhances the combination of the modes. This area is important transport terminal, which lacked the link to the cycling infrastructure. Local representatives hope for this to change. The creation of the parking space for bicycles should promote not only the cycling but also the public transportation and vice versa. This step is quite innovative in the environment of the Czech Republic. There are only two towns in the Czech Republic which has these biketowers so far - Hradec Králové and Přerov.



Figure 10 Biketower (Source: Bikeproject)

The municipality of Ústí nad Labem takes also special care of cyclist during the summer, when there are free of charge cycle-buses in order. The routes to the part of the town called Severní Terasa operate during the weekends and national holidays from June to October. The goal is to motivate to cycling those inhabitants who live in the more hilly area of the city.

Public transportation and biking are not the only means of transportation which are supported. The promotion of walking is also one of the incentives in municipality of Litoměřice (see chapter 4.3).

Mode choice can be influenced not only by building and infrastructure or incentives supporting certain mode of transportation. The final choice can be also influenced by negative motivation, such as the regulations of parking in Litoměřice town. These policies, which can also lead to reduction of car usage, are described in chapter 4.1.

11.3. Incentives to influence route and departure time choice

The promotion of walking is also one of the incentives in municipality of Litoměřice. The town has created an interactive (and printed) walk map, which deals mostly with barriers in the town. The map is called “Litoměřice without barriers” and the goal is to show the routes, paths, buildings and services which are suitable for wheelchair users. The outreach is much bigger though. This map can be used for example by everyone with temporary or retentive disabilities, difficulties of movement or by elderly who can have trouble using stairs or certain type of terrain. This map, when used for example by user of wheelchair, can strongly influence the choice of route so the passenger misses all obstacles on the way.



Figure 11 “Litoměřice without barriers” map (Source: Litoměřice bez bariér)

The route choice is also influenced by infrastructure innovations such as universal design concepts which are applied during the renovation and modernization of the roads, pavements and public spaces overall. This concept is dealing with repairing or making the routes usable by anyone (no stairs so the wheelchair users and elderly can use it, relief signaling for blind people etc.).

Traffic calming principles - which can influence the route choice as well - are applied in municipality of Litoměřice - especially in downtown. One of the ways of calming the transport is the utilization of policies which are lowering the speed limits. Litoměřice are going to establish the main square and its close surroundings as a residential zone. With this legal designation the speed limit will be 20 km/hour. Also the right of way will belong to the pedestrians instead of the cars, which will slow down the traffic as well.

Palachova street nearby the town center will be also reconstructed with traffic calming tools. For example all crossings will be elevated by 10 cm which will force the vehicles pass them slowly. The pavements are going to be reconstructed in the universal design concepts, so there will be long route to train station optimized for wheelchair users and other inhabitants with limited movement. The barrier free access will be also to buses, since the bus stops have elevated pavements as well. The safety of passengers and pedestrians is highlighted by the lighting of pedestrian crossings and lighting in general.

These traffic calming principles can influence the departure time since the measures involve lowering the speed limits, physical barriers which slow down the automobiles and other vehicles. Departure time and length of stay can be also influenced by parking policies. For example town of Litoměřice introduced the reduction of parking fee in the main square, but only in case that the cars park there for less than 30 minutes. Any extra hour is more expensive. The visitors are motivated to park elsewhere or run their errands in downtown quickly.

11.4. Innovative mobility concepts in the region

There are many mobility concepts applied in the region. Some events can be considered very innovative. Event which deals with parking spaces in the main square in municipality of Litoměřice is going to take place in Litoměřice in the end of September. The local representatives are going to close part of the parking zone in the main square of Litoměřice for one week. The goal of this action is to show residents and visitors how would the historically valuable main square look like as a pedestrian zone. There are



many people who would like to see this as a permanent solution. This trial can show the negative and positive effects brought by this change.

Another innovative mobility concept is also a bike sharing system Rekola, which already operates in six Czech cities. This system is spreading to Ústecký Region as well. The town of Teplice is going to use this service from September 2016. This bike sharing system is based on its users. To start this incentive there needs to be a support from the community - social and financial. The users register to the system, pay the pass and then they can use the bikes for a given period of time. Also there are no fixed stations. You can park the bike anywhere you want to. Renting of the bike is done via mobile phone. This system also allows the inhabitants and visitors of the region use the bikes without the need of buying them. Also there is a contribution to the system of hybrid journeys. When people use the bikes which are part of the bike sharing system, they don't need to take the bikes to the public transportation vehicles and that makes the combination of modes much easier.

The town hall also supports electromobility. We have already mentioned the biketower that will be also equipped by charging station for e-bikes. The electric cars have also another advantage. The parking of e-cars is free in the whole town including the parking tariff zones. The aim of this action is support of traffic which doesn't put so much pressure at the environment. The town hall is also going to rent e-cars for work related trips for staff of public bodies and public-benefit corporations.

The towns of the region are also interconnected and sharing the examples of good practices. Regional capital Ústí nad Labem and towns Benešov nad Ploučnicí, Litoměřice, Štětí, Telnice and Ústěk are members of Healthy Cities, Towns and Regions of the Czech Republic. It is an association of active local governments, which are programmatically committed to the principles of sustainable development, involve the public in decision-making processes and promote a healthy lifestyle of its inhabitants. Healthy Cities, Towns and Regions of the Czech Republic are deliberately trying to shape the places in the Czech Republic as a quality, healthy, comfortable, and in particular sustainable place to live, based on an agreement with local residents. The sustainable and smart mobility is a part of the program as well.

12. City and urban hinterland Leipzig (Germany)

12.1. Incentives to influence locations and trip frequency

To influence locations and trip frequency the City of Leipzig follows the both principles 'city of short distances' (Stadt der kurzen Wege) and 'firstly core city before suburbs' (Innen- vor Außenentwicklung) [1]. That means to reach a compact settlement structure with a mix of uses e.g. shopping, schools, kindergarten. The objective is to reduce traffic as far as possible and develop the transport system and settlement structure for the use of foot or bicycle. For that inner city revitalization of unused areas or brownfields are on the political agenda. New housing departments will be realized in these areas, so city centre, working places and other infrastructures can be easily reached by public transport, bicycle or foot [2].

One issue the city dealing with, is the management of transport in the core city. For that the City of Leipzig has developed a concept in 1993 'car reduced city centre', which was further developed in 2008. It includes car traffic, cycling, walking, public transport and parking management [3]. In regards to parking management the objective is to reduce parking capacities in the core city. In the core city the main parking lots are concentrated on parking garages. About 7.000 parking lots in garage are directly around the city center and 1.400 near to zoo to be still attractive for tourists and visitors [2].

Parking lots in public street spaces have been reduced from 830 (year 2008) to about 360 (year 2015) in the core city. There is no price advantage for parking in public street places in comparison to parking garages in the core city. Parking is just for free for direct inhabitants, who need permission for parking



(‘Anwohnerausweis’). The City parking guidance system gives information of free parking lots in the inner city [2].

In Leipzig environmental zones exist, which regulate the access to cities for motorized vehicles in dependence of their emissions. All vehicles with catalyst and diesel fuel used cars with euro 4 and euro 3 particle filter receive a green label, which allows the full access to the city.

In the city administration flexible working hours are available with a core working time between 09:00 and 14:00. The specific advantage of a flexible working time (in reference to traffic science) is the reduction of peak hour traffic due to the different arrival times of employees.

First working mobility management have been tested in during the program ‘effizient mobil’ in the public utility of Leipzig (‘Stadtwerke Leipzig’), including questionnaires to employees analysis of framework and some realizations in the fields cycling, public transport and e-mobility.

12.2. Incentives to influence mode choice

The mode choice depends on different factors like purpose of travelling, costs (better say cost awareness), length of the trip, weather, personal experiences, offers and opportunity.

One major aspect is cost: mostly relevant costs are directly paid costs (out-of-pocket-costs) like tickets for public transport, parking or fuel. Indirect costs (e.g. taxes or insurance), however, are usually not considered. This leads to the situation that public transport is more expensive than car uses especially by travelling with more than two persons. A single trip within the zone of Leipzig city is 2,60 € and a fully day ticket 7,20 €. Nevertheless there are different incentives to influence the mode choice.

In regards to MIT (motorized individual transport) the strategy of Leipzig is to reduce MIT and especially in the city centre. For that the already mentioned parking management is one tool. To compensate less parking lots the combination with other transport modes have an important role. In the region Leipzig on nearly all train stations (3.000) Park and Ride-parking lots are available in total, which have a high demand [2]. The Park and Ride stations in the city are less demanded, because of less time savings. Actions foresee therefore to concentrate Park and Ride stations in the surrounding areas. Park and Ride still remains important especially for bigger events. The cooperation with public transport operators is envisaged to realize combined tickets to freely use public transport at events. For soccer events this has been realized already [2].

Another incentive is car sharing. The flexibility of car and bike sharing are recognized as important potential. The biggest car sharing provider has 200 vehicles within 80 stations in Leipzig. The amount of car sharing vehicle increase rapidly about 20% each year. There is cooperation with public transport providers provide cost reduction in combination with public transport passes. In Leipzig car sharing is becoming more and more popular. But nevertheless only 4% of persons use car sharing regularly or at least sometimes [12].

Another aim is the further development of e-vehicles in Leipzig. In Leipzig 58 charging stations are placed with approximately 16 points in the inner city. The City of Leipzig is partner in a national pilot program testing different electro mobility solutions. For additional mobility offers 700 taxis exist with 78 Taxi parking lots [2].

The City administration can influence the sharing offers by providing selected places and stations for car sharing and taxi stations. Especially in districts with parking problems fostering car sharing is envisaged [2]. It has to clarify which legal obligations have to fulfill to use public space for private car sharing providers and distribution of capacities to them [4].

The public transport Leipzig is well developed. The City of Leipzig has one of the biggest public tram networks in Germany with 13 lines and 212 km of Tram tracks. Nearly all trams and buses have a



frequency of 10 to 15 min. For the increase of the coverage of public transportation stops and for bringing new customers to public transportation one possibility is the promotion of intermodal journeys. This can be achieved for example through Park and Ride or Bike and Ride Stations. Also special hubs (Mobilitätsstationen) for Carsharing, Bike Sharing, e-Car recharging are connected to public transportation. For reaching Park and Ride and Bike and Ride strategy is in place. Additional actions are special public transport offers to also reach peripheral areas through call line taxis which are flexible available [2]. For business trips of city administration employees public transport modes are supported according to the principles of cost efficiency.

Also the cycling infrastructure in Leipzig is well developed. The length of the bicycle network is approximately 440 km. In addition a 500 km network of paths through green areas forms the backbone of the cycling network, because of the extended green belts within the city. A lot of cyclists use the greenway cycling infrastructure because of the convenience of driving through green areas. There are also a lot of bicycle parking facilities in public space. Around 5.000 Bicycle Racks for 10.000 bicycles are placed in the City of Leipzig. One of the main hot spots for bicycle parking is the car reduced downtown. There are 1.500 bicycle racks for 3.000 bicycles installed within the City Ring and the buildings of the University of Leipzig also includes 2 bicycle underground parking stations with 700 and 1.200 bicycle parking facilities. For the strategical planning of cycling development a cycling master plan is in use. The last update of this plan was finished and confirmed through the city council in 2012. Besides the declaration of main goals for cycling development, like increasing the modal share of cycling and reducing the risk of heavy and fatal accidents with cyclists, one central element is the development of a route network in the whole city and close existing gaps in the network. First priority is the main route network. On main traffic route options for cycling should be realized through cycle paths and cycle lanes [2]. In the city centre cycling streets ('Fahrradstraßen') are established. These are small streets, where tempo is limited to 30 km/h and cycling is possible in both directions on one way streets. There exist also information materials for cycling, e.g. how to reach the department of traffic planning and road construction best via bicycle [6]. Within the city administration over 87 bicycles for business trips are available, which will be further supported .

The bike sharing system provides 700 bicycles on about 70 stations in whole City. The city supports bike sharing by offering public spaces [2].



Figure 12 Cycling Master Plan 2010-2020

For walking a concept was developed in 1993. Walking network has been further developed and additional support for street crossing established. According to the concept 'car reduced city centre' pedestrians have generally priority compared to other modes of transport. There exist extended pedestrian areas with support lanes for visual impaired people. Also for primary school ways separate plans exist which shows safest way to school within the school districts [2].

