The paper deals with the problems of modelling urban public transport with regard to the principle of the sustainability of transport development. The proposed model is one optional solution to problems of urban public transport, which integrates objectives of mobility, physical planning and environmental protection in transport policy.

1. INTRODUCTION
A transport policy, including urban transport policy can be defined as a complex of regulatory, operational and economic measures that executive authorities implement in the realization of their strategic goals of transport development. Therefore, the implementation of transport policy measures assumes the adoption of a transport strategy. