

TRAFFIC MANAGEMENT CHALLENGES AND SOLUTIONS FOR SOUTHERN EUROPEAN CITIES

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ABSTRACT

In the beginning of the 90s, most countries in Eastern Europe had political and economical changes, therefore they had to face new opportunities and new problems as well. In the field of surface transport, now focusing on urban transport there were a number of different strategies, concepts and ad-hoc decisions concerning different political goals, transport policies and supporting systems. Since then, for most middle-sized Eastern European cities there was a lack of systematic strategies or there was no urban strategy at all.

Realizing these kinds of problems projects receiving EU funding require systematic decisions of different fields of urban development. Special development, reconstruction, revitalization projects with a high budget have to correspond to general strategies of the municipality (integrated urban development strategy, transport development strategy, urban environmental strategy, etc.)

This paper is focusing on the transport development strategy of Bekescsaba, a town of county rank and the county seat of Bekes County located in South-East Hungary. The study includes all modes of urban transport covered with traffic counting, surveys for public transport, individual transport modes and households. Road network data and other static

data was mostly available, but there was a lack of dynamic data and trends which could also be useful for the next step of the research. Beyond the national practices, some of similarly situated western European cities were analyzed looking for best practice traffic management tools (junctions, parking policies, biking, public transport network, traffic calming, etc.)

All of the collected data was an input to a macroscopic transport modeling software. Several kinds of modeling software have been used in bigger cities all around the world for around 10-15 years to analyze of the actual traffic volume and traffic flow, road choice decisions, and working out any kind of alternatives concerning to development plans for the future. The output of the transport modeling software is the validated base of the possible traffic management solutions as development alternatives or development packages. The study analyze the developments from other aspects like environmental, traffic safety, humanity (ergonomy, willingness to use, etc.), cost-benefit, public relations etc.

Keywords: political and economical changes, sustainable urban transport development, EU funding, best practice traffic management tools, macroscopic transport modelling, transport development strategy

INTRODUCTION, PREMISES

Travel distances has been increased in the last few decades. Accessibility, supplying reasonable mobility demand, sustainable development of level of service are important basis of economical and social growth. Accessibility is complex. It includes goods and passenger transport with sufficient capacity on a high service level.

Sustainable development requires the harmonisation of economical, social, ecological concepts. Depend on the aims of the European Union, the ratio environmental friendly transport has to be raised.

Hungary determines the principles of national transport policy considering to the EU transport policy focusing on the possibilities of a dynamic development of the transport sector falling into line with the EU level. This procedure has a positive effect on the quality of life. On local level, the municipalities and the local authorities has rights and tools to get through this complex challenge.

Békéscsaba, “the capital, the seat” of Békés County is a mid-sized city, with an area of 194km² and population of 65000 people is located in South-East Hungary, on the Great Hungarian Plain. The city is a geographical, economical and social center of the South-Great Plain Region.

The municipality prepares important development projects of great dimensions to realise the sustainable development. These projects partly supported by the European Union focusing on predefined action areas but have an effect on environment and transport in extended areas.

Supplying the reasonable transport demands is one of the main aims of the transport development. The actions have complex and sometimes different effects on parties concerned (inhabitants, transit traffic, ventures, municipality, etc.). To support optimal decisions the parties concerned and their reasonable demands have to be appointed exactly. They have to be holistic informed and involved the decision support procedure if needed.

The city has prepared its own transport development strategy harmonizing with integrated urban development strategy. The transport development strategy includes transport analysis, transport modelling, transport development recommendations.

The transport analysis gives a general overview of the transport characteristic and current transport situation of Bekescsaba highlight urban development problems require transport development. The first part of the transport modelling is a forecast (without any development, BAU) in several time frames. Future mobility demands could be defined. Moreover, reasonable reasonable development possibilities are collected and compared by development packages and analyse the effects on urban transport. Bottlenecks, problematic sections and junctions could be easily found and different alternatives could support transport development decisions of the municipality.

Transport development strategy gives directives scheduled by short middle and long terms considering EU and national directives and interdisciplinarity.

Transport development proposal is a detailed, operative chapter collecting the recommendations sorted by transport sectors and modes, This chapter is the most effective decision support system for the municipality considering the complexity of urban development.

MAIN AIM

The main aim of the paper is to show the problems, difficulties and possibilities of the urban transport development of a mid-sized European city through the example of Bekescsaba.

The study focuses on transport and financial aspects, regarding the role of the municipality and other stakeholders working for the decision support system of urban developments.

TRANSPORT ANALYSIS OF BEKESCSABA

Accomodate to superior transport development directives

In the European Union more than 60% of the inhabitants live in urban areas. Around 85% of EU GDP is given by cities. Mid-sized cities are different, but they have similar problems and challenges in the field of transport and looking for similar solutions. Growth of motorisation level followed by typical problems as congestion, air and noise pollution, road accidents and conflicts, etc.) which all having negative effects on liveability.

The White Paper on European transport policy for 2010 was the most important document out of overall EU strategies in the field of transport. The Green Paper on urban mobility focus on the future of urban transport including important directives for stakeholders which could be easily adopted for each cities. The Green Paper addresses the main challenges related to urban mobility by 5 themes:

1. Free-flowing towns and cities;
2. Greener towns and cities;
3. Smarter urban transport;
4. Accessible urban transport,
5. Safe and secure urban transport.

In addition, the Green Paper looks at means in order to help the creation of a new culture for urban mobility, including knowledge development and data collection, and addresses the issue of financing.

The Integrated Urban Development Strategy of Bekescsaba has 5 thematic goals (TG) for 7-8 year long term development:

1. invigorate local economy, raise the competitiveness (TG1),
2. society (TG 2),
3. built environment, urban infrastructure (TG3),
4. urban green areas, ecology (TG4),
5. transport (TG5).

Current transport situation

Having a look at on urban development processes of similar European mid-sized cities it is evident that quantity and quality of mobility demands are growing. This procedure is interlocking with the growth of motorisation level and other urban growth process, which could not broken by the economical crisis significantly. The change of the lifestyle have an effect on quality demands in the field of transport. Car using became a reasonable alternative for wide range of the population which generates extra traffic.

Figure 1 shows the modal split of Bekescsaba based on 1352 trips of household survey, 2009.

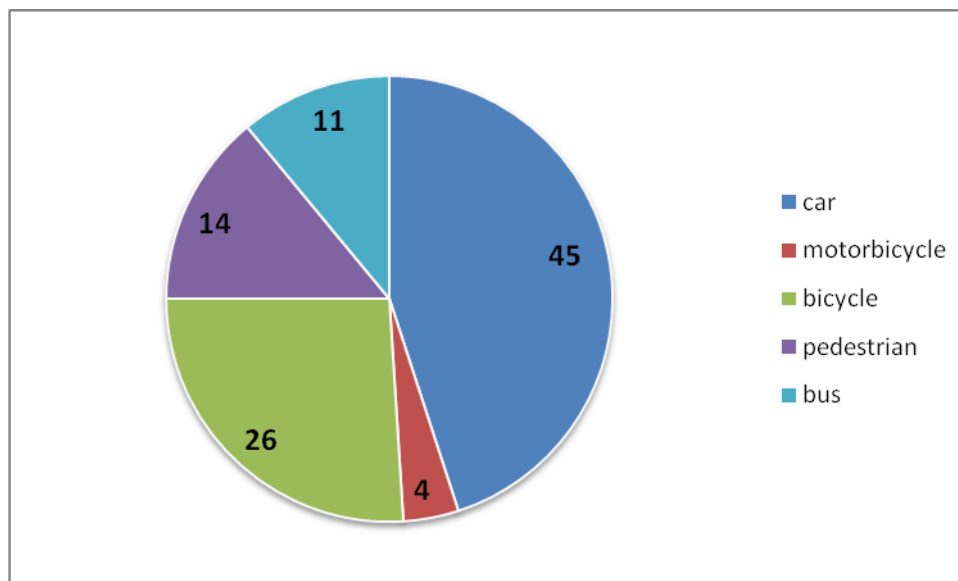


Figure 1 – Modal split in Bekescsaba (based on household survey, 2009; n=1352 trips)

Road transport

The length of the internal road network is 208 km, mostly owned by the municipality of Bekescsaba (93%). 17 km transit route in the city is state-owned. 80% of the road network is paved. Roads on periphery are mostly unpaved (95%). The road network is radial structured with few round sections.

After the bypass road [Figure 2] was given to the public (2004-2006), the function of the state-owned internal road sections was changed. According to the national legal regulation, it is necessary to arrange the ownership of these sections as soon as possible. The comprehensive transport analysis includes traffic counting, road cordon point survey, household survey, public transport survey and counting and static parking analysis.

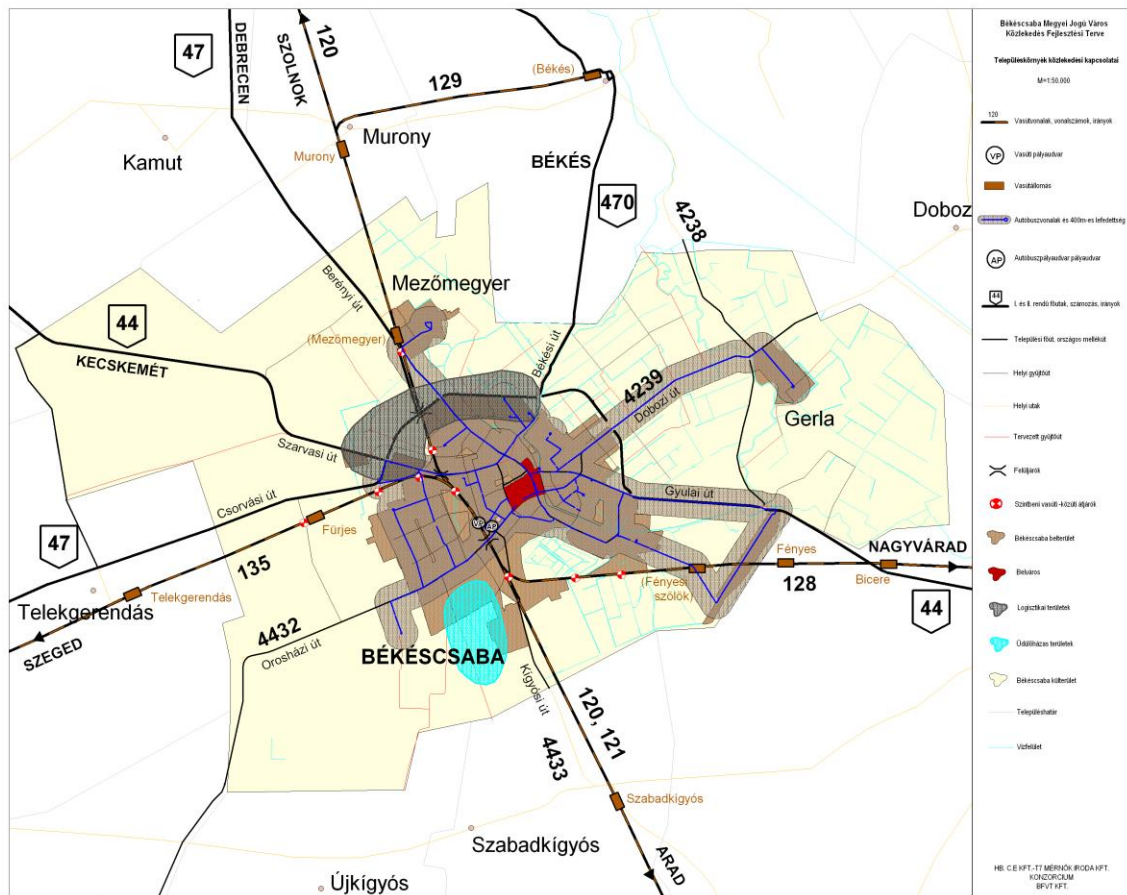


Figure 2 – Road network of Bekescsaba and environment [source: BFVT Ltd.]