12.3. Incentives to influence route and departure time choice

Different actions for management of traffic and routes especially soft measures exist. The aim is to concentrate car traffic to main routes, while other roads are used for accessibility and provision of service, which leads to less traffic in side roads and better amenity value.

Besides the effect of street design to route preferences, speed limitation to 30 km/h in side roads and installing one way streets and dead ends are important measures to influence the route choice.

For shorter travel time and better competitiveness of public transportation (in comparison to car traffic) there are two main instruments. First tool is the separation of the tram tracks from car traffic, so the trams do not stuck in traffic jams. The average speed on separated tram tracks is also higher than on combined roads. For narrow streets without the chance of separation of tracks there is the possibility to give the public transportation a head start on traffic signals, so the cars have to drive behind the tram/bus. The public transportation has also priority at all signalized intersections.



Leipzig has a transport information system which gives information of constructions sites, road closure, Park and Ride and parking garages in the inner city. A regional transport management system has just started. Moreover, a dynamic system is in test phase at fairs and big events.

12.4. Innovative mobility concepts in the region

Leipzig decided to introduce a sustainable principle concept which is called “Leipzig ist Klima bewusst”. Leipzig took part in the program ‘effizient mobil’ in 2010. The concept provided actions for connection and automatization of mobility information. The goal was also to install a mobility manager in the city administration, for bundling mobility actions from different offices of city administration, mobility consulting for citizens, tourists and companies [7]. Unfortunately this position is not realized yet. Also mobility management is integrated in the traffic development plan with an extra chapter. Different steps are included here to influence mobility behaviour through teleworking, flexible works, job tickets, passenger platforms, bike holders, and e-bike renting [2].

Some aspects are already realised or planned in the near future.

One point is to provide tools for allowing simple booking of public transport tickets is the ‘easyGo’ app. The app received the German mobility price in 2016. The app allows buying public transport tickets directly shown in the app and eligible for using public transport in the region surrounding Leipzig of Mitteldeutschen Verkehrsverbund. Passengers pay for their tickets on easyGo via the safe and simple method of their mobile phone invoice or prepaid credit, without having to give their bank details. Beside booking of tickets it also gives actual information about timetable, journey planer, transportation, map of public transport and the next public transport station. Also points of interest are displayed while journey is being planned. It will automatically show points of interest by means of different coloured dots, for example restaurants, sights or the nearest car or bike sharing stations.

Additional to that Leipzig included 24 Mobility stations in the City. These are information and booking platforms to connect public transport, car- and bike sharing. With the stations and the app it is also possible to pay for the electrical power for e-mobility cars [8], [2].

Other platform realizations are currently underway. In January 2017 a new platform for MIT-passengers for automobile and logistic branches in the north of Leipzig was established. The area has shown high commuting [9].

Other initiatives for supporting public transport are mentioned in the integrated energy and climate concept [5]. Actions here provided foresee to better check optimisation of fares in public transport especially to give more flexibility by starting monthly tickets.

Another innovative instrument is the ‘Jobticket’. Companies make a contract with public transport provider and provide the Jobticket to their employees. With job ticket the cost for using public transport are reduced of 13%. The concept mentioned to further develop the Jobticket to check a raise of discount to 20% and make the process more transparent [5]. In the city administration of Leipzig 700 employees has already use the Jobticket. Jobticket will be further supported within the city administration.

Regarding parking management one example of concept has been realized for one district in Leipzig called Schleußig which face problems with parking situation. The following actions are mentioned in the concept [10]:

1. Actions for increasing parking space through change of parking of cars (vertical, cross, lengthwise) and the partly realization of one-way-roads and use of private space for parking.
2. Actions for reducing demand: parking management which prefers inhabitants before other users.
3. Pilot action for changing mobility behavior of inhabitants: ten households park the car out of the district in a free of charge parking garage. They receive a free passes for use of public transport, a car



sharing pass and free check for bicycles. In some households a change of behavior was recognized. For daily working trips more cycling and public transport have been used. The car was just used if there are no other option from personal point of view, e.g. for longer week-end trips. The biggest advantages are in the combination of different transport modes (multimodality) [11].

