BUDAPEST
MOBILITY PLAN
2030

BMT

Volume I
Objectives and Measures

CONTENTS

INTRODUCTION

On 29 May 2019, the General Assembly of the Municipality of Budapest adopted with decisions 776/2019 (05.29.), 777/2019 (05.29.), 778/2019 (05.29.), 779/2019 (05.29.), 780/2019 (05.29.) and 781/2019 (05.29.) the Budapest Mobility Plan for a period lasting until 2030, based on sustainable urban mobility planning (SUMP) guidelines. The planning process of the Budapest Mobility Plan (BMT) meets the requirements prescribed by the IKOP mobility planning guidelines prepared in line with EU directives for sustainable urban mobility plans. The adoption of the plan is a prerequisite for EU financing of IKOP-funded transport development projects as well as for the financial closure of some projects realised with KÖZOP funding.

The mobility plan prepared as a result of the 2017–2019 planning process comprises the updated objectives of the Balázs Mór Plan, which were approved in 2015, and the Transport Development Investment Programme based on project-based evaluations of transport concepts contained in the development plans for Budapest. The main parts of the full Budapest Mobility Plan, which is based on public and institutional consultations, are the following: Objectives and Measures, Transport Development Investment Programme and the Strategic Environmental Assessment prepared for the proposed projects. BMT documentation also contains Project Data Sheets, Institutional Analysis along with the Monitoring and Evaluation Handbook, all of which are available online on the website of the capital city. The Transport Development Investment Programme of the approved BMT is coherent with related sectoral and area based strategies, and it takes into account funding resources known to be available.

Creating wide-ranging and substantial partnerships are essential for the planning work, where partners do not only familiarise themselves with the planning process, but also provide their opinion about the planning phases, put forward proposals and participate in relating decision making. A regular expert consulting forum established by BKK's CEO, the Balázs Mór Committee (BMB), was brought into the entire planning process. The committee consisted of representatives of the stakeholder organisations that had taken part in the preparation and implementation of transport development projects: Municipality of Budapest/Mayor's Office, Ministry of Innovation and Technology, Centre of Key

Government Investments, Municipality of Pest County, Budapest Közút Zrt. (Road Manager), BKV Zrt., National Infrastructure Development, MÁV Zrt., MÁV-HÉV Zrt., MÁV-START Zrt., Budapest and Pest County Chamber of Engineers. At its session on 21 March 2019, the Budapest Public Development Council and through that council governmental organisations and the Prime Minister's Office discussed the planning documentation. The Ministry of Innovation and Technology, which financed preparation through IKOP funds, approved the BMT on 29 July 2019.

At the time of the BMT's adoption on 29 May 2019, the General Assembly also approved two amending decisions submitted on site without prior professional consultation – decisions 780/2019 (05.29.) and 781/2019 (05.29.) – in addition to the prepared proposed decisions. Following the decisions of the General Assembly, these previously non-coordinated amendments that were approved at the request of a representative, were justifiably criticised by city management, the Press and the transport sector, thus at BKK Zrt.'s proposal the new city management elected in October 2019 repealed the amendments by Decision 183/2020 (02.26.).

In addition to updating the objectives, a component of the two-year-long planning phase was the detailing of the strategic guidelines derivable from those objectives. The role of the overall guidelines is to provide a logical link between the BMT Objectives and the Transport Development Investment Programme and to devise a transport system serving the city structure, in which the transport projects can be placed. Through its overall and strategic goals, the BMT facilitates integration between urban and transport planning, between transport modes as well as between the city and its region. Strategic guidelines identifies three layers of the transport structure: (1) liveable destinations, (2) the backbone transport network and (3) the fine network.

(1) City and regional development along with the integration between transport modes demands that transport lay special focus on the destinations served by transport, that is, that the aspects of the "places" justifying transport are recognised (place making). This is the first layer of the approach whose main aspects are defined by BMT's strategic and operative objectives. Modal shift from the road traffic arriving to the city can be made flexible only if the task is not focused on a single high-capacity intermodal junction along the individual access roads, but if there are several options to switch to public transport to the city along the route. In other words, transfers and transport mode switches are not practical to be done at ever-bigger intermodal junctions with forced transfers, but instead at several transfer points that are easier to manage and are more convenient through short walking distances.

(2) The second layer is formed by the zones (Danube, Inner, Suburban, Buda Hills and Transitional) defined in the urban development documents of the capital and the backbone network connecting the city and its agglomeration, which provides a transport superstructure of the area on which the majority of project programming are directed. The basic principle of the Budapest Mobility Plan is the application of transport planning serving the creation of a liveable urban environment, which prioritises sustainable forms of mobility. Accordingly, what is needed for the mitigation of car traffic of densely populated neighbourhoods is the reduction of the share of road traffic arriving from radial links. That way the balanced management of urban functions and the liveable arrangement of transport-justifying places become possible. In addition to the reduction of radial road capacities to the city, the construction of transversal external connections will contribute to the establishment of a road network adapted to the urban structure. The ring-road along the transversal railway ring forms the internal boundary of the motorway access roads and freight transport, on the other hand this ring-road has an internal distribution function for ongoing traffic as well. Simultaneously with the above, both traditional and new forms of public transport need to be prepared to serve increasing demand in a quick, quality and passenger-friendly manner. In order to achieve this, the backbone network needs to be transformed into a system that competitively integrates suburban railway lines into the urban transport network (an "S-Bahn network".)

(3) The third layer is represented by further fine network elements enabling access to local destinations, which is not simply a feeder network for the main network, as the fine network itself is capable of handling interzonal travel, while at the same time the shared connection points of the two layers must allow transfers between the layers. A significant part of the required actions are task-like, continuous functions to be performed.

The BMT defined the different scenarios for the 2018–2030 investment programme with the help of a complex evaluation and programming methodology derived from domestic and EU guidelines for SUMP that equally takes into account societal, economic and environmental impacts along with a strategic environmental evaluation (SEA). From among of those scenarios, the General Assembly selected the most effective one requiring a low budget on the basis of consolidated CBA results.

A

PILLARS OF THE BUDAPEST MOBILITY PLAN

The Budapest Mobility Plan 2030 (hereinafter BMP) is the transport strategy of the capital for the year 2030, which consists of two main volumes – Objectives and Measures (Volume I) and Transport Development and Investment Programme (Volume II) – along with additional supporting documents.

This volume of BMP, Objectives and Measures is a revised version of Volume I of the former Balázs Mór Plan. It sets out – as a first step – in the spirit of Sustainable Urban Mobility Planning (SUMP), the underlying objectives of the plan, their relationships with each other, as well as the measures to be taken to achieve the goals.

A.1. PROGRESS IN STRATEGIC PLANNING

The Municipality of Budapest approved a complex development plan for the transport system of Budapest (BKRFT) in 2001. The plan had introduced an, at the time, novel approach as it extended beyond the administrative boundaries of the city and included the idea of cooperation between transport sub-sectors, yet it lacked an impact analysis, the ranking of projects and an adequate programme for funding. The plan was reviewed in 2009 in the spirit of regional integration and an action plan up to 2020 was also added. This system plan set progressive objectives, yet failed to take into account that only few development projects could be implemented due to the economic crisis emerging in 2008.

Following the reform of the Budapest transport governance system in 2011, the system plan review in 2013 was already determined by the concept of mobility planning. Based on this, the Balázs Mór Plan (Volume I, Objectives and Measures) was created. This plan, based on the thematic concept of the European Commission-recommended handbook, redefined the transport devel-

opment objectives and measures in the capital, building on the previously approved transport development plans of Budapest, at the same time incorporating the strategic objectives and measures better into the city development concept. The time frame for the strategic short-term and medium-term development of transport in Budapest is the period lasting until 2030.

As a result of public participation and institutional consultation of the consultation material, circa 1,300 comments were received. According to a questionnaire-based survey completed among Budapest residents about the problems and objectives identified, more than 87% of the respondents agreed with the main strategic goals of the BMT and with the objective that the proportion of environmentally conscious modes of transport should increase significantly by 2030. Based on the evaluation of the responses, the Mór Balázs Plan was approved by the Budapest General Assembly in 2015.

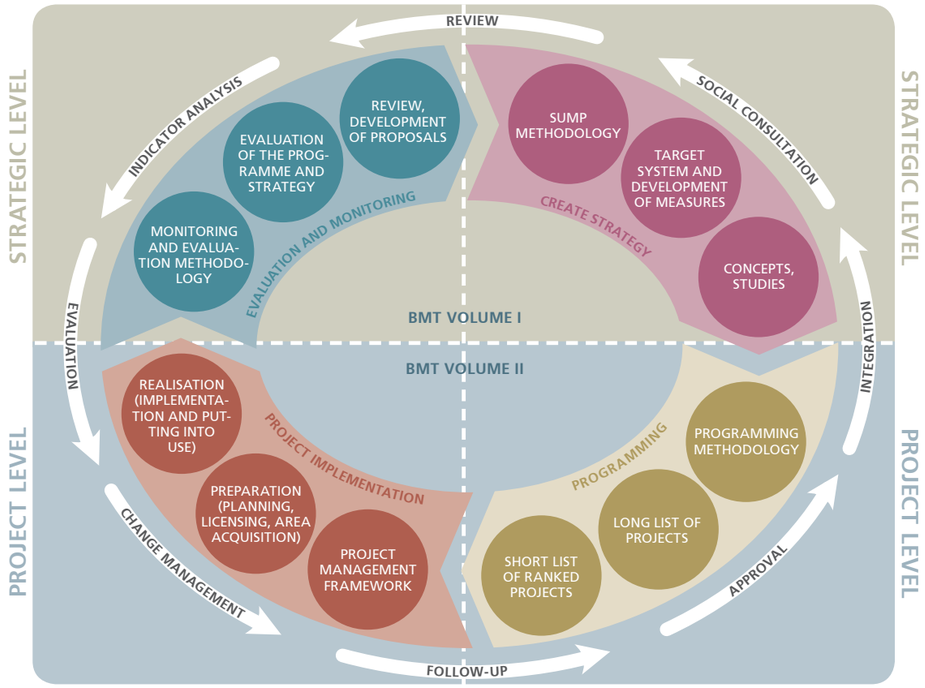
In 2017, the preparation of the further work packages of the Budapest Mobility Plan representing further units of the SUMP process based on the Objectives and Measures volume started and it included the transport development and investment programme determining the selection and timing of projects and tasks to be implemented. During this process, the previously set goals and measures were also revised taking into account the comments received in the meantime for the 2015 version of Volume I, the results of the professional and institutional consultations, and in particular the findings of the Mayor's Review, thus facilitating the creation of a better balance between the different transport modes. During this revision, the Analysis of the Current Situation chapter of Volume I was updated and clarified, and the individual measures were adjusted. The modifications have taken into consideration the developments completed during the past period, the technological changes and in some cases have improved the consistency of the plan by merging or renaming measures.

> In the urban context, a mixed strategy involving land-use planning, pricing schemes, efficient public transport services and infrastructure for non-motorised modes and charging/refuelling of clean vehicles is needed to reduce congestion and emissions. Cities above a certain size should be encouraged to develop Urban Mobility Plans, bringing all those elements together. Urban Mobility Plans should be fully aligned with integrated urban development plans.
>
> EU *White Paper* (49.)

During SUMP, the transport investments are realised in synergy with the urban development ideas, this way reinforcing their mutual impact. The aim of the developments is to improve the quality of life in the city, while at the same time having a positive impact on the mobility needs of citizens and businesses.

In this spirit, the principles of integrated transport development should be enforced, and more emphasis should be placed on the cost-effective use of financial resources when selecting investments that fit to the goals set.

Figure 1: *PROCESS OF STRATEGIC PLANNING AND IMPLEMENTATION*



A.2. ANALYSIS OF THE CURRENT SITUATION

For almost three decades starting from the 1960s, urban planning and development principles were determined by the prevailing modernisation approach and by the specific social and economic environment. The concept of autonomous individuals was not reflected at all in that coordinated, heavily organised and hierarchically technocratic system. The idea of functionality also determined the approach to public spaces: motorised transport was given priority at the expense of other aspects; a liveable environment was a secondary issue. The response to the trend of motorisation, which had already been questioned more and more frequently in international practice at the time, served primarily the spectacularly growing demand through continuous capacity enhancement. Towns were converted to serve passenger car transport. When wide footpaths, tree-lined boulevards and opportunities for stopping for a while began to disappear, people living in towns and the public spaces used by them fell victim to that idea. The urban planning practice, committed to motorisation, can also be witnessed in Budapest, although the number of passenger cars in Hungary has been lower than the Western European average. As a result of the process, the preferences in choosing places of residence along with transport habits have changed.

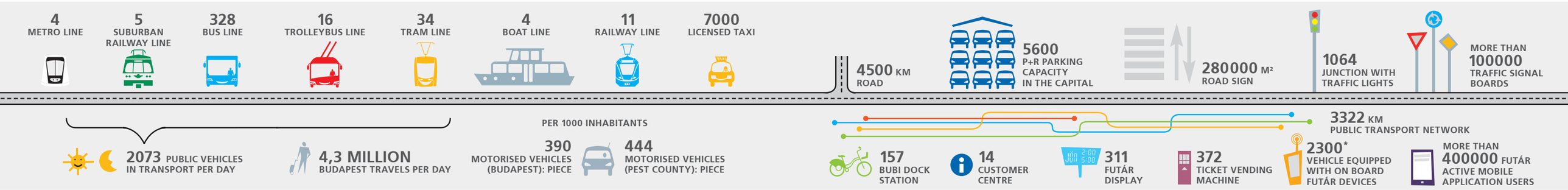
No transversal components were built into the ring-radial transport network, because it was believed that traffic, which had a much smaller level than it does nowadays, could be managed by increasing the capacity of the roads leading across the city centre. All these aspects affected the development of urban spaces and the positioning of pedestrian crossings. Pedestrian underpasses were built in the inner city; trams disappeared from the most important avenues of Budapest and the thus freed road surfaces were used by additional traffic lanes on Üllői út, Rákóczi út, Váci út and Bajcsy-Zsilinszky út.

Transport planning did not focus on the comfort of travellers but on the operation and operational aspects. At major passenger junctions, the possibility of recycling public vehicles, terminal functions, vehicle storage took precedence over passenger movements and the utilisation of urban development opportunities. Typical examples of these are Széll Kálmán tér, Baross tér, Örs vezér tere or Móricz Zsigmond tér. However, this did not cause an immediate distortion in the distribution of transport modes, as an overwhelming majority of city dwellers were in need of public transport.

In order to use metro lines more intensively, the previous street-level transport lines serving long routes were segmented and turned into feeder lines for the metro network, thereby increasing the number of forced transfers. The smaller number of tram lines deteriorated the degree of integration of the fixed-rail network and made changes cumbersome. Transport planning focused on technical-operational aspects and not on the comfort of passengers. At the most important traffic interchanges, priority was given to the possibility of turning round public transport vehicles, terminus functions and the storage of vehicles instead of passenger movements and the utilisation of urban development opportunities. Typical examples include the following squares: Széll Kálmán tér, Baross tér, Örs vezér tere and Móricz Zsigmond körtér. These changes, however, did not distort the breakdown of transport modes immediately, because the majority of the residents of the city were dependent on public transport.

Following Western European trends with a lag, the previous approach began to change gradually in Budapest as well after the turn of the century and the criteria of liveability began to be applied also at the strategic level: pedestrian zones, cycling infrastructure, traffic calming, public transport prioritisation, reinstatement of bus lanes and long bus routes. The demand emerged to regulate car and road freight-traffic coming to Budapest and to form a public transport tariff community; a long-term plan was made for the integration of railway lines into city transport (S-Bahn concept) in order to reduce the number of forced transfers and to cut back the further increase in car traffic. In spite of changing aspirations, the transport infrastructure of the city still preserves the remnants of the former approach at several locations.

Figure 2: *BUDAPEST TRANSPORT IN NUMBERS (2014)*



A.3. PROBLEM TREE AND KEY PROBLEMS

The summarised assessment of the detailed problem analysis and situation evaluation revealed the recurring root causes and mechanisms behind the symptomatic emergence of disturbing factors.