The car usage is 50% (Figure 1), because the traffic flow is roughly free, theoretical capacity limits are not achieved, although bottlenecks and conflicts were coming up in the last decade (2000-2010).

The operation of the parking system is not efficient enough. There is a pricing system in the city center, but there is still no parking strategy which could help to optimize the utilization of parking lots. There are around 1800 parking lots and 51 parking automats in the city center.

The kiss-and-ride traffic is typical in the morning peak, which generates congestion and has an effect on parking habits around schools and other traffic attractive institutions.

Figure 2 shows the traffic volume of Bekescsaba city center without any development in 2009 made by CUBE software (licensed to TeRRaCe Ltd.).

*Traffic management challenges and solutions for Southern European cities
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Figure 2 – Bekescsaba city center road transport model without any development, 2009 [CUBE, 2009, TeRRaCe Ltd.]

Bus public transport

There is only one local and regional bus public transport service in the city (Körös Volán). The usage of bus transport is below the national average (11%). High rate of passengers has preferential tickets (students, retired people, etc.).

The service network covering is adequate, accessibility of some peripheral areas could be improved. As the usage of individual transport (car usage) is growing, it is difficult to ensure the sustainable development of public transport. Car transport is door-to-door and there are no serious capacity problems, so the accessibility and the time usage of individual transport are better.

As the public transport is a public service, the financial shortage of the operation is supported by the municipality (operation subsidy). As long as the Körös Volán is in monopol situation, it is difficult to expect a competition or working profit oriented without using operation subsidy.

Pedestrian and bicycling transport

The ratio of cycling is surpassingly high (26%), comparable to the Denmark and the Netherlands average. Bekescsaba located in the Great Plain, therefore the city has very good geographical parameters for cycling and walking connected with real mobility demand. Even so the prestige of these transport modes is quite low, mostly based on private financial decisions. The commuter traffic and function motivated cycling is typical, the sport and recreational cycling is considerable and growing.

The cycling network is around 18 km. The cycling routes are typically 3-5 km long (which means 10-20 minutes travel time). Most of the existing bicycle roads are located by main roads, connecting sections are partly incomplete.

The ratio of walking is significant (14%) according to the structure of the city and the short distances in the city center. The length of the paved pathways is 240km.

Railway transport

The international rail corridor No. 4 (national rail road No. 120; Budapest – Szolnok – Lököshaza), pass through the city. Other rail roads are Békéscsaba – (Gyula) – Kötegyán – Püspökladány (No. 128) and Békéscsaba – Szeged (No. 135.) has regional functions.

The railway station connected to the bus station (including coach terminal) is located in the geographical center around 1200 m far from the city center. The rail roads cut the city area in half, which generates some transport problems.

According to the public transport and household surveys the transport behaviour mainly consist of commuter traffic, especially the accessibility of secondary schools and higher education institutions.

Air transport

Bekescsaba airport has 1200 m long paved pathway. It is suitable for smaller planes and sport planes from 600-800 km. The sport flight and sailplaning are important in and have regional interest. There are some important competitor airports in the region as Arad, Timisoara, Szeged, Debrecen.

Water transport

There is a 37,35 km long (14,2 km artificial) watercourse from Gyula to Békés passing through Bekescsaba. The catchment area is 623 square km, the runoff is 1,5-2,5 cm/s average.

The watercourse is a biological corridor connecting the three mid-sized city in the region, and it is also a basis for complex touristic development, ecological innovation and city rehabilitation. In the last few years important development projects were executed supported by the EU.