13. References

13.1. Industrieviertel (Austria)

- [1] Stadtgemeinde Mödling (s.a.): Mödling wird zur „Smart-City“. Online: http://moedling.riskommunal.net/Moedling_wird_zur_Smart-City_1 (accessed: 13.09.2016)
- [2] Regionalverband Industrieviertel (2006): Regionaler Alltagsradverkehr in Bezirk Baden. Online: <http://www.industrieviertel.at/projekte/mobilitat/> (accessed: 13.09.2016)
- [3] Stadtgemeinde Baden bei Wien (2011): Stadtentwicklungskonzept 2031 Baden - Band B: Stadtentwicklungsstrategie - Die Sektorenthemen im Detail. Online: http://www.baden.at/cms/upload/pdf/2011_09_15_Endbericht_Teil_B_Sektorenthemen.pdf (accessed: 08.09.2016)
- [4] Stadtgemeinde Mödling (s.a.): Mobilitätstag Neusiedler Viertel. Online: <http://www.moedling.at/system/web/zusatzseite.aspx?detailonr=224910708> (accessed: 14.09.2016).
- [5] Stadtgemeinde Baden (s.a.): Radfahren in Baden. Online: <http://www.baden.at/de/unsere-stadt/verkehr/radfahren-in-baden/> (accessed: 14.09.2016)
- [6] Stadtgemeinde Baden (2004): Radverkehrskonzept 2001 und 2004. Online: <http://www.baden.at/de/unsere-stadt/verkehr/radfahren-in-baden/radwegeprogramm/radverkehrskonzept-2001-und-2004.html> (accessed: 14.09.2016).

13.2. Cityregion Bruck-Kapfenberg-Leoben (Austria)

- [1] StadtentwicklungskonzeptOnline: http://www.bruckmur.at/pdf/raumordnung/20100719_STEK400_Wortlaut_I-Net.pdf . (accessed 26.10.2016).
- [2] Stadt Bruck. Online: <http://www.bruckmur.at/buergerservice/parkraumbewirtschaftung> (accessed 26. 10 2016)
- [3] Stadt Leoben.. Online: <http://www.leoben.at/buergerinnen/verkehr-infrastruktur/parken/> (accessed 26. 10 2016)
- [4] Bruck, personal information of mobility representative NAME??. (20. 9 2016). (E. Sumper, Interviewer)
- [5] Stadtregion Bruck-Kapfenberg-Leoben. Online <http://www.raumplanung.steiermark.at/cms/beitrag/12017180/104109945> (accessed 28. 10 2016).
- [6] Stadtleitbild Leoben. Online: http://www.leoben.at/file/sites/4/2015/05/Stadtleitbild-Leoben_2008-2017.pdf (accessed 26.10.2016).
- [7] Move2Grid. Online: <https://nachhaltigwirtschaften.at/en/sdz/projects/move2grid.php> (accessed 28. 10 2016).



- [8] Mobility lab. Online:
<https://www2.ffg.at/verkehr/projekte.php?id=1276&lang=de&browse=programm> (accessed 28. 10 2016).
- [9] Smart City Leoben. Online: <http://www.smartcities.at/stadt-projekte/ /greenetleo/> (accessed 28. 10 2016).
- [10] ENDURANCE, European SUMP network. Online:
<http://www.epomm.eu/endurance/index.php?id=2809&city=101> (accessed 02.11.2016)
- [11] Leoben, personal information of mobility representative Mrs. Janze, (20. 9 2016). (E. Sumper, Interviewer)

13.3. Banská Bystrica (Slovakia)

- [1] Mattias Juhász, Travel Demand Management - Possibilities of influencing travel behaviour. Periodica Polytechnica Transportation Engineering, Vol. 41, No. 1, pp. 45-50, 2013. DOI: 10.3311/PPtr.7096
- [2] ÚPN mesta Banská Bystrica (*Zoning plan of the town of Banská Bystrica*). Banská Bystrica City Hall, 2016.
- [3] Marek Modranský: Autá ničia životný priestor a medziludské vzťahy na sídliskách (*Marek Modranský: Cars destroy environment and interpersonal relations in living quarters*).
<http://www.bystricoviny.sk/titulka/marek-modransky-auta-nicia-zivotny-priestor-a-medziludske-vztahy-sidliskach/>