In terms of networks, the urban transport development over the past three decades has not been able to follow the urban processes with the needed flexibility. This is an especially serious problem in the outer areas and in the agglomeration, where there have been intensive changes, while in these areas car use is dominant. This problem in turn spreads to the entire city, through increasing the congestion of public roads even in those areas that are well supplied by public transport.

The radial-ring main road network of Budapest was completely built in only in the inner city areas; the development of the spatial structure of the city and the expansion of the built-in areas were not followed by any significant road network development in the outer parts of the city. The transversal road and rail links are not fully built out, the existing network elements are incomplete and fragmented in some parts of the city. In the outer districts, there is no continuous transverse connection with capacity either by road or in the public transport network, therefore an increasing part of road traffic, not destined for the city centre, also goes through the century-old narrow streets of the inner city and across the centrally located Danube bridges.

Since the 1970s, the public transport system of Budapest has been determined by the public transport system carrying passengers to and from the metro lines. However, none of the existing four metro lines reaches the suburbs, therefore from the metro terminuses passengers need to use bus, tram, trolleybus or commuter railway services for their onward journeys. Until recently, the surface public transport lines of the inner-city districts, with a few exceptions, have had no connection with lines serving outer-city districts either.

The public transport network is able to perform as required by the size and population of the city, but the constraints imposed by the obsolescence of the fixed-rail network infrastructure impair the performance of the network as well as journey times and reliability.

In recent decades, urban and transport development has ignored the importance of cycling, handled it separately from motorised transport, as a weightless factor, as reflected by the current layout of the Budapest road network. The concentrated result of the analysis is summarised by the so-called Problem tree.

Figure 3: *PROBLEM TREE*

KEY PROBLEMS

The conclusions drawn from the analysis of the problems are summarised in the following Key problems.

1. The most noticeable debt from the past is the deterioration of both the infrastructure and the vehicle stock, caused by persistent neglect of maintenance, failure to carry out periodic refurbishments, which in some cases already endangers everyday operation.
2. Urban planning practice, focused on modernisation, has resulted in a transport network and transport spaces subservient to motorisation. Surplus movements are required in transport owing to the distorted urban structure, urban sprawl and bypassing of derelict brown field areas. The use of urban space for purposes other than their original functions leads to increasing tensions, while at the same time many developments do not respond to structural problems but try to react to specific symptoms. The developments not fitting into the system and which are taken out of their urban context indicate the lack of careful consideration. This situation is preserved by planning based exclusively on projects, lacking a strategy.
3. Instead of the analysis of the actual situation, the development activities were either based on concepts that are now obsolete or on foreign examples, which are not adaptable in Budapest due to the specificities of the city (e.g. extension of traffic lanes, design of a multi-storey car park in a zone designed for traffic calming). All these activities cause increasing and permanent problems primarily because of the acceleration of the suburbanisation processes. Interventions applying outdated patterns in response to changing lifestyles exacerbate problems and increase environmental pressures.
4. Major network structure deficiencies prevent the development of more up-to-date sharing of tasks in transport. The overemphasising of developments did not result in the elimination of the key network inadequacies, which is a complex problem concerning approach and priorities. Radial transport network development has enjoyed a long-term advantage over transversal development, car transport to public transport. Due to the lack of funding caused by the metro construction, surface public transport developments were postponed.
5. Fragmented regulations, impending comprehensive solutions, hampering modern developments. The legal, governance and regulatory background affecting the overall planning environment impedes reasonable cooperation, which is reflected in discrimination within transport (e.g., in the rigid separation of local and regional transport) and also in the hindrance of multi-stakeholder cooperation.
6. The persistence of sector and sub-sector approach and the lack of co-operation are serious obstacles to integrated transport development. . The routines and habits within the sector have impeded advanced solutions for a long time. They include the exaggeration of technological and operational problems, and giving priority to the operator's approach over the service provider role of transport. Placing operational considerations over passenger comfort and the rigid separation of fixed-rail systems deteriorates service quality. This problem will be preserved for subsequent decades if only vehicles fitting into the existing network are purchased.

The most typical common root causes of the identified key problems are the fragmentation and lack of cooperation, which may be resolved by applying an integrated approach. Sub-sectoral integration and a joint regional approach to transport and other sectoral policies are indispensable for defining the appropriate directions for transport development and for managing the identified problems. A fundamental and priority task is to eliminate the lack of coordination and to introduce cooperation, which is in harmony with the principles of advanced mobility planning and the requirements stemming from international experience and the need for an integrated urban approach. In addition, an integrated review of maintenance, operation and development is required for the optimal use of funds for the operation of the transport system with a predictable financing background.

OBJECTIVES OF THE BUDAPEST MOBILITY PLAN

The objectives represent a hierarchy of different levels, being vision for the future, overall objectives, strategic objectives and operational objectives, the latter being broken down further by area of intervention.

The objectives of the Budapest Mobility Plan are identified by taking into account three fundamental preconditions:

- the overall development goals of the capital
- tendencies as well as European and national objectives based on international transport development experience
- the general and specific transport related problems revealed in the situation analysis, the correlations of the problem tree.

Summary of the main EU transport policy objectives:

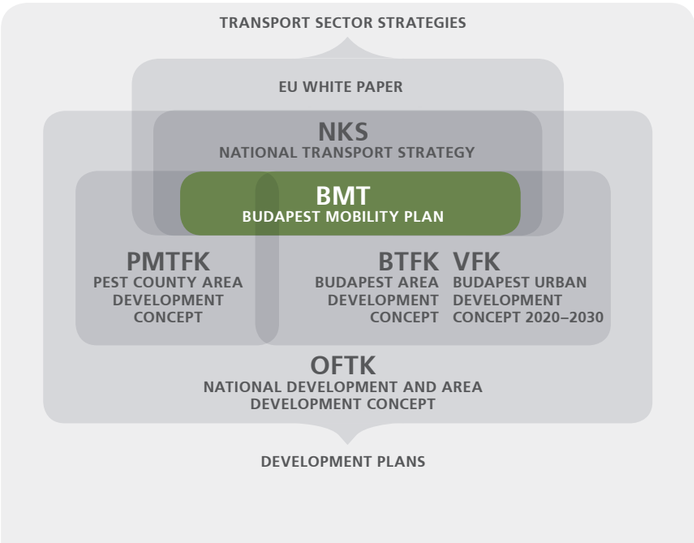
- reduction of the burden on the environment
- reduction of greenhouse gas emissions and local pollution
- energy security, reduction of dependence on hydrocarbon-based fuels
- making the regions of Europe more competitive
- improving the quality of life for European citizens
- transport safety as a priority.

Transport is a major city-forming power, an economy-developing and environment-shaping factor, a part of urban policy, therefore the overall interests of Budapest and its metropolitan area are reflected in the objectives of transport development in accordance with the principles of urban development adopted by the capital in the Budapest 2030 City Development Concept. This ensures that transport measures are not implemented as isolated interventions but in a coherent, comprehensive context. In order to perform this, the social and transport goals of the following different development level documents, prepared often in parallel, need to be taken into account:

- OFTK: National and Regional Development Concept (2014)
- PMTFK: Pest County Regional Development Concept (2013)
- NKS: National Transport Infrastructure Development Strategy (2014)
- OVK: National Railway Development Concept (2014)
- NKP: National Environmental Protection Programme
- VFK: Budapest 2030 Urban Development Concept
- BTFK: Budapest Territorial Development Concept
- FKP: Budapest Environmental Programme
- TSZT: Budapest Urban Structural Plan
- ITS: Integrated Urban Development Strategy of Budapest
- TFP: Thematic Development Programmes
- Budapest Danube Area Utilisation Concept
- Budapest Tomorrow and the Day after Tomorrow (The Cultural Capital of the Danube)
- Budapest Track-based Vehicle Strategy 2013–2027 (2013)

The regional development concepts of Budapest and Pest County made also joint proposals for the development of the capital city region, which are priorities among the objectives of the transport development plan.

Figure 4: *POSITIONING OF THE BUDAPEST MOBILITY PLAN IN THE HIERARCHY OF NATIONAL AND CAPITAL REGIONAL PLANS*

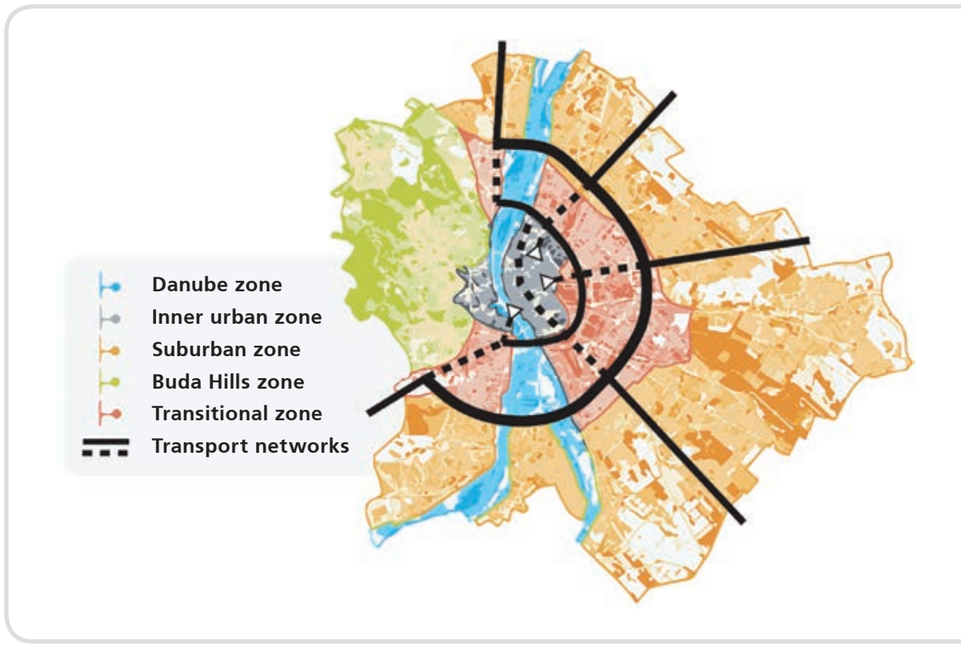


An important strategic task of transport policy is ensuring harmonisation with regional policies. For this purpose, transport conditions in the zones of Budapest specified in the Budapest 2030 long-term urban development concept and the Budapest Urban Planning Regulations need to be adopted to their functions.

Therefore, the following territorial units shall be distinguished in the transport development plan, as well:

- the Inner Urban Zone, the Danube Zone and the city centre areas where walking, cycling and public transport are prioritised, and the goal is to reduce car use as well as to curb transit traffic that can also be solved elsewhere. (environmentally sensitive and densely built-up areas),
- the Suburban and Buda Hills zones, where public transport provides a reliable basic service, although private car use is also quite significant (sparsely built-up areas) and
- the Transitional Zone, where a symbiotic relationship can be developed between the two previously mentioned mobility preferences and where the infrastructure for modal switching based on intermodality also plays a role in addition to the lines crossing the area, as does the development of transversal links (transitional regions with potential for development).

Figure 5: *DIFFERENTIATED TRANSPORT INTERVENTIONS IN THE ZONES DEFINED BY THE BUDAPEST 2030 LONG-TERM URBAN DEVELOPMENT CONCEPT*



B.1. FUTURE VISION

The transport of the capital (as well as any other professional area) should serve the realisation of the vision adopted in the Budapest 2030 Urban Development Concept:

"Budapest is a liveable attractive capital city with a unique character and is a respected member of the European network of cities as the innovative economic and cultural centre of the country and the city region."

B.2. GENERAL GOAL OF THE BUDAPEST MOBILITY PLAN

The plan is based on the future vision of Budapest urban development, stating that the goals set in the Budapest 2030 Urban Development Concept must be supported through transport.

In line with the flagship initiative "Resource Efficient Europe" and the new Energy Efficiency Plan 2011, the paramount goal of European transport policy is to help establish a system that underpins European economic progress, enhances competitiveness and offers high-quality mobility services while using resources more efficiently. In practice, transport has to use less and cleaner energy, better exploit a modern infrastructure and reduce its negative impact on the environment and key natural assets like water, land and ecosystems.
EU *White Paper* (17.)

OVERALL GOAL OF TRANSPORT:

"The transport system of Budapest should improve the competitiveness of Budapest and its region and contribute to the realisation of a sustainable, liveable, attractive and healthy urban environment."

B.3. STRATEGIC OBJECTIVES OF THE BUDAPEST MOBILITY PLAN

The EU transport policies conceived with an integrated approach (where the keywords are sustainability, competitiveness, integrated approach, involvement of the stakeholders in defining the objectives and the tasks, systematic monitoring of decisions and evaluation of implemented projects) focus on the healthy lifestyle of people and their communities and the liveability of cities.

In an integrated approach to the transport development plan, the objectives become transport-specific at the level of transport measures that contribute to the overall goal. Therefore, those strategic objectives which appear as a general requirement in all other operational objectives can be defined as an expression of the overall goal.

Integration is a key concept when defining strategic objectives. Sustainable urban mobility planning achieves integration in three target areas and terminates the unilaterally sectoral, sub-sectoral and transport-based approach, as well as the approach that does not go beyond the city's administrative boundaries and it creates a link:

- between the urban development and the transport development approach
- between the methods of development and operation of the various transport modes and
- between local, regional and macro-regional systems.

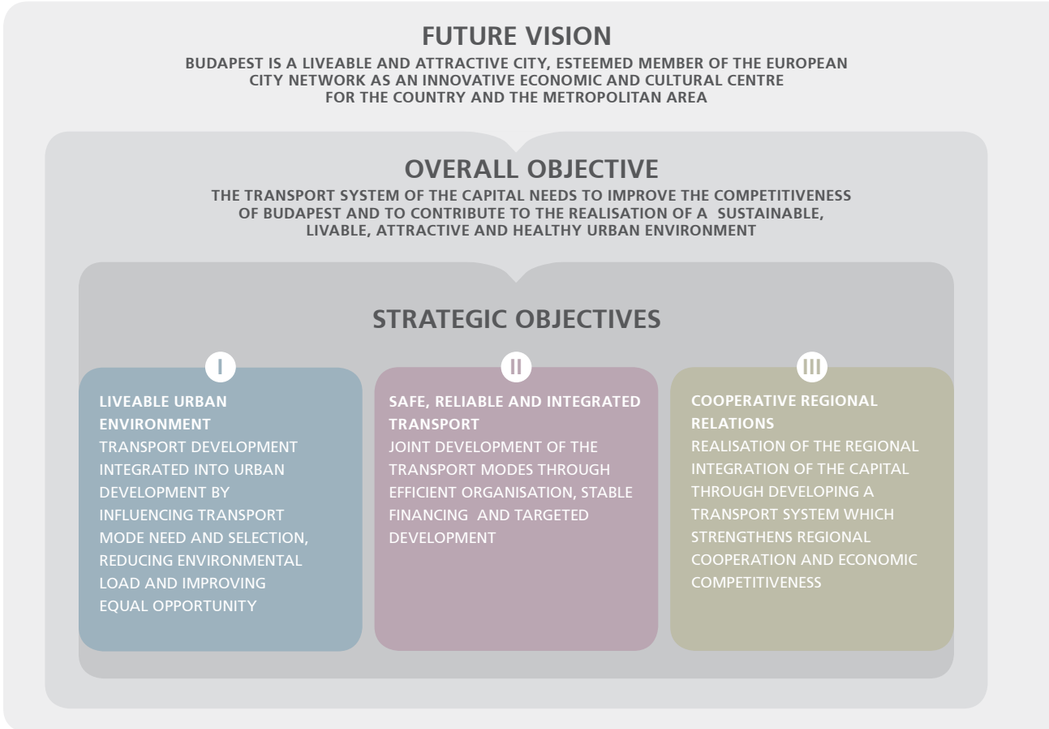


Figure 6: *VISION AND THE MOST IMPORTANT GOALS BUILT ON EACH OTHER*

The three transport-specific strategic objectives of Budapest transport development based on these are:

I. LIVEABLE URBAN ENVIRONMENT

- transport development integrated into urban development through influencing transport needs and mode choice, together with reduction of the environmental impact and strengthening of equal opportunities

Transport solutions need to be integrated into the objectives of urban planning in order to achieve one of the basic conditions for the sustainable development of the capital, which is the effective management of the existing values, spaces and assets. The surfaces used for transport must be integrated into the urban public spaces as their organic parts, taking the actual needs and spatial specificities into consideration. Liveable urban space utilisation and the desired shaping of mobility require not only balanced urban structural development that follows the principles of the 'compact city', but also the environmentally conscious use of the already built infrastructure. That is why less polluting transport modes such as walking, cycling and public transport must be made readily available and their self-evident, everyday use needs to be promoted.

II. SAFE, RELIABLE AND INTEGRATED TRANSPORT

- joint development of transport modes through efficient organisation, stable financing and target-oriented development

Safe transport spaces, predictable and reliable transport means, built on consistent principles, are required in order to enable residents to reach the sites of their everyday activities. Stable financing of transport, as well as cost-effective development, maintenance and operational interventions are required for the predictable operation of the city. The means of operation and development must be designed to facilitate interoperability between the transport modes, an increase in cooperation between services and service providers as well as the environment-specific division of labour between sub-sectors.

The downward trend of transport accident numbers of the early 2010s has come to a halt; therefore transport safety must play a key role in the course of transport developments. The principle of equal opportunity of access must be considered, in both developments and operations, as it ensures that people from all walks of life can travel in a safe and predictable way.

III. COOPERATIVE REGIONAL RELATIONS AND CONNECTIONS

- regional integration of Budapest with the help of a transport system that supports regional cooperation and strengthens economic competitiveness

Budapest is situated at the intersection of European, national and regional transport network systems creating a fundamental prerequisite for a globally competitive economic area. As a single urban area, the capital and its surroundings offer an environment that can provide a wide range of activities. Well-coordinated economic cooperation requires, among others, an integrated system of transport networks and the optimisation of their connections.

The presence of macro-regional transport systems – international and national – requires, on one hand, the efficient interconnection of rail, road, waterborne and air networks, on the other hand, the proper integration of those networks with the regional and local ones.

The organisation of regional transport systems requires a complex network and regulatory structure which facilitates cooperation on a daily basis. A basic principle that is essential for achieving the development objectives of the capital city in line with the efforts of the European Union is to apply an integrated approach in transport policy that goes beyond administrative boundaries. The development of regional transport network connections, transferable (interoperable) systems and intermodal nodes and the introduction of related services, governance and regulations are strategic goals.

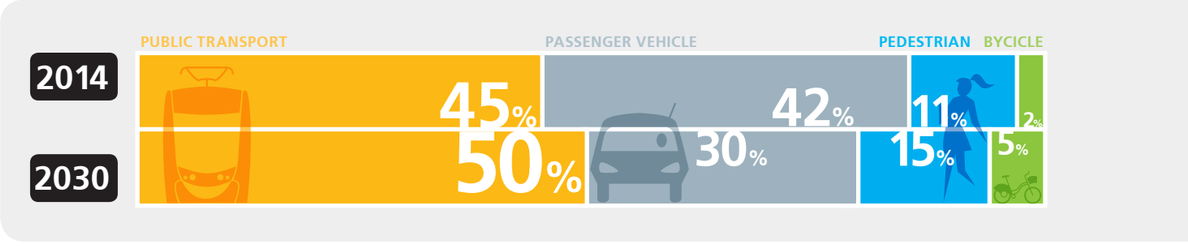


Figure 7: *PLANNED EVOLUTION OF THE MODAL SPLIT IN TRANSPORT [TRAVELLER KM %]*

B.4. INTERVENTION AREAS, PRIORITIES

The intervention areas link the transport development tool set to the strategic objectives of an integrated approach and determine the tasks for each traditional technical field within transport. The Transport Development Plan focuses on the four following intervention areas: infrastructure, vehicles, services and the institutional system.

1 IMPROVING CONNECTIONS

THROUGH THE INTRODUCTION OF NEW CONNECTIONS, THE SAFE AND RELIABLE DEVELOPMENT OF EXISTING TRANSPORT NETWORKS, THE REALLOCATION OF PUBLIC SPACES AND THE DEVELOPMENT OF PASSENGER-FOCUSED INTERMODAL CONNECTIONS

> Infrastructure shapes mobility. No major change in transport will be possible without the support of an adequate network and more intelligence in using it.
> EU *White Paper* (10.)

An accessible, well-maintained, safe infrastructure, satisfying the requirements of our times, forms the scene of everyday transport in Budapest and an important component of the urban environment. The availability of that infrastructure must be ensured continuously in terms of operation, maintenance and development. Integrated infrastructure development leads to the revision of public space use and the redistribution of urban spaces, which in turn remedies the disproportionalities of the transport network and creates an attractive, healthy and liveable urban environment. The development of the competitiveness of walking, cycling and public transport improves both the mobility related and the environmental situation of the city. The objective of using the existing infrastructure more efficiently is to establish well-managed public spaces and community places where all transport modes are safely accessible and usable.

2 ATTRACTIVE VEHICLES

ACHIEVED THROUGH THE CREATION OF A COMFORTABLE AND PASSENGER-FRIENDLY VEHICLE FLEET AND THE ENCOURAGEMENT OF THE PROLIFERATION OF ENVIRONMENTALLY FRIENDLY TECHNOLOGIES

As preventive maintenance and development have always been postponed, the technical standards of the rolling stock and infrastructure of public transport in Budapest are significantly lower than required. A part of the vehicle fleet is well beyond its economically and technically ideal operating life, including also such vehicles that have gone through value-adding upgrades in the meantime.

> Urban transport is responsible for about a quarter of CO2 emissions from transport, and 69% of road accidents occur in cities. The gradual phasing out of 'conventionally-fuelled' vehicles from the urban environment is a major contribution to significantly reducing oil dependence, greenhouse gas emissions and local air and noise pollution. It will have to be complemented by the development of appropriate fuelling/charging infrastructure for new vehicles.
> EU *White Paper* (30.)

The commissioning and operation of advanced, comfortable and safe public transport vehicles gradually replacing the ageing vehicle fleet is an urgent task. A comfortable, accessible and clean vehicle running on time per schedule can make public transport more attractive in itself than passenger cars. An advanced service and maintenance background is also needed to ensure that vehicles of sufficient quality are available to the passengers every day.

In accordance with the EU guidelines, one of the objectives of future developments is to reduce the level of environmental pollution caused by public transport vehicles operating in Budapest. Apart from the renewal of the public transport vehicle fleet, the measures regulating the taxi and city logistics services also encourage the improvement of the environmental characteristics of the vehicles used in Budapest in order to make the air cleaner in the capital city.

❸ BETTER SERVICES

ACHIEVED THROUGH AN EFFICIENTLY ORGANISED AND INTELLIGENT, WIDELY ACCESSIBLE INTEGRATED TRANSPORT SYSTEM PROVIDING RELIABLE PASSENGER INFORMATION SERVICES

> To promote more sustainable behaviour, better mobility planning has to be actively encouraged. Information on all modes of transport, both for travel and freight, on possibilities for their combined use and on their environmental impact, will need to be widely available.
> EU *White Paper* (48.)

The availability, extent and quality of transport services are determining components of the quality of urban life. Public, real-time travel information, transparent and fair tariffs and advanced fare payment methods promote the use of the system and, simultaneously, facilitate more efficient utilisation of the transport infrastructure and vehicles in both individual and public transport. In the public transport system of Budapest, more emphasis should be placed on accessible informational technology applications that assist the mobility of people and influence demand and use, as well as on advanced traffic control and passenger information systems.

❹ EFFICIENT GOVERNANCE

THROUGH CONSISTENT REGULATION AND PASSENGER-FRIENDLY DEVELOPMENT OF NETWORK CONNECTIONS AT NATIONAL, REGIONAL AND CITY LEVELS

> The goal is to enable the residents, economic operators and various institutions to find high-quality homes in the city in an excellent infrastructure, sustainable natural and built environment under appropriate organisational and legal conditions
> Budapest *2030 VFK*

The Budapest transport governance system must support the achievement of the set urban policy goals, for which the necessary competencies need to be provided. Since 2010, transport affairs in Budapest have been implemented in a single, well-coordinated organisational structure. Currently, the operation of the road transport system is the responsibility of Budapest Közút Zrt. (Public Road Management), which operates independently, while the operation of the suburban railway network is the responsibility of MÁV-HÉV Zrt. The main task for the coming years will be to ensure operation as an integrated system of the currently separate public transport services, which operate within the city and on the metropolitan area networks in addition to re-establishing a coherent approach to transport issues.

The formation of a unified timetable, consistent tariffs and a consistent passenger information system is conditional upon the necessary governance background. The set of institutions of the unified transport service system along with the framework of cooperation between the participating organisations must be put in place. In addition, a stable, sustainable and predictable financing framework is required for an effective governance system that can function as the background of quality transport services.

B.5. OPERATIONAL OBJECTIVES AND MEASURES

There are nine operational objectives for the four areas of intervention of the transport development plan and measure packages are assigned to these objectives. Projects prepared and implemented, and the tasks solved based on the measures, are the tools for implementing the strategy.

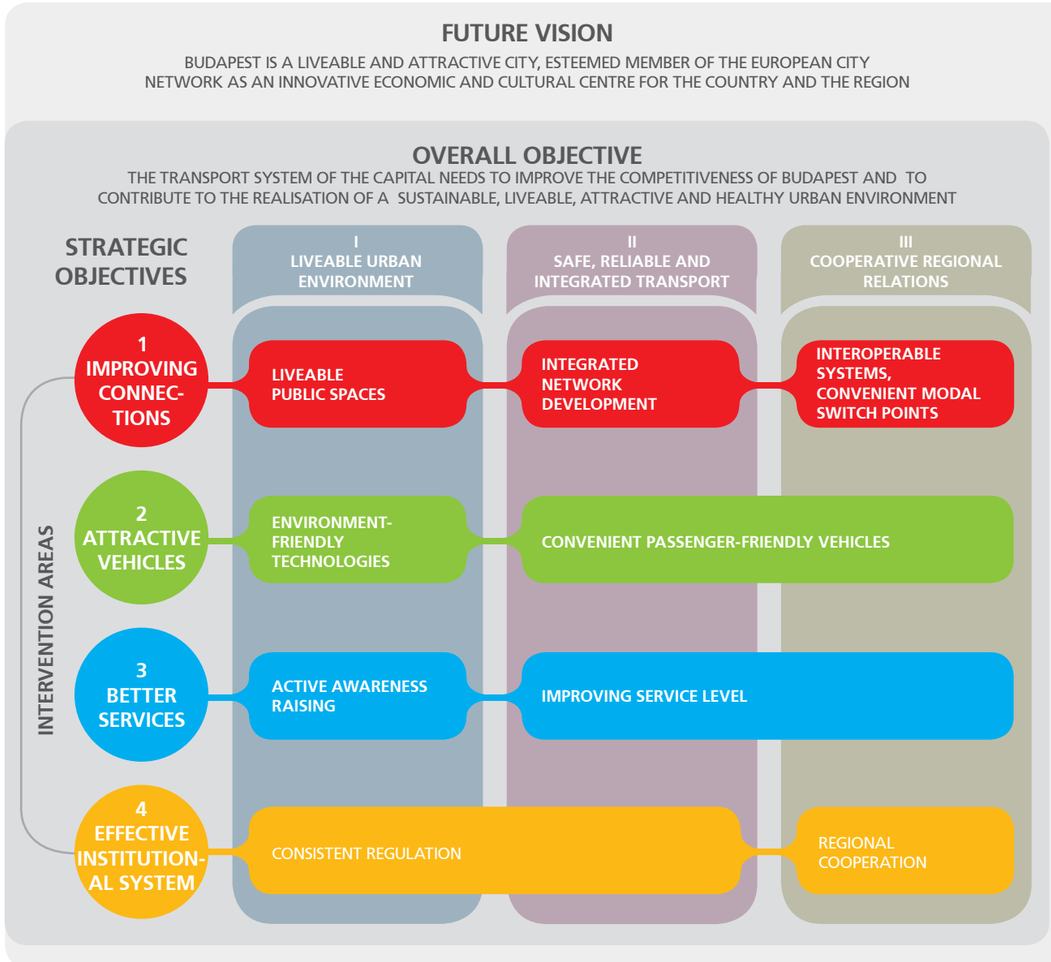


Figure 8: *OPERATIONAL OBJECTIVES ADJUSTED TO STRATEGIC OBJECTIVES AND AREAS OF INTERVENTION*

IMPROVING CONNECTIONS

THROUGH THE INTRODUCTION OF NEW CONNECTIONS AS WELL AS THROUGH THE SAFE AND RELIABLE DEVELOPMENT OF THE EXISTING TRANSPORT NETWORKS, THE REALLOCATION OF PUBLIC SPACES AND THE DEVELOPMENT OF PASSENGER-ORIENTED INTERMODAL CONNECTIONS

The development of the transport network of Budapest and its agglomeration must both make up for the lack of service supply to the previously completed urban development projects and, on the other hand, make it compatible with the future construction projects.

In the outer neighbourhoods, shortcomings in the transversal road and rail links need to be overcome, especially on the Pest side of the city, thus reducing the problem of traffic not destined for the city centre being forced to appear in inner-city neighbourhoods and on Danube bridges. In addition, the fragmentation of the radial fixed-rail transport network needs to be eliminated.

In public transport, the comprehensive rethinking and development of the metro, railway and suburban railway lines as well as the backbone network covering the most important surface connections in unity are of paramount importance. This network should ensure accessibility between metropolitan areas.

In order to make public spaces more liveable, complex public space planning is needed which handles the needs of walking and cycling as a priority.

Three operational objectives promoting integration with urban development, integration of transport modes and regional integration relate to the improvement of infrastructural links:

- integrated network development
- liveable public spaces
- interoperable systems, convenient intermodal nodes.

1.1. INTEGRATED NETWORK DEVELOPMENT

THROUGH INTELLIGENT URBAN STRUCTURAL CONNECTIONS AND THROUGH NETWORK DEVELOPMENT REDUCING TRAFFIC DISPROPORTIONALITY

The basic infrastructure of urban transport comprises the public transport backbone network, as well as the main road network, providing various regional and long-distance connections and connecting the urban districts. The additional network elements of street-level transport, including secondary roads, form the fine fabric of the infrastructure. These systems need to be managed and developed with an integrated approach. The integrated approach is an overall requirement in network development; only development of such spirit should be implemented.

Mobility needs cannot be satisfied with quality services without developing the infrastructure. This operational objective summarises the relevant measures according to the types of transport related task involved.

1.1.1. DIRECT PUBLIC TRANSPORT LINKS

The interconnection of isolated elements of different tram networks enables high-quality services that are competitive with motorised individual transport, both in terms of capacity and travel time, also in the long term. In addition to establishing specific links and interconnections and standardising the technical operating parameters, attractively designed P+R car parks and B+R storage facilities capable of satisfying demand are also required at the stations of the suburban sections.

The development of the public transport track network as a unified system, requires the reconstruction of some of the previously terminated network connections and the introduction of a few new connections, as well. The interconnected track network thus eliminates current insular operations: diverging and interconnecting line groups may be built that cover large impact areas, yet provide attractive services and sufficient capacity to passengers on shared route sections. In addition to rapid railway (metro and suburban railways) and tram networks, this is also applicable to those elements of the state railway network that can be included in urban transportation. The connection points of multi-level fixed-rail transportation should be developed into high-quality intermodal junctions, and the possibility to create interoperable connections also needs to be examined.

These developments fall into five main categories.

In order to ensure that the city centre and the main transport axes can be accessed from the existing suburban lines without inconvenient transfers and any loss of time, the integration of urban and suburban fixed-rail networks is required. For integrated development, the existing suburban railway lines need to be reconstructed so they can provide rapid urban rail transport, barrier-free access has to be provided, the vehicles must be replaced and a chain of P+R components must also be constructed at several locations along the roads leading into town, both within and outside the administrative boundaries of Budapest. In relation to these developments, the total feeder and distribution bus network should be reviewed in order to ensure the optimal sharing of tasks. Advanced, high-capacity suburban lines reaching the city centre without the need to transfer can significantly improve the quality of the connections of suburban districts and the metropolitan area.

When the metro network was constructed in the 1970s, tram services in the city centre were eliminated on several routes. These shortcomings are intended to be overcome by building the missing links in the fixed-rail network in the city centre. The new inner city

connections need to be implemented in a diverging and interconnecting system that serves several lines. Diametric and overlapping services are preferred on the network elements; terminuses are to be developed accordingly. The new lines should be organised into a unified system in cooperation with the existing metro network, paying special attention to any traffic related (e.g. different positioning of stations) and economic justifications (e.g. it is uneconomical to transfer passengers to the metro). The developments to restore the integrity of the fixed-rail network in the city will improve accessibility in numerous directions, enabling reduction in traffic on the city centre's main roads.

Several housing estates constructed in the past decades were not provided with adequate fixed-rail transport links. In a part of those, the extension of the fixed-rail network, especially in densely built-up suburban areas, is justified. The expansion of the tram network and the purchase of new vehicles with larger space requirements necessitate the construction of a new tram depot – in addition to the development of urban fixed-rail systems, the refurbishment of not-yet-renovated suburban lines, the elimination of slow signals, the modernisation of and improvement of accessibility at stations as well as development of the local feeder network in the metropolitan area. Furthermore, the upgrade of the state railway lines along with the modernisation of their suburban route sections are also linked to the transport strategy goals of the capital.

Due to the lack of transversal (diagonal, avoiding the centre) lines many trips are forced to use the radial routes and the city centre, even if their actual destinations lie elsewhere. By building transversal fixed-rail connections, the most overloaded parts of the city and transport hubs can be relieved through better distribution of traffic. In addition to the relevant tasks concerning the tram network, the railway ring can also become an integral part of the fixed-rail network after appropriate adaptation. Improvements should be implemented simultaneously with the construction of parallel transversal roads.

An appropriate division of labour between fixed-rail and rubber-tyred services needs to be established in order to develop regional connections and improve territorial coverage. In areas where fixed-rail network integration has been completed, the funds owing to released bus capacity need to be used partly to improve regional connections and area coverage, while where the development of integrated fixed-rail services is not justified, the diametric, overlapping and interconnecting-diverging network elements must be realised in the bus sector.

1.1.2. MODERNISATION OF THE EXISTING TRACK NETWORKS

The adequate interoperability of the integrated track network is limited not only by the missing components, but also by the poor condition of a considerable part of the existing sections. Although this is an operational issue within a consolidated framework of operation, the phenomenon is so extensive in Budapest that without significant intervention the usability of both the fixed-rail and road network is at risk.

In order to ensure the long-term capacity of the network, the modernisation and replacement of the deteriorated components of the existing street-level and underground infrastructure is an outstanding task on the whole track network, which must be performed at a pace that facilitates the gradual elimination of the backlog. Modernisation also requires a regulatory environment that keeps pace with the development of technical solutions. In a complex approach to the renovation of transport networks, infrastructure renovation entails the renovation of the entire cross-section of the public space.

Renovation of the metro lines is ongoing, which is a task to be continued. Most of the suburban railway lines are degraded, the existing infrastructure needs to be developed and the conditions for safe operation need to be provided. Speed is limited on a considerable part of the lines, which also decreases the quality of the service. Simultaneously with those tasks, connections must be built to the metro network, the majority of the level crossings need to be eliminated, accessibility needs to be ensured and the capacity of parallel bus transport services will have to be reduced with an integrated approach.

Most tram lines have been refurbished since the 1990s, consequently the condition of the infrastructure has improved. These sections also need to be gradually refurbished and reconstructed again according to their life cycles. In order to ensure sustainability, a continuous reconstruction financing system must be put in place to maintain the condition of the lines. These investments, implemented with an integrated approach, should be aligned in terms of timing and financing with the construction of the new line sections and of accessible platforms as well as with vehicle procurements and with the relevant regulations. In the course of reconstruction, noise and vibration protection tasks and, wherever required, landscaping activities and the development of public spaces must also be performed.

The main development tasks in the next period are the renovation of outdated power supply systems on trolleybus lines and the implementation of high-speed switches and intersections that can be traversed without reducing speed. Simultaneously with the procurement of vehicles capable of off-wire operation, the trolleybus network can also be supplemented with shorter sections without the need for deploying upper wires to make up for any missing sections. The lack of funding to maintain the road network is noticeable in the condition of the roads. Maintenance tasks must reach an initial state starting from where normative regular maintenance no longer requires dedicated financing for development.

1.1.3. CONNECTING CUT-OFF PARTS OF THE CITY VIA NEW DANUBE BRIDGES AND VIA GRADE-SEPARATED ROAD-RAIL CROSSINGS

In the inner parts of the city, traffic concentration may be eased, the transit private car use can be gradually eliminated, new connections may be established between peripheral district centres and the traffic load of the central Danube bridges and the related road network can be substantially reduced by constructing new bridges across the Danube. By the construction of new bridges across the Danube and by the development of the surrounding areas, a more balanced and less centralised urban structure can be created. The Danube crossing points which are currently missing from the transport structure of Budapest (Csepel–Albertfalva, Újpest–Aquincum) will also be the basic pillars of the city's ring-shaped transport connections. The cluster of open spaces, green areas and islands on the North Budapest Danube section, and along the Ráckeve-Danube branch could be organised into a permeable system with a few localised interventions, and the recreational network of the Danube corridor may be expanded significantly by the construction of smaller bridges for pedestrians and cyclists across the side-branches of the Danube (Óbuda Island, Molnár Island).

The road-rail level crossings of the main and collection road network of Budapest isolate the affected parts of the city from each other, reduce the capacity of the routes significantly, impede the continuous flow of road traffic and are also prone to accidents. They may be replaced primarily in connection with the reconstruction of railway lines, through the construction of grade-separated crossings within the framework of the individual railway projects.

1.1.4. BUILDING THE MISSING ELEMENTS OF THE ROAD NETWORK

By constructing the missing transversal links, the congested district centres can be bypassed and relieved of car traffic, which must be achieved in parallel to the integrated development of public transport options. However, instead of the former plans focusing on the significant expansion of radial capacities to accommodate increasing traffic flow, the Budapest transport development concept support traffic calming developments.

1.1.5. INTERCONNECTED CORE CYCLING NETWORK

In recent years, the number of bicycle trips in Budapest has been growing dynamically, with cyclists becoming natural parts of the landscape of transport and of public spaces. The elimination of long, unnecessary detours and adequate alternative routes as a

substitution for the need to cycle in traffic lanes of the main roads, which poses a safety risk, promote the further increase of cycling. Fragmentation of the core cycling network linking parts of the city, the agglomeration and the regions should be eliminated, just like the shortcomings of the deteriorated, outdated and inconvenient route sections with a dangerous design that cause conflict situations with pedestrians and parking. Recordkeeping, management and maintenance related to the core network should be standardised. In order to eliminate the existing disadvantages of cycling and to continuously upgrade and develop the core network, aspects of cycling should be considered during all public space interventions and the status and network connections of cycling need to be improved. On routes not covered by any other project, conditions for cycling need to be developed by special interventions.

1.1.6. A CYCLING-FRIENDLY SECONDARY ROAD NETWORK AND IMPROVING PENETRABILITY BY BICYCLE

The urban road network has not been able to satisfy the dynamically increasing demand for everyday cycling. The role of the local infrastructure components supplementing the main cycling network in Budapest is primarily to facilitate short, 1 to 5 km-long trips within districts by making the road network a bicycle-friendly network. The conditions of safe cycling can be ensured through the traffic engineering based technical review of the current road network, through the reallocation of road surfaces and the introduction of traffic-calming zones. This involves numerous small interventions not only along a particular single route, but rather focusing on a particular area or region (speed limits, localised traffic calming, redesign of transport hubs, review of traffic light control at signalled intersections, prioritisation of cycling, opening of one-way streets to contra-flow cycling, designation of shared bus and cycling lanes, designation of pedestrian and cycling zones, establishment of barrier-free environment for cyclists, creating comfortable road surfaces, providing bicycle access to intermodal hubs as well as solutions for bike storage on public space). Apart from improving the internal facilities of a particular area, these measures will also improve cycling connections to high-capacity public transport routes. The use of bicycles is further facilitated by the extension of the possibility of transporting bicycles on board public transport vehicles.

1.1.7. EXTENSION OF THE WATERBORNE TRANSPORT NETWORK AND DEVELOPMENT OF THE SERVICE INFRASTRUCTURE

New piers need to be constructed both within and outside the administrative boundaries of Budapest that are able to support scheduled services and new, related routes must be created to meet the conditions of regional boat services.

The quality of pier infrastructure determines the attractiveness and capacity of the riverboat sector. An adequate pier can support a fast exchange of passengers regardless of the water level. By speeding up the docking process, waterborne transport can be made an attractive alternative. On-shore facilities must be positioned at easily accessible locations, near public transport stops and quality transport mode-switching options (P+R car parks and B+R storage facilities depending on the site). The construction of new inner city piers need to be coordinated with public space developments in the area, improving the conditions of pedestrian access. Tourist attractions along the river Danube should also be made accessible by boat, which requires better cooperation between commuter and tourist boat services. The development of infrastructure suitable for river cruise ships (supplementary services, connecting bus parking, well-arranged pedestrian areas) is primarily needed on the central section of the river, which does not have a World Heritage status.

1.2. LIVEABLE PUBLIC SPACES

THROUGH RELIABLE AND SAFE OPERATION AND MODERNISATION OF TRANSPORT NETWORKS AND THE REALLOCATION OF PUBLIC SPACES

The experience gained from international urban development trends has revealed that the problems of private car use cannot be managed effectively by increasing road capacity; the solutions need to be defined with an integrated transport development approach. Through targeted regulation and development of the road network, transit traffic needs to be diverted from residential and secondary streets to main roads, while parking related traffic to areas outside of public spaces. The reallocation of road surfaces used by transport services began in the city centre over the last few years, whereby the area used for motorised transport has been decreasing and the role of public and non-motorised individual transport (cycling and walking) has been increasing. In order to achieve the goal of liveable public spaces, the focus of urban development should be on the continuation of all these processes along with the expansion of their territorial coverage, the calming of motorised traffic, the improvement of general and traffic safety, the reduction of physical barriers to pedestrian mobility as well as the creation of the conditions for attractive and comfortable walking.

Facilitating walking and cycling should become an integral part of urban mobility and infrastructure design.
EU *White Paper* (31.)

1.2.1. ESTABLISHING PEDESTRIAN CONNECTIONS OF URBAN STRUCTURAL RELEVANCE

The objective is to organise inner city areas and new pedestrian and cycling friendly public spaces into a single network within a liveable urban structure. In doing so, it is possible to draw on the experience of development actions of the recent period, including the Heart of Budapest project and the reconstruction of the Millennáris Park in Buda, which have introduced new architectural quality, gaining public support for further public space reconstruction projects. The goal is that walking would not be considered a constraint, but a welcome urban mobility alternative for distances that could otherwise be covered by trips of one or two stops.

1.2.2. IMPROVING THE CONDITIONS FOR WALKING

The purpose of this measure is to make the conditions for walking to nearby destinations and at transport hubs during walkable transfers attractive convenient and safe. Within the framework of the complex road reconstruction activities, pedestrian movements and crossing over will also be aided by the construction of pavements and lowered kerbs at pedestrian crossings, and even at locations where there is no designated crossing option. These measures and the increase

in number of pedestrian crossings will help to reduce the separating effect of the given road section and improve the possibility of safe crossings. Pedestrians are supposed to move along on street level, yet although it is not possible to fully replace the function of the underpasses, wherever possible, crossing points to be established above the underpasses on the surface will reduce forced underpass use. In addition, the high-quality renovation and functional rethinking of the existing pedestrian underpasses is also an urgent task.

Scooters, skateboards, segways, etc. are new forms of transport that have emerged recently and are primarily used by tourists, typically on sections of the pedestrian and, to a lesser extent, of the cycling network. The integration of transport modes is critical from a transport safety aspect, thus in the course of the development of pedestrian infrastructure special attention needs to be paid to these means of transport.

1.2.3. EQUAL OPPORTUNITIES AND BARRIER-FREE ACCESSIBILITY

A comprehensive review of equal opportunities is required on the existing transport surfaces, public transport vehicles and facilities (stations, stops and terminuses). Based on the review, the provision of accessibility is performed according to a scheduled programme, helping not only people with reduced mobility, but it also facilitates the mobility of people travelling with a baby carriage, with young children as well as the elderly. It is a basic requirement that new and reconstructed infrastructure as well as modern vehicles be designed to be accessible. Apart from the elimination of physical barriers, accessibility through information and communications technology, such as the renewal of the voice-based passenger information system and the introduction of special, clearly visible and legible signage will also contribute to the availability of equal opportunities.

1.2.4. ACCIDENT-FREE 'FORGIVING' ENVIRONMENT

As a result of road reconstruction planning with a complex approach, human-centred "forgiving" transport spaces can be created in Budapest where accidents caused by road conditions may be prevented and accidents caused by human and vehicle errors are less severe. Where accidents occur regularly and increasingly, proposals for traffic engineering modifications are prepared with the help of targeted road safety audits. In the course of the operation, reconstruction and development of the road network of Budapest, the goal is to create clear order in traffic conditions and to make it safe: the 'self-explanatory' surfaces formed according to the road category automatically convey all the information required for safe driving such as for speed selection. Apart from the improvement of the condition of road surfaces indispensable for road safety, road signs will also be renewed within the framework of the programme. Special attention is paid to children: the traffic alignment and the condition of traffic signs are reviewed in the vicinity of schools in Budapest each year.

Vehicles in transport must comply with the safety requirements on an ongoing basis. Stricter technical requirements applied to passenger transportation vehicles also contribute to transport safety.

1.2.5. DEVELOPING ZONES WITH TRAFFIC CALMING AND TRAFFIC RESTRICTIONS

In order to improve living conditions and the safety of pedestrians and cyclists, the system of restricted speed zones should be extended to all locally relevant elements of the inner urban zone road network. Traffic calming measures are recommended to be introduced especially in public spaces where the groups most exposed to the harmful effects of air pollution are more frequently encountered than the average, such as in the vicinity of educational and health care institutions.

The consistent development of the "self-explanatory road" system (reduction of superfluous, excessive capacities, construction of components increasing road safety) will assist motorists in the selection of adequate speeds. There should be no urban road sections left in densely populated areas where high speeds are allowed or possible.

1.2.6. DIFFERENTIATED DEVELOPMENT OF THE INNER ZONE IN BUDAPEST (WITHIN HUNGÁRIA RING ROAD)

The integrated development of the road network can lead to the elimination of territorial disparities, can ease the central focus and can create a proportionate and balanced network by traffic regulation – differentiated according to environmental characteristics –applying traffic calming, disturbance-free and even traffic management and reduction of congestion. The conditions of reducing transit traffic must be put in place in the inner zone, even by applying a total ban on specific critical sections (for instance, no transit passenger traffic should enter within the Grand Boulevard). In this context, it is also necessary to avoid concentrating new transfer points of the public transport backbone network within the inner zone. Active modes of transport – cycling, walking and public transport – characteristic of a liveable city are provided more room in the city centre.

Public car-parking capacities for destination traffic must be reduced in the inner areas by introducing short-term public parking, priced and regulated according to actual demand and supply levels. Public space should not be used for storing cars.

1.2.7. LIFE AND PROPERTY SECURITY, CRIME PREVENTION

A liveable city is also a safe city, thus surveillance and security systems are to be gradually deployed on board vehicles and at transport mode-switching nodes in Budapest. Cameras will be installed at stops on busy route sections during reconstruction and at lifts

operating between underpasses and street-level stops. The docking stations of the public bike-sharing system and public transport customer centres are also required to be equipped with security cameras.

1.2.8. PUBLIC SPACE REFURBISHMENTS WITH A COMPLEX APPROACH

During the preparation and design of road reconstruction works in the capital (including the relating bridges and architectural structures), it is a basic principle that a complex approach should be applied based on the revision of traffic alignments and needs rather than a maintenance intervention keeping the original traffic alignment, such in the case of a road surface replacement. This involves reallocating road space to the needs of the age, redesigning the entire cross-section if necessary, including the surrounding pavement and green space that are critical to walking and cycling.