BEKESCSABA TRANSPORT DEVELOPMENT STRATEGY [2010-2020]

Main goals

Bekescsaba would become economical, public administrative, educational, information, trade and service center of the region. Transport development directives should be defined for sustainable and integrated urban development.

Geographical advantage of the opportunity should be taken. Development of external transport connections is a term of accessibility and a possibility for exhilarating the local and regional economy. Road connections also support cross-border cooperations and enhance attractiveness of regional tourism.

Internal urban transport development includes road section development, bus public transport development and priority of non-motorised transport (walking, cycling). Traffic calming measures are important part of developing a liveable city.

Methods to modify demand and supply of transport

As other mid-sized city of the European Union, Bekescsaba has to figure out its own general, foresight, deliberate urban transport development strategy. So urban development projects could be managed aligned, continuously scheduled considering technical and financial feasibility.

Urban transport development plans includes the followings:

1. transport analysis by sectors,
2. working out an overall strategy (analysis, aims, development directives, tasks and methods)
3. working out strategies by transport sectors,
4. update the strategy if needed (or in 3-5 years).

There are two different methods to affect mobility demand and supply:

1. Affect mobility supply (and follow mobility demand) with capacity development to supply mobility needs. This method includes developing new road sections, redevelopments, using new areas for transport services, etc.
2. Affect mobility demand with optimizing resources.

Both of these methods have advantages and disadvantages. Capacity development is not an utter (and long term) measure for sufficing reasonable mobility demands. Although this method is easier because mobility demands could be allocated with traffic analysis of current traffic. The main disadvantage of this method is that capacity developments might generate extra mobility demands so increase the traffic volume.

If the municipality could develop mobility demands the negative spiral could be obviated and sustainable transport development goals could be achieved. Visible results could be seen in mid-term and long term, but they mean to be long lasting.

The two different strategies could not be separated. Following mobility demands is necessary because of supplying reasonable mobility demands, long lasting effects of former urban development decisions and other circumstances. Farseeing, deliberated and harmonised development conceptions conduce to liveability and sustainable urban development.

Tasks

Urban transport development strategy consist of directives considering former directives and plans, the results of transport analysis and survey (October-November 2009), the outcomes of CUBE macroscopic transport modelling.

The strategy set up a scheduled development plan for the next 10 years consist of short term, mid-term and long term tasks.

Road transport

External road sections, connection roads, and bypass roads are important tasks for decreasing transit traffic and improving conditions of local and regional economy and tourism.

Motorway M44 (Motorway M5 – Kecskemét – Kunszentmárton – Szarvas – Békéscsaba – Romania border) improves the regional and international accessibility and conditions of cross-border cooperation. Lobby activity and preparation work of Bekescsaba Municipality is necessary for the success of this project.

Developing of internal road network could be defined considering to formal and current development plans.

The rehabilitation of the city center is one of the most important urban development projects in Bekescsaba having significant and long lasting effects on urban life and transportation. The accessibility of the city center has high priority. Reasonable mobility needs should be supplied, transit traffic should be decreased with traffic management tools (traffic signal programmes, traffic calming, traffic signs, one-way routes, etc.).

Motorised traffic could not be decreased to zero. Reasonable traffic needs must be managed by road sections with traffic calming and appropriate parking capacity.

According to known development projects and traffic accident density junctions, a lot of junctions should be redesigned. Microscopic transport modelling is a good method for supporting these development decisions. Harmonizing traffic signal programs helps to obviate congestion in peak hours. Different types of junction design should not developed on typical access routes.