13.4. Békéscsaba (Hungary)

- [1] Mattias Juhász, Travel Demand Management - Possibilities of influencing travel behaviour. Periodica Polytechnica Transportation Engineering, Vol. 41, No. 1, pp. 45-50, 2013. DOI: 10.3311/PPtr.7096
- [2] Transport Development Plan of City of Békéscsaba - Transport Concept (2010.)
- [3] Regional Features of Békéscsaba Micro Regions (2011.)
- [4] Actualization of Regional Development Plan of Békéscsaba micro region (2009.)
- [5] Integrated City Development Strategy 2014-2020. (2014.)
- [6] www.bekescsaba.hu
- [7] www.csabaikisterseg.hu

13.5. Budapest (Hungary)

- [1] BKK - Center for Budapest Transport, Balázs Mór Plan, Budapest Transport Development Strategy 2014-2030. Draft for public consultation, Budapest, 2014
- [2] Éri Vilma: Guide for creating work mobility plan, (Útmutató a munkahelyi közlekedési tervek készítéséhez), Ministry of National Development, Környezettudományi Központ Alapítvány, Budapest, 2012, http://www.ktk-ces.hu/utmutato4_elektronikus.pdf



- [3] Law No. LXIV of 2005 and its modification by Law No. LXXXVIII of 2011 (Budapesti Agglomeráció Területrendezési Tervéről szóló 2005. évi LXIV. törvény és módosítása a 2011. évi LXXXVIII. törvény által), http://net.jogtar.hu/jr/gen/hjegy_doc.cgi?docid=A0500064.TV
- [4] Plan for settlement structure of Budapest by Government Decree No 314/2012, Article 40 (Budapest Főváros Településszerkezeti terve 314/2012. (XI. 8.) Korm. rendelet 40. § szerinti végső szakmai véleményezési szakasz), Budapest, 2015
- [5] Mattias Juhász, Travel Demand Management - Possibilities of influencing travel behaviour. Periodica Polytechnica Transportation Engineering, Vol. 41, No. 1, pp. 45-50, 2013. DOI: 10.3311/PPtr.7096

13.6. Modena (Italy)

All the data are collected and managed by Municipality of Modena, Mobility and Traffic Service.

13.7. Ljutomer (Slovenia)

- [1] Research on Telework in Slovenia, 1998

13.8. Ústecký Region (Czech Republic)

- [1] ANKETA: Z části náměstí bude pěší zóna. Bez aut. Na zkoušku. In: Litoměřický deník [online]. 2016 [2016-08-30]. Online: http://litomericky.denik.cz/zpravy_region/z-casti-namesti-bude-pesi-zona-bez-aut-na-zkousku-20160805.html
- [2] BIKEPROJECT. 2016. [2016-08-30] Online: <http://www.bikeproject.cz/cz/>
- [3] BŘEŇOVÁ, Eva. 2014. Palachova ulice má být krásnější a bezpečnější. In: Litoměřice [online]. [2016-08-30]. Online: <https://www.litomerice.cz/aktuality/3906-palachova-ulice-ma-byt-krasnejsi-a-bezpecnejsi>
- [4] BŘEŇOVÁ, Eva. 2014b. Parkovné v centru Litoměřic od září podraží. In: Litoměřice [online]. 2014 [2016-08-30]. Online: <https://www.litomerice.cz/aktuality/4372-parkovne-v-centru-litomerice-od-zari-podrazi>
- [5] Litoměřice bez bariér [online]. 2011. [2016-08-30]. Online: <https://www.litomerice.cz/bezbarier/>
- [6] MAXA, Jan. 2014. Doprava Ústeckého kraje. In: Ústecký kraj [online]. [2016-08-30]. Online: http://old.kr-ustecky.cz/vismo/dokumenty2.asp?id_org=450018&id=1682555&n=doprava-usteckeho-kraje&p1=178192
- [7] MUNICIPALITY OF LITOMĚŘICE. 2009. General cyklostezky a turistických tras regionu Litoměřice a okolí v podmínkách Českého středohoří.
- [8] MUNICIPALITY OF LITOMĚŘICE. 2016. Přípravná studie pro SUMP pro město Litoměřice.
- [9] CITY OF ÚSTÍ NAD LABEM. 2012. General udržitelné dopravy města Ústí nad Labem: Analýza stávající situace.
- [10] NÁRODNÍ SÍŤ ZDRAVÝCH MĚST. 2016. [online]. [2016-08-30]. Online: <http://www.zdravamesta.cz>
- [11] Návrh prvních úprav v dopravě na litoměřickém náměstí. In: Severočesí Litoměřice [online]. 2015 [2016-08-30]. Online: <http://severocesil-litomerice.cz/navrh-prvnich-uprav-v-doprave-na-litomerickem-namesti/>