As a result of the complex approach in detail-oriented road and infrastructural renovations, the conditions for walking and cycling improve, if needed through the reprogramming of traffic lights. As part of the renovations, the affected tram stops will be able to accommodate low-floor vehicles. The necessary traffic safety interventions are also validated using traffic and accident data.

Bridges and other structures need to be renovated on the basis of individual assessment. In addition to the structural reconstruction of bridges, a complex, scheduled renovation of the connecting road network must be carried out in harmony with the urban development concepts.

1.3. INTEROPERABLE SYSTEMS AND CONVENIENT INTERMODAL NODES

INTEGRATED TRANSPORT NETWORKS WITH CONVENIENT INTERMODAL NODES, THROUGH THE ESTABLISHMENT OF INTEROPERABLE SYSTEMS, THE PASSENGER-CENTRED DEVELOPMENT OF INTERMODAL CONNECTIONS, AND THROUGH THE IMPROVEMENT OF MODE SWITCHING AS WELL AS TOURISM-ORIENTED CONNECTIONS

Satisfying the everyday needs of urban mobility is realised by the successive use of different transport modes and vehicles in the form of a so-called travel chain. The majority of travellers do not use only a single transport mode: there are no passengers who are exclusively pedestrians, cyclists, bus-, car- or taxi-users; each traveller combines those modes, optimising his or her trip in space and time from departure to destination. Passenger comfort demands fewer transfers and the availability of advanced, fast and safe intermodal nodes. In the past, traffic planning did not take those criteria into account.

1.3.1. INTEROPERABLE FIXED-RAIL SYSTEMS; URBAN AND SUBURBAN RAIL NETWORK

This can reduce the number of transfers and travel time making travel more convenient.

In order to ensure seamless travel, an interoperable network is created by linking the various rail tracks, currently operated separately: in this way the vehicle, rather than the passenger, "transfers" from one line to another, which reduces the number of transfers and the journey time making travel more convenient. Fully interoperable transport modes will be developed along major urban structural axes with permanently large passenger flows running on shared route sections.

The state railway lines crossing the capital – and in many cases dividing regions – must have a significantly greater role within the city and in the traffic between the metropolitan area and the city, owing to which not only the traffic parameters of the railway lines are required to be modified, but also the design of the stations need to be adjusted to meet the traffic demand of the city. In order to reduce the number of transfers, the possibilities of integrating suburban railway lines with the urban rapid railways (metro) and with state railway lines need to be examined. In case of the diesel multiple units that have become predominant in suburban railway traffic, the procurement of multi-powered (current type, voltage) vehicles is necessary to provide for suitable interoperability.

Better modal choices will result from greater integration of the modal networks: airports, ports, railway, metro and bus stations should increasingly be linked and transformed into multimodal connection platforms for passengers. Online information and electronic booking and payment systems integrating all means of transport should facilitate multimodal travel. An appropriate set of passengers' rights has to accompany the wider use of collective modes.
EU *White Paper* (23.)

1.3.2. IMPROVING TRANSFER CONNECTIONS BETWEEN COMMUTER RAILWAYS AND URBAN TRANSPORT

The key to the cooperation between commuter rail and urban systems is to improve the transfer connection network. As connections between Budapest public transport and the rail network exist only at some major transport hubs, the integration of railways into urban transport, and thus the relieving of urban transport, requires the creation of new transfer connections. These new connections are required at the intersections of the commuter railways and the trunk lines of the urban transport network (primarily the metro lines and, secondarily, the major tram and bus lines). The new hubs may be implemented in phases, together with the next scheduled development of the fixed-rail network components.

In the current situation, it is equally possible to improve the transfer connection between the bus, tram, metro, suburban railway and the state railway networks. This modern commuter rapid rail system ("S-Bahn", according to the German terminology) requires improvements on both sides and a novel approach. On the one hand, the number of stops on the railway network needs to be increased in line with technological developments. Although synchronised timetables (Taktfahrplan) have been introduced on all the lines in recent years, the vehicle fleet is being modernised and tariffs are partially uniform within the capital, the system needs to be further developed: the internal interoperability of the rail network needs to be improved by developing the existing terminus railway station system through providing additional services, by using transversal lines for passenger transport and by creating as many services eliminating transfers as possible.

Increasing the number of stops on the existing rail network infrastructure may create conflicts due to mixed traffic, therefore, on the one hand, the modernisation of traffic management is required for greater capacity and, on the other hand, the construction of underpasses and further structures, as well as the extension of track capacity by constructing third, fourth tracks is necessary. These enhancements allow for the desirable 10–15 minute headways (more frequent on the interlaced section) instead of the current 20–30 minute or lower frequencies. The capacity of the terminus stations needs to be extended and their reintegration into the urban space is required. In the long run, new, so-called diametrical connections bypassing the terminus stations which require no transfers should be established.

On the other hand, urban transport links also need improvement, new stops and new or better-organised transfer connections need to be established. Especially important is the development of urban transport with a fully integrated approach, i.e. the construction of those stops and transfer points need to be realised that enjoys full stakeholder consent. In some cases, the relocation of existing stops is necessary to enable better connections. (The topic of major transfer points is dealt with under Measure 1.3.9.).

1.3.3. INTEGRATION OF THE CITY ACCESS AND BYPASS SECTIONS OF THE NATIONAL ROAD NETWORK INTO THE ROAD NETWORK OF BUDAPEST

The purpose of the developments is to facilitate reasonable and geographically better balanced traffic on the road network, to remove any unnecessary traffic from residential and service roads, to create development potential in the transitional zone and to ease traffic on the congested main routes crossing the inner city and district centres.

Apart from the Hungária Ring road, the primary objective of the road development measures is to put the missing transversal connections of the ring-radial main road system in place. These connections are required to bypass congested district centres and to provide a relief of car traffic through the development of public transport options. The radial traffic capacity of roads leading to the Centre from various directions shouldn not be further increased and there is no point in letting traffic beyond intermodal nodes.

1.3.4. FACILITATING THE URBAN INTEGRATION OF LONG-DISTANCE PUBLIC TRANSPORT

Starting from the present situation, the immediate goal is to streamline the relationship between long-distance and local transport through relatively small interventions. Factors to consider in-

clude avoiding unnecessary round trips, reducing the number of transfers per passenger, increasing the number of transfer points, improving transfer comfort, reducing walking distances and grade differences, providing accurate and comprehensive passenger information in both directions, common tariff systems. Urban integration is also enhanced if long-distance trains and buses stop also at one or more intermediate high traffic urban nodes. If the system of terminal stations is maintained over the long term, the transfers between various long-distance services may be assisted by providing high-capacity, direct fixed-rail connections. Urban integration will also be enhanced by making long-distance trains stop at one or two busy intermediate urban railway stations, e.g., at the airport, before reaching the terminal station. (The topic of major transfer points is dealt with under Measure 1.3.9.).

1.3.5. INTEGRATION OF RIVERBOAT SERVICES INTO URBAN AND METROPOLITAN AREA PUBLIC TRANSPORT

By increasing the role of boat transport, road traffic in the city centre and on the embankments can be mitigated and by improving connections to the ports, city dwellers can be encouraged to opt for public transport, walking or cycling. Scheduled waterborne public transport services need to be developed in and around Budapest in order to widen the range of public transport options by establishing new direct links. The urban side of the Danube bank must be made more easily accessible and the piers need to be connected to the public transport network.

1.3.6. IMPROVING THE ACCESSIBILITY OF BUDAPEST LISZT FERENC INTERNATIONAL AIRPORT

Considering the volume of passenger traffic at Budapest Liszt Ferenc International Airport, it is not economical to build a dedicated urban fixed-rail connection to the airport, but the use of the existing railway network is obvious. Railway services to the airport are only effective if the station is integrated into the long-distance or commuter railway network. An essential aspect of improving airport connectivity is to provide direct access from many parts of the country. The optimal solution is a track linked to a main line of the state railways. The development of an integrated commuter railway network (S-Bahn) from the city and the western part of the country can provide good access to the airport.

Accessibility of the airport by road may be increased by the joint refurbishment of the expressway and the parallel road (Gyömrői út), by the reconstruction of the junctions and by offering frequent opportunities to access and exit the expressway, preserving the

original function of the road leading to the Airport; yet a safer urban main road with higher capacity can be created that also serves the adjacent urban areas and provides attractive urban development options.

1.3.7. DEVELOPMENT OF LOGISTICS CENTRES, CONSOLIDATION CENTRES AND THEIR CONNECTIONS

Logistics centres host economic activities that attract a considerable amount of traffic. An important aspect of their establishment is to position them at the intersection of high- capacity networks of several modes of transportation (air, waterborne, rail and road)

with the consideration of regional and national connections. Additionally, it is also necessary to develop more, smaller transhipment facilities (consolidation centres) within the city's inner zone, which could provide for "last mile" shipments to protected zones, road sections and pedestrian zones with the use of small, environmentally friendly (zero-emission) vehicles. In order to mitigate burden on the environment, environmentally friendly transport modes (railway, waterborne transport, electric, freight bicycles) need to be prioritised, and new terminals and shops need to be served relying on those modes. Currently, the Free Port on Csepel Island is involved in substantial freight traffic on the European transport corridor on the river Danube; freight transport connections by ship need to be expanded.

At busy public transport hubs, P+R car parks, the services of parcel delivery companies can be simplified by developing (in cooperation with consolidation centres) unified package pick-up points (package lockers).

1.3.8. DEVELOPMENT OF NATIONAL AND REGIONAL CYCLING TOURISM CONNECTIONS

Cycling has an increasing share in the tourism-generated traffic of Budapest, too: more and more people plan one-day excursions near their homes, furthermore weekend traffic by tourists and the number of non-Hungarian cycling tourists are also clearly rising.

Further pedestrian and cycling connections are needed along the Danube region because the islands along the North Budapest Danube section and along the Ráckeve Danube branch and the strips of the bank, still in their near original natural states, are not easily accessible and therefore their green space potential remains untapped.

The Budapest sections of the national cycling tourist core network (the “Rivers Route” cycling route along the Danube, the Budapest–Balaton route and the Budapest sections of the EuroVelo route of the Eastern Hungary cycling tracks, built as a priority government project) are integrated into the city network.

1.3.9. DEVELOPMENT OF INTERMODAL CENTRES AND HUBS IN PASSENGER TRANSPORT

The goal of the urban line network development is to reduce the number of transfers in the course of a location change, however transfers and modal switches cannot be eliminated completely. It is therefore a basic task to create simple, fast, clear, passenger-friendly nodes facilitating modal switches. The primary logistical function of such smaller nodes is to ensure the comfort of passenger mobility, to which all other functions of the node need to be subordinate.

It is necessary to distinguish from the above solutions the larger intermodal distribution hubs, where it is not possible to avoid the convergence of several services of different transport modes. The design aspects of intermodal hubs for passenger transport are different from those used for distribution centres for freight transportation. The convenience and ease of transfers and modal switches is also of primary importance here: transport operational and terminus-related functions that can be solved elsewhere must be relocated from the hub while commercial and urban functions other than traffic must be designed in a way that does not disrupt passenger flow. The goal must not be to increase the number of transfers and concentrating them into the node; it is unnecessary and harmful to burden the node by connections that can be solved easier elsewhere.

1.3.10. PROVIDING THE CONDITIONS FOR SWITCHING URBAN TRANSPORT MODES

Parallel to the reconstruction and development of the fixed-rail network in Budapest, the construction of P+R car parks and B+R storage facilities enabling convenient, safe and predictable switches between individual (motorised and non-motorised) and public transport modes continues in the outer districts of the city, primarily along the high-capacity fixed-rail public transport lines (metro, suburban railways, trams). The main purpose of the MOL Bubi public bike-sharing system is to mitigate traffic congestion in the city centre, to provide easier access to the inner city and to facilitate short trips. Urban cycling is becoming more comfortable through the installation of bicycle stands and storage facilities.

It needs to be ensured that passengers lose the least amount in space, time, expenses and comfort through transfers. In order to reduce the losses in space caused by transfers, stops with shared

platforms need to be built. Following a complex review of transfer hubs, further measures related to network organisation and traffic engineering will alleviate the disadvantages of transfers significantly (barrier-free accessibility and passenger comfort are always basic requirements during the design process).

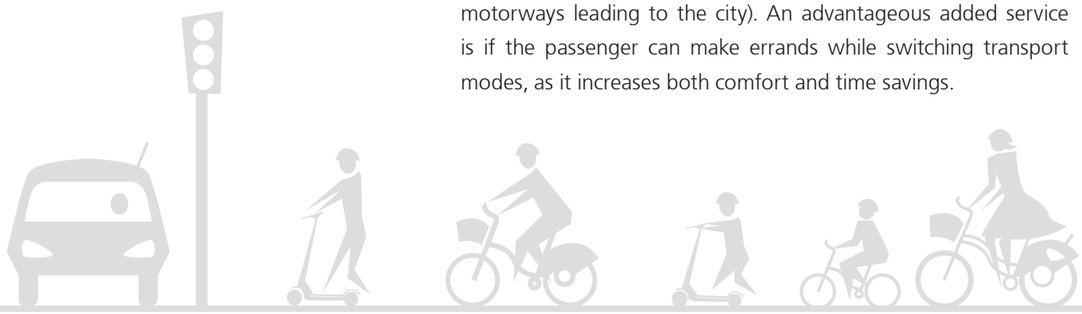
Shared public transport corridors used by trams, buses and trolleybuses along route sections will facilitate transfers on a shared platform and the common implementation of priority traffic arrangements. In addition, they will also reduce the road usage demand by public transport. Wherever traffic and the cross section of roads permit, shared bus-bicycle lanes will also be established as part of the cycling infrastructure.

Short-term parking facilities (K+R, Kiss and Ride) will be established at the intersections of public transport trunk lines and main traffic routes of the road network to facilitate transfers from cars or private coaches to other vehicles. These stops are similar to public transport stops and can be used only as boarding and drop-off points. Thus passengers will not use public transport street-level stops for this purpose – current behaviours do not comply with the regulations and they are accident-prone at the same time.

1.3.11. DEVELOPMENT OF P+R CAR PARKS AND B+R STORAGE FACILITIES

In line with European development directives, the need for creating a liveable urban environment requires traffic calming, the mitigation of car traffic in the inner zones and the increase of public transport in the modal share. One of the possible means to reach this goal is to promote combined transport modes and to combine individual and public transport effectively.

Commuter traffic from the agglomeration to the city should be collected as close as possible to where it originates by means of P+R car parks implemented next to commuter train stations in the agglomeration. B+R storage facilities need to be provided for cyclists. Furthermore, it is practical to construct large- capacity car parks near the city boundaries, at the edge of the congestion zone, along the fixed-rail transport network (primarily along the access motorways leading to the city). An advantageous added service is if the passenger can make errands while switching transport modes, as it increases both comfort and time savings.



ATTRACTIVE VEHICLES

THROUGH A COMFORTABLE AND PASSENGER-FRIENDLY VEHICLE FLEET AND THE ENCOURAGEMENT OF THE PROLIFERATION OF ENVIRONMENTALLY FRIENDLY

The purpose of developing the public transport vehicle fleet in Budapest is to make public transport an attractive option to travellers. There is a need for aesthetic vehicles that are in a good condition and provide high quality services and further improvement is also required in accessibility.

The main objective of the intervention area is to reduce the environment-related burden caused by the transport system. On one hand, the new vehicles will also be fuel efficient and less polluting, on the other hand, as they offer an attractive alternative, the modal share of public transport compared to individual transport modes will increase, thus the indirect effect of vehicle development will also be a cleaner and more liveable environment.

2.1. COMFORTABLE AND PASSENGER-FRIENDLY VEHICLES

THROUGH THE RENEWAL OF THE VEHICLE FLEET ACCORDING TO ASPECTS OF ENERGY EFFICIENCY, ACCESSIBILITY AND RELIABLE MAINTENANCE

The quality level of the public transport vehicle fleet has been improving for several years through the purchase of new vehicles and second-hand ones that are still in a good condition. The vehicle procurement and vehicle refurbishment programmes need to be continued. As a result of the measures, the accessibility is also improving, the reliability of services and the proportion of barrier-free accessible vehicles is increasing. Interoperability plans and concepts need to be considered when renewing the future fleet of fixed-rail vehicles, otherwise vehicles could become obstacles to further network integration for decades to come.