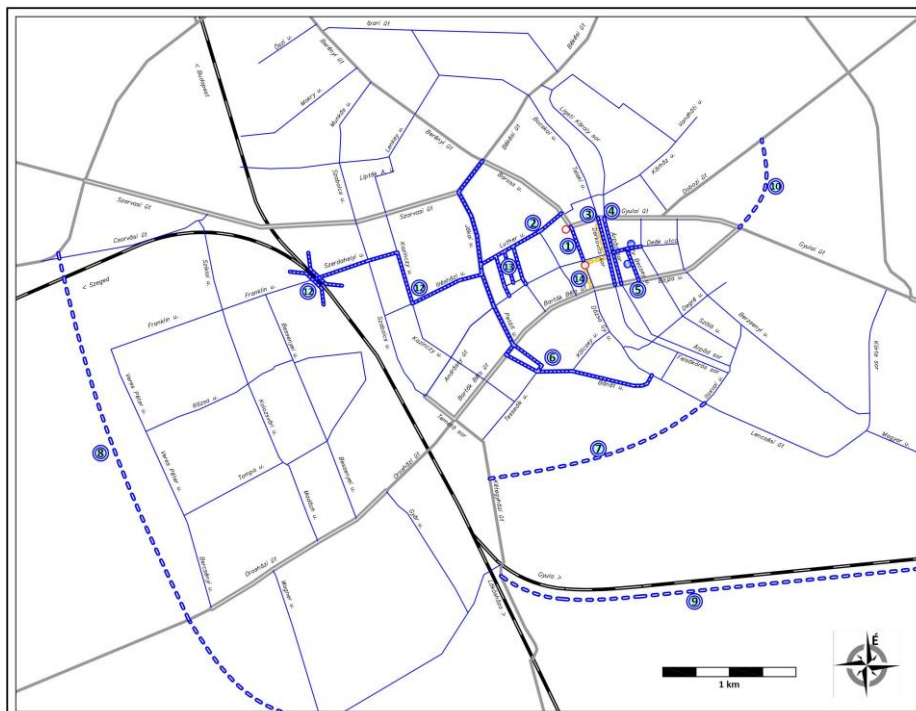


Figure 3 – Actual reasonable road development plans in Bekescsaba [bold sections]

Roundabouts need bigger area, which is a bottleneck of the development. Ownership of the environmental area should be arranged. Operation cost could be increased so engineers have to pay attention to work out optimal design considering operation.

According to development and changing circumstances it is necessary to update the traffic management plan in 3-5 years.

Junctions are bottlenecks in themselves, so if there is no opposite purpose (decreasing transit traffic volume, etc.), junctions' capacity and traffic management have to be harmonised to road sections.

Pedestrian and bicycle crossings have to be clear, safe, easily usable, focusing on even chance aspects.

Most of road accidents (96%) occurred by human failure. The municipality could improve road safety with the followings:

1. traffic management tools, traffic control,
2. promoting police control, sanctions,
3. education, information system, campaigns and other prevention tolls to improve transport behaviour,
4. promoting technological achievements (active and passive safety tools in cars).

Transport infrastructure development plans have to consider transport safety aspects. Preparation, planning, decision support are the most effective tools for municipalities to establish safe urban road networks and junctions. The effects on the road safety is visible right after given to the public (conflict analysis).

Transport safety in closer environment of important traffic attractive institutions has high priority as well as risk prevention of schools, so police control is useful in morning and afternoon peak hours. Permanent police control improves transport safety but it might have negative external effect (dissatisfaction occurred by dense control and sanctions, etc.). Optimal police and traffic control should be scheduled together by police and municipality. Transit traffic control is useful at the border of city area.

The main aim of parking management is to optimize incomings focusing on liveability. Concentrated parking capacity (e.g. parking garages) in closer environment of the city center is required for accessibility which is an important aspect of attractiveness of public spaces. A parking garage with a capacity of 300 cars has design plan, and other garages are planned.

Kiss and ride parking facilities would be useful close to schools. Short term parking facilities could support the accessibility offices, shops in the city center.

Parking fees have to be differentiated by time frames and by areas. The operator company is owned by the municipality, so general assembly make decisions.

Parking management strategy including best practice experiences would be useful as a sub-strategy.

Bus public transport

Supplying reasonable public transport mobility needs means appropriate service coverage, bus service density, high level of service and sustainable operation. Sustainability includes financial aspects. Consideration money for financial deficit is guaranteed by the municipality (it was around 400 000 EUR in 2009).