- [12] Parkovné v Litoměřicích zlevní na polovinu. In: Litoměřický deník [online]. 2013 [2016-08-30]. Online: http://litomericky.denik.cz/zpravy_region/parkovne-v-litomicich-zlevni-na-polovinu-20130324.html
- [13] TECHNICKÉ SLUŽBY MĚSTA LITOMĚŘICE. 2016. [online]. [2016-08-30]. Online: <http://www.tsmlt.cz/parkovani.html>
- [14] ÚSTECKÝ KRAJ. 2005. STRATEGIE UDRŽITELNÉHO ROZVOJE ÚSTECKÉHO KRAJE 2006 - 2020.
- [15] ÚSTECKÝ KRAJ. 2016. Plán dopravní obslužnosti Ústeckého kraje 2017-2021: Analýza stávající situace.
- [16] Ústí n.L.: Cyklobus na Severní Terasu zdarma. In: Národní síť zdravých měst [online]. 2016 [2016-08-30]. Online: <https://galerie.udrzitelne-mesto.cz/cz/priklady-dobre-praxe/usti-n-l-cyklobus-na-severni-terasu-zdarma>
- [17] WEISSOVÁ, Veronika. 2016. Cyklisté by v Litoměřicích nově mohli parkovat ve věži. In: Litoměřický deník [online]. [2016-08-30]. Online: http://litomericky.denik.cz/zpravy_region/cykliste-by-v-litomicich-nove-mohli-parkovat-ve-vezi-20160419.html

13.9. City and urban hinterland Leipzig (Germany)

- [1] Stadt Leipzig, Dezernat Bau und Stadtentwicklung 2009: Leipzig 2020 - Integriertes Stadtentwicklungskonzept (SEKo)
- [2] Stadt Leipzig, Dezernat Stadtentwicklung und Bau 2015: Stadtentwicklungsplan Verkehr und öffentlicher Raum. Erste Fortschreibung
- [3] Stadt Leipzig, Verkehrs- und Tiefbauamt 2008: Fortschreibung der Konzeption autoarme Innenstadt
- [4] KEMA - Ingenieurunternehmen für Energieversorgung GmbH 2011: Integriertes Energie- und Klimaschutzkonzept für die Stadt Leipzig - Kurzfassung
- [5] KEMA - Ingenieurunternehmen für Energieversorgung GmbH 2011: Integriertes Energie- und Klimaschutzkonzept für die Stadt Leipzig - Phase 4
- [6] Stadt Leipzig, der Oberbürgermeister Amt für Umweltschutz 2009: Mit dem Rad zum Technischen Rathaus
- [7] Deutsche Energie-Agentur GmbH (dena) 2010: effizient mobil. Das Aktionsprogramm für Mobilitätsmanagement. Programmdokumentation 2008-2010.
- [8] <http://www.myeasygo.de/home.html>
- [9] <http://www.leipzig.de/news/news/fahrgemeinschaftsplattform-fuer-die-automobil-und-logistikbranche-im-leipziger-norden-1/>
- [10] LK Argus 2015: Stadt Leipzig Parkraumkonzept Leipzig Schleußig Endbericht
- [11] 11. Dr. Sylvia Harms et al. 2008: Parkraumprobleme in Schleußig: Anwohnerbefragung und Evaluation freiwilliger Verhaltensänderungen während eines Testzeitraumes - Abschlussbericht -
- [12] Stadt Leipzig, Amt für Statistik und Wahlen: Kommunale Bürgerumfrage 2014