2.1.1. MODERNISATION OF THE PUBLIC TRANSPORT VEHICLE FLEET AND ITS MAINTENANCE CAPACITIES

The procurement and the measures of fixed-rail public transport services are defined in the vehicle strategy prepared by the Municipality of Budapest for the period of 2013–2027, which equally applies to the metro and suburban railway fleets, trams and buses. The aim of this strategy is to put a comfortable, low-floor, energy-efficient and environmentally friendly vehicle fleet, consisting of advanced and reliable types, into service. The replacement of the more than 40-year-old cars of metro lines M1 and M3 and those of the suburban trains is yet another urgent task. The strategy needs to be revised, because the principles currently adopted require new aspects to be taken into consideration, such as the creation of a fleet of vehicles that can meet the requirements of interoperability or be suitable for the transportation of bicycles. While passenger comfort and environmental considerations are a priority, in case of the further vehicle and service purchases the realisation of a more homogeneous range of models supports more efficient operability. The modernisation of the fleet and the maintenance services of waterborne transport is also an important aspect of public transport, and the procurement of new boats can no longer be postponed either. There is a need for a good quality riverboat fleet that are flexibly adaptable to weather and water conditions, are suitable for higher speeds, fast mooring and manoeuvring, have advanced propulsion, which is sustainable for decades, and provide a degree of comfort, which is generally expected in public transport. The maintenance of more advanced boats requires significantly higher quality of operation and therefore the maintenance facilities also need to be developed.

2.1.2. ACCESSIBLE VEHICLES

At present, most part of the Budapest transport system is still not accessible; the problem being the gravest on the tramlines as well as on high-capacity metro lines forming the backbone of the network. By means of continuous purchases and investments, it needs to be achieved that between 2020 and 2030 the proportion of the barrier-free services increase from 50% to 100% in both the tram and metro sectors. In the bus sector, this level must be reached even sooner through procurements.

2.1.3. PROVISION OF VEHICLE OPERATING CONDITIONS, VEHICLE DEPOT DEVELOPMENTS

The operation of vehicles with higher technical standards and the modernisation of depots are also parts of the development of the vehicles and assets used in transport. In relation to the network enlargement projects, the location of the depots and their longer-term roles need to be reviewed while the establishment of new depots should be in line with urban planning.

2.1.4. INCREASING THE NUMBER OF PUBLIC TRANSPORT VEHICLES CAPABLE OF CARRYING BICYCLES

The longer-term goal is to put conditions for the transportation of bicycles combined with reliable public transport in place. As the first step in that process, the transportation of bicycles will be made possible on suitable vehicles in less busy periods, which may be expanded further depending on the degree of utilisation of the system. Besides the gradual refurbishment of the existing vehicle fleet expanding their bicycle-carrying capacity and making them more comfortable, the capability of carrying bicycles will be an important requirement when any new bus, tram, trolleybus or metro is procured.

2.2. ENVIRONMENT-FRIENDLY VEHICLE TECHNOLOGIES

THROUGH THE ENCOURAGEMENT OF THE DIFFUSION OF VEHICLE TECHNOLOGY SOLUTIONS SUPPORTING CLIMATE POLICY

New technologies applied in vehicle development and traffic management will play a key role in reducing greenhouse gas emissions. Improving the energy efficiency of vehicles, supporting the introduction of sustainably produced fuels and promoting the introduction of new propulsion systems reduce harmful emissions by transport. The innovative environmentally friendly developments should be encouraged in both the public and private transport vehicle fleets.

2.2.1. PROCUREMENT OF ZERO-EMISSION VEHICLES

In order to expand the environmentally friendly trolleybus network, the isolated segments should be connected. The service can be made even more flexible by increasing the ratio of vehicles with off-wire capability. The existing trolleybus infrastructure provides a background for the installation and expansion of the operation of electric buses. Technological advances can blur the borderline between the still separate sub-sectors, meaning that bus and trolleybus services can be developed into an optimised transport mode, in which the vehicles use overhead wires at the terminuses and on the intensively used sections, while they are battery-operated on the branching-off sections of the network.

2.2.2. ENVIRONMENTALLY FRIENDLY TECHNOLOGIES IN FREIGHT FORWARDING

Simultaneously with the restrictions related to environmental categories, the support of environmentally friendly vehicles with alternative modes of propulsion can also be gradually strengthened (electric, hydrogen and hybrid technologies, human-powered transport, freight bicycles). By spreading and applying intelligent systems and providing real-time information services, traffic congestion can be significantly mitigated and the efficiency of city logistics can be further enhanced. In view of technological and network changes, the Freight Transport Strategy of Budapest needs regular review.

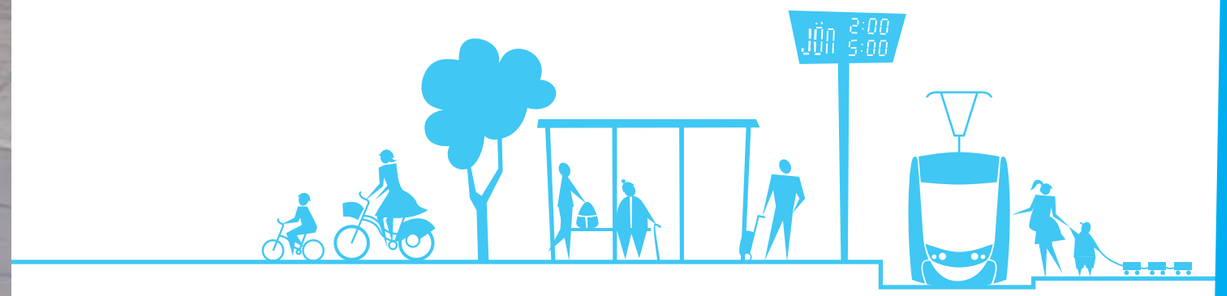
3

BETTER SERVICES

THROUGH AN EFFICIENTLY ORGANISED AND INTELLIGENT, WIDELY ACCESSIBLE, INTEGRATED TRANSPORT SYSTEM THAT PROVIDES ACCURATE INFORMATION

> Growing out of oil will not be possible relying on a single technological solution. It requires a new concept of mobility, supported by a cluster of new technologies as well as more sustainable behaviour.
> EU *White Paper* (43.)

Improving the quality of services equally affects the city (living conditions of city dwellers and urban users), the passengers participating in transport and the vehicle drivers, as well as the organisations and their employees contributing as partners. The measures are aimed at access to information, simplifying ticketing and route organisation, increasing reliability and punctuality, reducing the number and duration of transfers, comfort and promoting new modes of transport. Improving the quality of service also involves influencing transport mode selection; when the demand is influenced with the help of administrative regulatory tools, the introduction of alternative mobility options, with campaigns and with awareness raising in such a way that transport users choose the user-friendly, people-centric options in line with their own interests, which in turn are more favourable for the city, as well.



3.1. IMPROVING SERVICE QUALITY

THROUGH UNIFIED PASSENGER INFORMATION SERVICES, COORDINATED TIMETABLES AND EXPANDING INTELLIGENT SERVICES

> The quality, accessibility and reliability of transport services will gain increasing importance in the coming years, inter alia due to the ageing of the population and the need to promote public transport. Attractive frequencies, comfort, easy access, reliability of services and intermodal integration are the main characteristics of service quality. The availability of information over travelling time and routing alternatives is equally relevant to ensure seamless door-to-door mobility, both for passengers and for freight.
> EU *White Paper* (41.)

The purpose of this measure is to focus on the aspects of travelling city residents and passengers and to improve the quality of service provided to them. Operational considerations are important, but they must promote service goals. Passenger-friendly transport measures can make public transport more attractive and the conditions for using different modes of transport can be improved.

With the expansion of state-of-the-art IT services, the travel chain becomes well plannable and individual needs can be flexibly managed. Providing predictable financing is a prerequisite for improving the quality of service. The Municipality of Budapest must strive to ensure the interconnection and interoperability of ITS systems, SMART solutions and transport-related applications, and to prepare for the use of C-ITS enabled communications links and IT collaborations.

3.1.1. UNIFIED PASSENGER INFORMATION AND OTHER INFORMATION SERVICES

Providing continuous information provision to passengers and real-time updates on individual and public transport options are one of the key priorities for high-quality transport services in Budapest. The information and communications technology revolution of the new millennium is also taking place in the transport of Budapest: the most advanced technological innovations assist passengers in reaching their destinations as fast as possible. Transport modes

and service providers need to be integrated so that the passenger information system can provide real-time and accurate traffic information minute by minute on online interfaces, accessible at the most important intermodal nodes of Budapest and through mobile devices as well. Participants in transport will turn from being helpless travellers into conscious passengers and from being customers into partners who can make their travel related decisions before starting their journey. Those decisions may also be assisted by personalised online and interactive on-site information, developed for modern communications tools.

3.1.2. AUTOMATED FARE-COLLECTION (AFC) SYSTEM

The fare system is an important factor in the attractiveness and competitiveness of public transport, including pricing, fare structure and access to tickets and passes, i.e., the sales system.

The introduction of a new, time-based electronic fare-collection system is a complex transport and IT development: as part of a modern system focusing on the requirements of the travelling community, the tariff system will be renewed and the paper-based system will be replaced by contactless card technology, which requires the installation of electronic ticket validating devices on vehicles and access gates will need to be installed at busy stations. Parallel with the development, the sales channels will also be expanded (internet, smartphone app, vending machines, etc.). Within the framework of the system, the P+R car parks in Budapest will also be available for use with electronic tickets.

The electronic fare system reduces fare evasion, thereby contributing to sustainable financing. The AFC system provides up-to-date usage data based on card activity, which is important information for the development of the quantity and quality of the service.

3.1.3. INTEROPERABLE FARE SYSTEM AND TARIFF COMMUNITY

Close cooperation between service providers is the basis of an integrated transport system. The introduction of an integrated timetable and fare system within the entire capital and suburban transport system is necessary to enable public transport to compete with individual transport. This is particularly important in regional transport, so the commuter services of MÁV (Hungarian State Railways) and Volánbusz need to be included in the integrated system.

An integrated fare system that includes both tickets and passes is urgent development in itself and at the same time it is an important prerequisite for the establishment of a full-value "S-Bahn" type rapid railway system.

3.1.4. HARMONISATION OF URBAN AND SUBURBAN TIMETABLES AND COORDINATION OF SERVICES

The developments are aimed at improving the comfort level of transfers and minimising the involved time loss. The coordination of timetables is an important aspect of that progress. An integrated timetable means that various lines meet at intersection points in a coordinated manner, which can effectively reduce time lost during transfers especially on services operated with less-frequent headways. By coordinating suburban and urban timetables and strengthening the service capacity of the lines, the urban sections of the regional rail services may have a more active role in Budapest transport. This type of integration will primarily involve feeder bus services; the operating times must also be coordinated with connecting transfer options adjusted to the first and last trains.

The new route marking system of commuter trains and their line numbering also contribute to the development of an integrated system. The first step of timetable integration is to establish a common timetable interface.

3.1.5. APPLICATION OF INTELLIGENT SYSTEMS IN TRANSPORT MANAGEMENT

The development of information technology is revealing new ways for transport organisation. Providing real-time information for route selection, influencing traffic with dynamic displays, parking management, coordinated and demand-driven traffic control, consistent administration and the extensive use of the databank and operations database will all contribute to a predictable and effective road transport management. The demand-driven public transport service, Mobility as a Service (MaaS), requires the use of advanced IT systems and IoT technology and the utilisation of the possibilities offered by C-ITS. There is a continuing need to monitor the progress made in the field of self-driving vehicles, artificial intelligence, and to examine their impact on the urban transport system.

The traffic technology based review of public transport routes identifies and eliminates the factors causing idle time for vehicles and optimises the utilisation, in space and time, of road surfaces shared with individual transport. The application of traffic-dependent regulation technology solutions will give priority to public

transport at due times flexibly, without any losses, and will provide a predictable and reliable service to passengers.

An advanced traffic control system ensures connections specified in the timetable even in the case of delays, in addition to effectively managing service disruptions, and provides ongoing data updates to the real-time passenger information system on current traffic situation. In the event of a service disturbance, the system informs the affected passengers about the situation, on the measures taken to remedy the error and on transport options to avoid the route section involved.

In order to reduce the level of daily car use, public transport must be given real priority continuously. Increased use of public transport will be encouraged by attractive service offers such as direct connections, bus corridors, high-speed, separated tram tracks and bus lanes, priority in traffic.

The spread of wireless technologies, including intelligent mobile devices, opens new opportunities for the use of integrated data systems in transport (information on travel habits of passengers, provision of dynamic personalised information). The traditional 'predict and provide' type approach to transport planning, based on forecasts and estimates, has been replaced by the 'aim and manage' approach, which focuses on influencing transport needs. There is a shift away from physical infrastructure development towards the application of intelligent ICT solutions. The spread of personal mobile devices opens up new opportunities for transport management. The standardisation policy of the European Union is aimed at the spreading of open data, intelligent transport systems (ITS) and multi-modal route planning.

Integrated, cooperative transportation systems are the peak of the development curve and represent the most advanced technology that is currently technically available.

By collecting, processing and analysing large amounts of urban transportation data in a unified manner, continuously monitoring the transport infrastructure and its services, and by better understanding the needs of the passengers, a more reliable, safer, more environmentally friendly and more efficient transport system can be developed and operated. The development of information technology in the field of urban transport management also enables the provision of several modern, integrated services: (unified internet (WiFi) service, intelligent traffic control, coordination of traffic signals, integrated sales channels, traffic monitoring, disruption detection and elimination, more effective checks, integrated and dynamic traffic information, inner city traffic mitigation, regulatory protection, dynamic parking system, dynamic traffic management).

3.1.6. OPERATION AND DEVELOPMENT OF THE PUBLIC BICYCLE-SHARING SYSTEM, EXPANDING OF CYCLING SERVICES

Based on the operational experience, the public bicycle-sharing system, i.e. Bubi implemented in the capital will be expanded and extended. In order to encourage the day-to-day cycling, storage facilities for daily use need to be provided in every residential area of Budapest. The implementation of bicycle racks is required in city centres and district centres, in institutional, service and workplace areas, and close to the entrance of public institutions and other traffic-inducing facilities.

The development of additional services directly related to the bicycle infrastructure can be made reliable and attractive, by appropriate regulation, also for market participants (bicycle rental, self-service express repair stations, repair shops, rest areas for cyclists, bicycle tours, tour guiding, cycling centre).

3.1.7. EXTENSION OF DEMAND RESPONSIVE PASSENGER TRANSPORT SERVICES

Not all urban transport needs can be served economically by scheduled services, especially in new residential areas with low population densities. In such locations, the alternative to individual motorised transport is an on-demand 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). The current service is reviewed and extended on an ongoing basis, according to programme.

3.1.8. DEVELOPMENT OF UNIFIED TAXI SERVICES IN BUDAPEST

The regulation must reconcile the aims of the city and the city dwellers (reduction of environmental burden, avoidance of congestion, operation complementary to public transport), the interests of the potential passengers (avoidance of excessive waiting times, reasonable fares) and the interests of the carriers (reliable income). Advanced international studies show that the above listed aspects can be optimised and a healthy supply-demand ratio can be reached by the optimal adjustment of the average hourly ride volume. Ensuring this requires significant progress compared to the current regulation, which focuses on vehicle technical parameters but is stuck there. Today, taxis can be operated in the capital which have an environmental category of at least EURO 5 and are up to 10 years old. The declared goal is to promote and continuously increase the share of environmentally friendly alternative-propelled vehicles (electric, hydrogen, hybrid and CNG fuelled technologies) to expand the e-taxi service with purchase incentive measures, tax and other benefits, and furthermore to implement integrated electric charging stations at as many taxi stations as possible.

3.1.9. CAR SHARING

Schemes aimed at boosting the occupancy level of cars in the city may ease congestion in the inner parts of the city, traffic on public roads and in car parks, as well as the resulting environmental pollution. With the help of the car sharing system, the same magnitude of vehicle usage may be achieved with fewer vehicles requiring fewer parking spaces (so less use of public space) enabling users to satisfy their mobility needs at a lower cost.