As some of the main roads of the city center will be closed or reduced with traffic calming tools, bus route network will be modified significantly. New bus stops and routes are marked out. Short walking distances and unhampered modern bus stops and walking routes are important to raise the attractivity of environment friendly transport modes.

Peripheral areas have to be connected to bus routes (bus service coverage). Bus route planning have to be harmonised to road network development. Public transport priority needs infrastructure development (negative bus gulf, junction design, curves, etc.) as well as traffic management (traffic signals, signs, etc.).

A new public transport service company should step in the market and stimulate competition through efficient operation. This might occur higher service level and differentiated fees. The main aim of the municipality is to optimize the public transport service and save consideration money. The preparation of competition conditions is a hard task for the municipality.

The bus public transport service company works out and improve the time schedule, but the general assembly of the municipality has the right to accept it. Improving new time schedule is possible right after finalizing new bus routes. A bus transport sub-strategy discuss these tasks.

Other developments could improve the level of service:

1. modern, sustainable, environment friendly bus fleet,
2. dynamic passenger information system (on-board, at bus stops, internet, mobile phone, etc),
3. sustainable tariff system (pay by distance, pay by time, zones, etc.)
4. electronic ticket system,
5. tariff union.

Pedestrian and bicycling transport

Developing pedestrian and bicycle transport is one of the main objective of environment friendly transport development directives. Pedestrian and bicycle infrastructure has different planning guides, but they could be handled together in a general strategy. It is especially right for city center pedestrian-bicycle zones and other public spaces.

Promoting non-motorised transport mode is important in mid-sized cities. Typical travel distances are suitable for walking and cycling, and door-to-door service is an unsurpassable advantage. Cycling is natural, environment friendly and cheap. The last aspect (financial issues) also occur low prestige for cycling, but it is totally unjustified.

Bicycle friendly developments include:

1. traffic calming,
2. zone indication,
3. road-signs,
4. unhampered infrastructure,
5. open one-way road sections for cyclists,
6. open dead-end streets for cyclists,
7. etc.

Regional bicycle roads (network) could connect neighbouring settlements and raise the awareness of tourism and commuter traffic.

Continuous mobility demand analysis could help to update bicycle and pedestrian transport sub-strategy and increase modal split ratio of non-motorised individual transport modes. Table I shows the goals of pedestrian and bicycle developments of the urban transport development strategy.

Table I – Goals of urban non-motorised developments

Goals of pedestrian and bicycle developments		
No.	Pedestrian	Bicycle
	A	B
1	give preference to environment friendly transport modes	
2	pedestrian-bicycle zone development (public spaces, pleasant living spaces)	
3	road crossings at junctions (fast, unhampered, safe)	
4	walking areas, zones, public spaces	increasing bicycle friendly areas
5	developing walking surfaces, pavements in peripheral areas	developing main bicycle network (main routes)
6	update pavement development program (analysis, tasks, schedule, resources)	complete basic bicycle network
7		bicycle storage system
8		bike and ride (B+R)
9		bike rental system
10		urban bicycle image (as a part of urban marketing) and information system
11		update bicycle transport development plan (sub-strategy)
12		sport, tourism developments

Railway transport

Budapest – Szolnok – Lokoshaza (Romanian border) railway is a part of the European main railway network. This is an important rail connection to the Balkan and also a part of the Paneuropean corridor No.4. Two tracks with speed limit of 160 km/h and 225kN axle weight are about to develop on the whole Hungarian section of corridor No.4. Most of bigger railway stations will be rebuilt. As the most important intermodal junction of the region, the main building of railway station will be rebuilt and has a modernized underpass connection with the bus station in Bekescsaba.

An important underpass are planned (Szerdahelyi street) between Jamina and the city center. Rail bridges will be also rebuilt.

A new logistic area is planned called North Logistic Center, and it will get a modernized railway connection. Dispersing goods logistic will be also moved to that logistic center (as a new tariff point of goods transport).