For the time being, the domestic regulation deals with one of the segments of this activity, the development of the rules of the integrated community car rental system. So far, the framework regulation has been prepared. Several services operate in the capital: at the end of 2016, GreenGo was launched and in the spring of 2018 the Limo car-sharing service. In 2018, Blinkee, an electric scooter sharing system was launched. The goal is to prepare a regulation framework harmonised with the other urban development aspects.

3.1.10. PUBLIC SANITATION AND PUBLIC HEALTH TASKS OF URBAN TRANSPORT

The measure is aimed at improving the environmental and hygiene situation of transport systems and at addressing the main transport-related hygiene deficiencies involving waste materials. People living in the capital and visitors can also be encouraged to use public transport in case in addition to modernising vehicles and their routes the hygiene conditions are improving too. Particular attention needs to be paid to keeping public areas clean, along with local public transport vehicles and their stops, as well as long-distance bus and train stations. In order to improve the liveability of public areas and the attractiveness of walking in Budapest, the hygiene condition of public and railway station toilets must be improved, furthermore the number of well-equipped, clean and free-of-charge toilets, accessible by disabled persons and parents with small children must be increased.

3.2. ACTIVE AWARENESS RAISING

THROUGH FACILITATING CONSCIOUS MODE SELECTION BY PROVIDING UP-TO-DATE INFORMATION AND CUSTOMER-ORIENTED COMMUNICATION

In order to achieve a sustainable balance between transport modes, transport users need to be assisted in their daily journeys to find the optimal transport solutions. From the liveability aspect of the city, the collective fulfilment of travel needs (public transport, carpooling) and the use of less polluting means are desirable. A further aspect of shaping attitudes is conscious travel planning

(e.g. combining travel goals and motivations) and encouraging passengers to use a motorised vehicle for the trip to be made, only if it is absolutely needed.

3.2.1. EDUCATION FOR CONSCIOUS MOBILITY AND SAFE TRANSPORT

Expanding the knowledge related to transport and supporting people's mobility decisions are equally facilitated by constantly growing information, targeted campaigns and R&D cooperation as well. In order to continuously reduce the number and severity of accidents, in addition to the provision of appropriate infrastructure, the standards of the transport culture can be raised with targeted campaigns and the promotion of training at local and national level (such as the integration of the Hungarian Highway Code into the National Core Curriculum).

3.2.2. AWARENESS CAMPAIGNS AND COMMUNICATION

In order to ensure safe transport, compliant conduct is supported by the provision of information, continuous attitude forming campaigns and active communication, which focuses on setting an example and on creating awareness of social advantages. Easily understandable information with feedback opportunities is conveyed on an electronic portal, in publications, through the information centre, and with the help of maps, route planners and newsletters. Joining the Transport Culture Day (May 11), a wide range of groups in society can be reached. The initiative is organised around the keywords of partnership, attention to each other and safe transport.

Along with an increase in the number of cyclists, the number of less experienced and uninformed users has also increased, resulting in more demand for the supply and transfer of information and targeted campaigns among cyclists to promote their compliance with the rules.

3.2.3. INTEGRATED CUSTOMER CENTRES

It is not only the attitude of travellers that has to change, but also the approach of the service provider organising transport. In order to maximise customer satisfaction and the user experience, sales channels need to be reconsidered and a new, customer-centred approach has to be introduced.

In order to meet the changed demand and to increase the level of service, at the major public transport hubs and in the main passenger traffic areas such integrated customer centres will be established, which provide full range of transport related services to customers. In addition to the AFC system, other matters relating to the integrated services of public transport and, in individual cases, to the Municipality, the districts and the service providing partners (MÁV-Start, Volánbusz) can also be handled at the same place.

3.2.4. PRESERVATION AND PRESENTATION OF TRANSPORT HERITAGE

The history of Budapest transport is marked by numerous world-class innovations, which greatly determine the identity of the capital, so it is advisable to broaden public access to the preserved values. This task requires a permanent location within Budapest with good transport links. This is the place where the collection items, museum-grade and vintage vehicles that are currently scattered in different locations are to be relocated. An educational venue should be created where the transport awareness of the growing generations can be shaped by presenting local and technical history in a playful and enjoyable way.

4

EFFICIENT GOVERNANCE

THROUGH CONSISTENT REGULATION AND THE PASSENGER-FRIENDLY DEVELOPMENT OF NATIONAL, REGIONAL AND LOCAL NETWORK

4.1. CONSISTENT REGULATION

THROUGH A SET OF INSTITUTIONS AND REGULATIONS THAT SUPPORT TRANSPORT OBJECTIVES

It is indispensable condition for the renewal and continuous development of Budapest transport that a well-prepared, well-functioning institutional system representing the target system authentically and operating in harmony with it supports the developments. Establishing and maintaining the appropriate governance system will enable the objectives set to be achieved and the system developed to be sustainable in the long run. The regulatory environment for transport must be consistent with the overall objectives, must help to achieve it in the capital and the agglomeration as well.

4.1.1. FURTHER TASKS IN THE TRANSFORMATION OF TRANSPORT GOVERNANCE, NORMATIVE AND RELIABLE FINANCING OF PUBLIC TRANSPORT

Transport matters need to be dealt with in a single, well-coordinated organisational form, equally separate from the ownership, control and service levels, and the correction of the stepping backward in this area is required. The next period has two main tasks in terms of governance.

There is a need to synchronise the suburban transport, which is currently separate but operates as a part of transport in the capital and public transport on intra-urban networks, which is not integrated into urban transport today. The realisation of a single timetable, a uniform tariff system and a single information system is today a key capability of every metropolis and is a precondition for high-quality and competitive transport in Budapest as well. However, this can only be achieved with an appropriate institutional background.

On the other hand, an efficient governance system requires stable, sustainable and predictable financing frameworks. Financing of public transport must be made predictable, normative, which provides the framework for good management. The purpose of the financing model is to ensure that the agreed transport objectives are achieved in an effective manner, to eliminate wasteful practices and to create the conditions for the implementation of economic developments.

In addition to the governance tasks to organise transport, strategic planning based project development and project management practices must be enhanced, as they are prerequisites of effective fund absorption and implementation.

4.1.2. ECONOMIC AND ADMINISTRATIVE INCENTIVES

The operation and development of transportation system of Budapest can be influenced not only with technical, but also with financial, economic and regulatory tools. In order to realise the vision of the city, to achieve its strategic goals, the regulatory measures for public road transport need to be reviewed and redesigned: the capital parking system (order of parking and storing vehicles, parking zones and fees), terms of use for public roads and public areas (access control, licensing and pricing, discounts, "fundamental right" free residential parking). By broader understanding of the environmental impact the short-term road and public land-use modes and modes with lower environmental load (walking, cycling and public equipment) and technologies (electrical, renewable or hybrid drive) must be encouraged through economic controllers; at the same time, incentives which counteract the stated objectives should be eliminated.

Road pricing and the removal of distortions in taxation can also assist in encouraging the use of public transport and the gradual introduction of alternative propulsion.
EU *White Paper* (32.)

In order to provide efficient and environmentally friendly transport services for the real estate developments in the capital, such an economic incentive system must be established which stimulates private capital activity in areas deemed desirable for urban development and creates a predictable development environment replacing ad hoc agreements. The combined application of economic and administrative regulators should encourage that the development of high-traffic inducing urban development concepts can be realised by reorganisation of fixed-rail lines or depending on transport supply possibilities. (In case a real estate development takes place in an area not supplied by existing high-capacity, first of all fixed-rail line the expansion of an appropriate high-capacity line must be completed as a compulsory part of the investment or the necessary resources must be transferred to the public sector).

Move towards full application of "user pays" and "polluter pays" principles and private sector engagement to eliminate distortions, including harmful subsidies, generate revenues and ensure financing for future transport investments.
EU *White Paper* (2.5.)

4.1.3. FROM REGULATION OF PARKING TO REGULATION WITH A PUBLIC SPACE MANAGEMENT APPROACH

As part of transportation policies, parking policy (including parking management) is a strategic tool for developing mobility processes in the desired direction, for influencing transport methods and for improving the quality of public areas. This requires the creation of such a public land management system that addresses the entire city, whereby residential, P+R and target parking (waiting, storage) are built on each other and can be managed in a single system. Within the framework of the unified management, regulatory conditions should facilitate the functional cooperation between public and off-street parking, the popularity of P+R parking and the normative residential parking conditions. Without regulating the latter, the largest demand segment, which is out of control today, a desirable parking policy cannot be enforced.

Inner city car parks and underground car parks should serve as much as possible the locals' vehicles, rather than those arriving in the city centre, in order to free up public parking spaces and redesign their surroundings so that different forms of urban community life can appear. In the inner districts, with adequate transport offer and information, and economic incentives, more and more residents can be made aware that it is no longer a necessity for them to keep their own cars and that transportation can also be done differently. The comprehensive parking regulation needs to facilitate also the planned measures for other modes of transport. Its task is, on the one hand, to establish a unified institutional and financing system for parking and, on the other hand, to review the parking norms associated with the real estate installations, i.e. to modernise the regulation for inside the site and institutional parking. The basis for developing a unified parking system can be a new concept based on comprehensive surveys developed jointly with the districts.

The targets of parking management to be implemented on a system-based approach: influencing the mode selection, encouraging of modal shift, improving the quality of public spaces, reducing and settling street parking, unified public parking management, keeping long-term storage outside public areas, keeping car commuter traffic away from the interior areas, scheduled solution of the normative residential parking that also benefits users.

4.1.4. REGULATION OF SIGHTSEEING VEHICLES AND TOURIST BUSES

A draft concept was prepared with the involvement of the relevant professional organisations (tourism, operators, transport sector) to control the vehicles, the route, the starting points, the stops and the waiting places of the buses presenting the tourist attractions of the capital. Moving forward requires the preparation of a consensus-based action plan.

The aspects of tourism should also be a priority when developing boat services. The balance between commuter and leisure use ensures that the system is profitable. Navigation routes need to be linked to sightseeing routes. For this purpose, the conditions and the model for business cooperation with the private operator stakeholders need to be prepared.

4.1.5. INTEGRATED TRANSPORT SAFETY DATABASE

The first step of accident prevention is to identify the root causes of accidents. The actual tasks can be defined on the basis of the review and evaluation of the occurred events. The capital has started to develop its own accident database to promote the evaluation of accidents, which receives data that is much more accurate and detailed than that of the Central Statistical Office, directly from the Budapest Police Headquarters and the Municipal Public Space Management Company. According to the accident trend, accidents involving material damage are also becoming increasingly accurately recorded. Expert analysis of events in the database can provide a basis for measures improving security.

4.1.6. PROMOTION OF ENVIRONMENTALLY FRIENDLY TRANSPORT TECHNOLOGIES

Air pollution caused by transport is one of the factors that deteriorate the quality of life in the city, therefore its reduction is an aim not only when replacing the fleet of public transport vehicles, but also in individual motorised transport. Replacing fossil fuels with renewable energy, alternative fuel is one of the biggest challenges the transport industry is facing. Therefore the European Commission had set binding rules to promote the expansion of the use of environmentally friendly fuels. By supporting the spread of alternative propulsion methods and by encouraging the installation of recharging stations that meet EU standards, the competitive disadvantage of the environmentally friendly vehicles can be reduced.

The spread of the environmentally friendly fuels and zero-emission propulsion systems, as part of financial measures to influence the modes of transport, should be facilitated by introducing tax cuts

and fee discounts, easing environmental restrictions on access and by building a dense network of electric charging stations.

Another factor deteriorating city life quality is noise pollution. In densely populated areas with a high density of traffic and noise, the possibility of constructing noise barriers should be examined. Whenever possible, the construction of new infrastructure or renovation of the existing infrastructure needs to be pursued in an environmentally friendly manner.

4.2. REGIONAL COOPERATION

BY FACILITATING THE INTEGRATION OF REGIONAL AND LARGE REGIONAL SYSTEMS

4.2.1. ESTABLISHMENT OF INSTITUTIONAL RELATIONS TO ENSURE AN ADEQUATE DEGREE OF INTEGRATION OF TRANSPORT SERVICES WITHIN THE BUDAPEST REGION

In addition to the changes in the transport governance of the capital, the institutional framework for cooperation in the urban and suburban transport of Budapest has narrowed. The decision-making and executive organisation of the Budapest Transport Federation (BKSZ), established in 2005, was terminated by the owners in 2011. Cooperation in the regulation of urban and suburban public passenger transport services between the relevant transport administration and the Municipality of Budapest is continuous but not formalised. The unified capital and suburban ticket and travel pass system for public transport services operates within Budapest

but is stuck in the state of the time of cooperation with the Budapest Transport Federation.

The current fragmented service obligation system for transport provision in the capital and its region does not favour transport integration. The daily transport of commuters from the city surroundings could be assisted by a regional transport organising institution, ensuring greater coordination between urban and suburban transport, in cooperation among the partners responsible for the service (the Municipality of Budapest, the competent ministry as well as the relevant municipalities). The uniform capital and suburban fare system stipulated in the Act on Passenger Transport Services will enable the competitive operation of urban and suburban public transport by expanding and further developing the existing tariff community.

4.2.2. MAINTENANCE AND DEVELOPMENT OF THE UNIFIED TRAFFIC MODEL

For the purpose of analysing the impacts of each transport development project in the capital and comparing the development alternatives from the same aspects, a uniform traffic model covering the entire territory of Budapest and its agglomeration was prepared with the support of the European Union. The traffic model (network and demand model) data must be continuously, regularly updated in order to have up-to-date content.

The updated unified traffic model and the related continuous traffic monitoring help to review the development plans in Budapest and in the suburbs and to evaluate new projects. With accurate traffic analysis, the model is a practical tool for advanced transport planning and contributes to the preparation of cost-effective, well-planned and feasible investments in the development of the transport system.

4.2.3. MORE STRINGENT REGULATIONS FOR THE ZONING SYSTEM, BASED ON THE TOTAL WEIGHT OF VEHICLES AND TRAFFIC RESTRICTIONS BASED ON ENVIRONMENTAL CHARACTERISTICS

Recent trends in freight transport, such as courier services and direct delivery are also playing an increasingly important role owing to online shopping. Freight traffic in the city should be provided by low emission freight vehicles; for example, the application of electric, hydrogen, and hybrid technologies or the use of human-powered transport will decrease not only pollutant emissions, but also noise pollution.

In freight transportation, the interface between long-distance transport and the last phase of transport (last-mile) should be organised more efficiently. The aim is to limit individual deliveries, the most "inefficient" part of the journey, to the shortest possible route. The use of intelligent transport systems contributes to real-time traffic management, reducing delivery times and congestion for last-mile distribution. This could be performed by low-emission urban trucks. The use of electric, hydrogen and hybrid technologies would not only reduce the emission of pollutants into the air, but also noise, allowing a greater portion of freight transport within the urban areas to take place at night time. This would ease the problem of road congestion during morning and afternoon peak hours.
EU *White Paper* (33.)

4.2.4. OPERATION AND DEVELOPMENT OF THE FREIGHT TRANSPORT ACCESS REGULATION SYSTEM

A decade ago, with the Budapest Freight Strategy, a system was introduced to keep transit freight transport out of the city, while allowing access to the production and logistics bases of the capital. The aim of the development measure is to regulate and influence the routing and the timing of freight transport to the capital. In order to keep away heavy truck traffic and its destinations from the inner areas, the system needs to be tightened time to time. By reducing the number and length of the radial routes serving destination traffic, served by mainly 40-ton shipments, the relocation of sites operating on inner urban logistics areas, but not serving the city per se, should be encouraged. This process can be facilitated by the experienced expansion of the supply in the external logistics

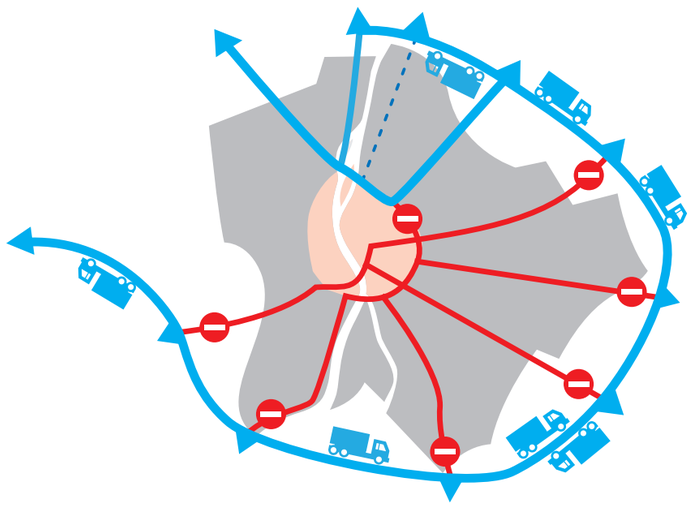


Figure 9: *INFLUENCING TRANSIT FREIGHT TRAFFIC*

ring around the city and the upswing of real estate developments in the brown zone, as well as the construction of transversal road links in the area concerned.

In the freight traffic access system, the continuous development of controlling through inspections is another indispensable factor apart from complex regulations. The initial stop-check control system is inadequate and out of date, therefore the control should be gradually upgraded by developing and operating a system based on intelligent technology, connecting to the electronic toll system introduced on the national main road network and taking countrywide experience into consideration. The concept is being implemented in small but continuous steps.

4.2.5. IMPLEMENTATION AND DEVELOPMENT OF A CITY LOGISTICS SYSTEM WITH TERRITORIAL AND TIME-BASED REGULATION

By aligning the interests of the partners in the logistics chain, the current urban supply practices should be transformed into organised city logistics. Parts of the urban logistics system are the retail end-points, designated loading areas, which, due to the increasing use of capacity, are a growing problem in the urban structure.

The loading area network for urban logistics and the related regulations (such as licensing) have hardly changed in recent years. Meanwhile, new functions with significant logistical needs have appeared in parts of the city. Particular attention needs to be paid to the IT-based organisation and monitoring of urban transport, and to optimising the use of the designated loading sites, primarily providing the basic supply, on public space. A comprehensive city logistics concept has to be defined in order to create the institutional and services background, to create urban service connections and to regulate logistics services in both time and space. The introduction of an IT system to support the use of designated loading areas (loading site reservation, placement of intelligent columns (bollards), determination of access time and route based on the actual traffic, etc.) can reduce congestion caused by freight vehicles searching for stopping space, stopping irregularly, traffic obstruction and the good supplier can load safely from a close location. The registration of transport vehicles can also provide additional information on vehicles not subject to the maximum weight limit.

In freight transport, the link between the long-distance shipping and the last leg of the journey (the 'last mile') must be organised efficiently so that the last, least efficient leg of the journey can be as short as possible. Using intelligent transport systems, the delivery times can be shortened and congestion can be reduced. The timing regulation of city logistics is aimed at shifting most intra-city freight transport to the night hours to relieve road congestion during the morning and afternoon rush hours. To make the night freight transport more attractive, loading areas can be expanded, new areas can be involved and combined (e.g. night bus lanes, taxi stations etc.)

By consistently collecting, managing and analysing large amounts of urban transport data, continuously monitoring transport infrastructure and services and by better understanding the needs of the passengers, a more reliable, safer, more environment friendly and more efficient transport system can be developed. The deployment of intelligent systems is an essential part of developing an environmentally friendly, advanced city logistics network. In the area of regulation, it is justifiable to establish a system of qualified freight forwarders.

OVERVIEW OF MEASURES

1. IMPROVING CONNECTIONS

1.1. Integrated network development

- **1.1.1.** Direct public transport links
- **1.1.2.** Modernisation of the existing track networks
- **1.1.3.** Connecting cut-off parts of the city via new Danube bridges and via grade- separated road-rail crossings
- **1.1.4.** Building the missing elements of the road network
- **1.1.5.** Interconnected core cycling network
- **1.1.6.** A cycling-friendly secondary road network and improving penetrability by bicycle
- **1.1.7.** Extension of the waterborne transport network and development of the service infrastructure

1.2. Liveable public spaces

- **1.2.1.** Establishing pedestrian connections of urban structure relevance
- **1.2.2.** Improvement of the conditions for walking
- **1.2.3.** Equal opportunities and barrier-free accessibility
- **1.2.4.** Accident-free forgiving environment
- **1.2.5.** Developing zones with traffic calming and traffic restrictions
- **1.2.6.** Differentiated development of the inner zone in Budapest (within Hungária Ring road)
- **1.2.7.** Life and property security, crime prevention
- **1.2.8.** Public space refurbishments with complex approach

1.3. Interoperable systems, convenient intermodal nodes

- **1.3.1.** Interoperable fixed-rail systems; urban and suburban rail network
- **1.3.2.** Improving transfer connections between commuter railways and urban transport
- **1.3.3.** Integration of the city access and bypass sections of the national road network into the road network of Budapest
- **1.3.4.** Facilitating the urban integration of long-distance public transport
- **1.3.5.** Integration of riverboat services into urban and metropolitan area public transport
- **1.3.6.** Improving the accessibility of Budapest Liszt Ferenc International Airport
- **1.3.7.** Development of the logistics centres, consolidation centres and their connections
- **1.3.8.** Development of national and regional cycling tourism connections
- **1.3.9.** Development of intermodal centres and hubs in passenger transport
- **1.3.10** Providing the conditions for switching of urban transport modes
- **1.3.11.** Development of P+R car parks and B+R storage facilities

2. ATTRACTIVE VEHICLES

2.1. Comfortable and passenger-friendly vehicles

- **2.1.1.** Modernisation of the public transport vehicle fleet and its maintenance capacities
- **2.1.2.** Accessible vehicles
- **2.1.3.** Provision of vehicle operating conditions, vehicle depot developments
- **2.1.4.** Increasing the number of public transport vehicles capable of carrying bicycles

2.2. Environment-friendly vehicle technologies

- **2.2.1.** Procurement of zero-emission vehicles
- **2.2.2.** Environmentally friendly technologies in freight forwarding

3. BETTER SERVICES

3.1. Improving service quality

- **3.1.1.** Unified passenger information and other information services
- **3.1.2.** Automated fare-collection (AFC) systems
- **3.1.3.** Interoperable fare system and tariff community
- **3.1.4.** Harmonisation of urban and suburban timetables and coordination of services
- **3.1.5.** Application of intelligent systems in transport management
- **3.1.6.** Operation and development of the public bicycle-sharing system, expanding of cycling services
- **3.1.7.** Extension of demand responsive passenger transport services
- **3.1.8.** Development of the unified taxi service in Budapest
- **3.1.9.** Car sharing
- **3.1.10.** Public sanitation and public health tasks of urban transport

3.2. Active awareness raising

- **3.2.1.** Education for conscious mobility and safe transport
- **3.2.2.** Awareness campaigns and communication
- **3.2.3.** Integrated customer centres
- **3.2.4.** Preservation and presentation of transport heritage

4. EFFECTIVE GOVERNANCE SYSTEM

4.1. Consistent regulation

- **4.1.1.** Further task in the transformation of transport governance, normative and reliable financing of public transport
- **4.1.2.** Economic and administrative incentives
- **4.1.3.** From regulation of parking to regulation with public space management approach
- **4.1.4.** Regulation of sightseeing vehicles and tourist buses
- **4.1.5.** Integrated transport safety database
- **4.1.6.** Promotion of environmentally friendly transport technologies

4.2. Regional cooperation

- **4.2.1.** Establishment of institutional relations to ensure an adequate degree of integration of transport services within the Budapest region
- **4.2.2.** Maintenance and development of the unified traffic model
- **4.2.3.** More stringent regulations for the zoning system based on the total weight and traffic restrictions based on environmental characteristics
- **4.2.4.** Operation and development of the freight transport access regulation system
- **4.2.5.** Implementation and development of a city logistics system with territorial and time regulation

LIST OF ABBREVIATIONS, CONCEPT EXPLANATIONS

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ABBREVIATIONS

BKK Centre for Budapest Transport

BKSZ Budapest Transport Federation (expression of the target system and management behaviour of the regional public **transport cooperation in Budapest)**

BKRFT Budapest Transport System Development Plan

Bubi Budapest Bicycle – public bicycle-sharing system

SEA (SKV) Strategic Environmental Assessment

SUMP Sustainable Urban Mobility Plan

CONCEPTS, EXPRESSIONS (IN THE CONTEXT OF BMT)

Agglomeration The agglomeration is a cohesive urban settlement system in which the centre and the settlements in its vicinity are characterised by close economic and infrastructural links. The largest urban agglomeration in Hungary is Budapest and its metropolitan area.

Access distance to first stop Required walking distance from the starting point of the journey to the nearest public transport stop

B+R parking Bike and Ride – bicycle storage facility with an option to transfer to public transport

Backbone (trunk) line The highest capacity line of a public transport network serving a specific area

Bogie wagon A railway car whose vehicle body and chassis with the wheel set are arranged in a pivoting framework

Brown zone Abandoned industrial and work sites

Bus corridor Traffic lane reserved for the exclusive use by scheduled buses and coaches participating in public transport

Car sharing A telematically controlled passenger car rental service, flexible in time and space, providing registered users with shared access to a particular fleet

City logistics Urban freight delivery management, organising of commercial traffic in order to reduce environmental pollution

Collective passenger transport A transport system, which may be used by anyone who complies with the terms and conditions of travel. Generally known branches:

- individual public transport (e.g., taxi, car sharing, public bicycles)
- public transport

Commuter traffic Traffic generated during journeys to and from work and/or an educational institution as well as during work and/or school

Congestion charge Traffic regulation tool which entails an obligation to pay a fee for entering or driving across a particular territory

Consolidation centre (distribution centre) A logistics facility that is relatively close to the served area and from where goods are regularly transported to that area. The purpose of consolidation centres is to centralise the reorganisation of certain freight transport operations impacting urban transport, in order to minimise the burden on the city and its inhabitants in terms of both the flow of traffic and the adverse environmental effects.

Designated loading area Area marked with the traffic sign according to 15 (6) KRESZ [Hungarian Highway Code] (no-parking sign, designated loading area on auxiliary signboard, restricted time period and duration)

Diametrical / diagonal route Public transport service that crosses the city centre with terminuses outside the central zone

EURO environmental categories The acceptable limit of emission levels by new motor vehicles sold in the Member States of the European Union is expressed by limit values, stated in legal regulations. Since 1992, the limit values for emission have become ever stricter and are established separately for diesel and petrol vehicles.

EuroVelo A network of planned bike trails across Europe, defined by the European Cyclists' Federation (ECF). The routes serve both cycling tourism and daily cycling. EuroVelo routes must have a defined standard of service and signage system. The routes of the Hungarian sections are specified in the National Spatial Planning Act as well.

Feeder service A public transport service which was designed to provide onward travel options by transfer to another, generally fixed-rail backbone line

Fixed-track infrastructure All transport means that require tracks, cables and/or overhead wires for operation, and where the vehicles may move only along the longitudinal axis or slightly deviating from it

Freight distribution Freight transportation/logistics concept: a freight transportation vehicle is loaded at a single loading site and distributes goods to various sites

Freight transport access fee Traffic regulation tool that entails an obligation to pay a permit fee for entering or driving across a particular territory with a freight transport vehicle. (At present, it equals the fee payable for the operation of a truck with a total weight exceeding the maximum total weight limit, indicated with a sign, as authorised by the road management agency.)

FUTÁR system GPS-based traffic control and passenger information system

Indicator Defined index for measuring processes and impacts

Integrated network organisation The organisation of the transport network in such a way that the aspects of various sub-sectors and service providers are taken into consideration together

Intermodal hub An intersection of various transport modes providing transfer / trans shipment options, coordinated in space

Intermodal transport Combination of various transport modes in an ideal travel chain in terms of environment, finances and travel time.

Interoperability, interoperable transport Technical provision of seamless interoperability between different systems. Various solutions to ensure interoperability between vehicle systems e.g. different track gauges, signalling, voltage levels, pantographs, etc. The essence of such transport is the ability of the vehicle to use different track and infrastructure systems instead of the passenger changing vehicles while travelling.

"Kiss and Ride" (K+R) stop "Kiss and Ride" – a short-term passenger car stop constructed near a public transport stop enabling the passenger to transfer directly to public transport

Limited traffic zone Area in which lorries, trailers, agricultural tractors and slow-moving vehicles exceeding the permitted maximum total weight indicated on the sign are prohibited

Line marking system A uniform system of the combination of numbers and/or letters to distinguish the services specified in the timetable.

Line / route Route and stops of a line as specified in the timetable

Measure A set of tasks assigned to strategic objectives to help in achieving that objective. Several projects could help to implement a single measure. In terms of operational objectives, it is a means to realise those objectives, while from a project aspect, it is the objective itself.

Mobility need People's need for locomotion in public space

Modal switch Transfer from one transport mode to another

Motorised transport mode The collective term for travel options where the vehicle is equipped with an engine, a built-in machine

Non-motorised transport mode Collective term for cycling and walking

Overlapping routes The routes have a common section, preferably with shared stops

P+R car park "Park & Ride" car parks offer long-term parking and are constructed specifically for enabling users to change from a passenger car to public transport. No parking fee is charged in any car park marked with the P+R sign, unless the car park is guarded as an additional service. The guarding fee collected per calendar day for the additional service between 6 a.m. and 10 p.m. must not exceed the lowest fare applied in public transport available at the given settlement.

Priority Importance, preference; intervention area of EU development projects

Protected area Area designated as per 14 (1) n) of KRESZ Hungarian Highway Code (with no entry signs from both directions) where entry and parking are subject to conditions.

Providing accessibility Deliberately designing or modifying the environment to accommodate people with reduced mobility, for whatever reason, in order to assist them in activities in which they are impeded

Public transport Transport mode which is conducted by public transport vehicles (e.g., buses with a capacity to carry more than nine passengers)

Railway route Part of the state railway network

Rolling stock General definition for iron-wheeled vehicles engaged in fixed-rail transport

S-Bahn concept A concept for the development of an integrated rapid rail network for Budapest and its surrounding area, prepared in 2009

Sub-sectoral goals Goals of different transport sub-sectors (individual, community and public road, railway, waterborne, air, respectively)

Suburbanisation The process during which the residents and then the businesses and services move out from the city into smaller settlements in the metropolitan area

Tariff community Common fare payment system of various subsectors and service providers designed on the basis of integrated principles

Terminal railway station A station from where trains can move on only by changing direction

Time-based ticket A fare product which is priced according to the time spent travelling

Traffic calming Reduction of the volume and speed of road traffic and influencing its composition by means of traffic control technology tools

Traffic management Operational management of road and public transport in order to ensure the smooth flow of traffic and to eliminate disruptions as soon as possible

Traffic model Transport development planning tool. Due to the complexity of transport networks, each transport development project has an effect on the social, economic and environmental features of city districts, areas. Traffic modelling is a tool for analysing those effects.Traffic modelling is the phase of presentation of transport effects in which the decisions stemming from the socio-economic environment leading to people's daily mobility are modelled. Thus, the analysis focuses on the quantity of movements within a particular area (district) and the volume of traffic from one district to another and its distribution by route and transport mode and where the expected impacts of transport measures are predicted.

Transport corridor The venue of traffic movements

Transport mode The means for mobility, such as walking, cycling, public transport, passenger car, freight truck, etc.)

Transport planning Conscious shaping of transport means, infrastructure and their use, strategic and detailed planning of future transport services based on scientific methodology

Travel chain Consecutive use of transport modes from departure point to destination

Vehicle dynamics A feature reflecting the movement, acceleration and deceleration abilities of a vehicle

White Paper A strategic document adopted by the European Commission in 2011 with the subtitle "Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system". (In general: the final version of the strategic documents of the EU Commission)

Zero emission Operation/vehicle with no harmful emission of pollutants

BUDAPEST MOBILITY PLAN
VOLUME I: OBJECTIVES AND MEASURES

The plan was prepared by the BKK Centre for Budapest Transport for the Municipality of Budapest on the basis and revision of Volume I (Objectives and Measures) of the Mór Balázs Plan approved by the Budapest General Assembly in 2015. The Budapest Mobility Plan is the SUMP framework document for transport development in the next decade (2020–2030), dynamically aligned with sustainable urban development. The range of projects evaluated here may vary according to the BMT methodology laid down according to the target system.

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