The level of service should be improved on Bekescsaba – Gyula – Kotegyan – Puspokladany railroad including integrated (rhythmic) timetable. This development could be supported by Hungarian-Romanian cross-border cooperation.

A market-based Bekescsaba – Arad – Gyula – Lokoshaza railway round could exhilarates cross-border employment and regional economy.

Small stations (e.g. Fényes) also would be developed. Dynamic information system could improve responsibility.

As the railway goes through the city and passes dense populated areas, environmental and noise defense aspects are important.

Railway developments are huge projects with high budget. According to complex legal frameworks and ownerships, railway projects requires complex, harmonised and long preparation work. The railway public transport operator is the MÁV (Hungarian Rail Transport Company) and it is also the owner of surrounding areas. The municipality has to cooperate with the MÁV in these developments.

Air transport

Lenghtening of paved runway is about to develop to 2400m, so bigger planes could easily take-off and land to Bekescsaba Airport.

It is very difficult to compete with stronger airports of the region, so firstly a concrete airport development plan has to be worked out. Municipality of Bekescsaba only 3,33% registered share, so it is a follower. The majority owner is Municipality of Bekes County.

The airport could be developed as a lightplane airport for sport and tourism events and maintenance airport with additional services and functions. Freight transport could be combined with logistic functions.

Water transport

Touristic attractiveness development of the watercourse includes ecological touristic water road and recreational route development through Bekescsaba, Bekes, Gyula. Riverside pathways, bicycle roads and other roads are also rehabilitated.

Regional image improvement requires regional cooperation. It also exhilarates local and regional economy.

The main aim is to make the canal navigable for small boats and watercycles. It also require developing ports and accessibility.

Ongoing projects of Bekescsaba Municipality also have an effect on watercourse development (e.g. port and park at Agora multifunctional culture and entertainment center).

Timing of development tasks

The transport development strategy has development schedule for the next 10 years:

1. short term developments (1-3 years),

Pressing and especially important tasks or simple tasks which don't need complex preparation.

2. mid-term developments (3-5 years),

Partly known development packages with preparation in process; tasks with high financial needs; and other important tasks to reverse negative trends.

3. long term developments (5-10 years).

Tasks based on short term and mid-term developments; or other significant investments which need long term preparation work.

A lot of elements of these development tasks should be overlapped and cohered, others could be shifted according to financial and feasibility aspects. Considering the effects of developments and changes of the circumstances the transport development strategy, especially the development schedule need to be actualized, verificated and modified in 3-5 years.

RESULTS, CONSEQUENCES

Urban areas of the European Union are significantly different (quality of life, population, economy, transport), but it seems to face similar problems and challenges. According to urbanisation there are a lot of structural an quality changes, and considering to social and economical procedures needs of the population improves. As the quality of life getting better, mobility demands also improves dynamically.

Urban development and urban transport development determine a lot of challenges for the municipality and the experts who work on the preparation and the implementation of the development projects. Focusing on sustainable development of liveable city an optimal urban transport system has to be developed where there is no blame on accessibility. To achieves these goals, environment friendly transport modes has to be preferred.

During working out Bekescsaba urban transport development strategy it came clear that it is not necessary to find completely new measures of transport management. It worth looking around and adapt experience and suggestions of more developed countries to Hungarian circumstances.

Just coming out of economical crisis most of European countries are in a tight spot. This has especially effect on urban municipalities which has scarce possibilities for profit-orientated activity. Municipalities manages national and authority incomes. To bring up and use own financial resources for EU supported developments is quite straining and risky for municipalities. Accordingly a perfectly worked out, scheduled, harmonized urban transport development plan is required with clear aims and well-defined tasks with determined financial background considering to feasibility.

Bekescsaba urban transport development strategy is a result of a one year complex job including transport analysis, modelling, operative transport development suggestions and general strategy. These results, experiences and directives should be useful and efficient for similar mid-sized European cities.

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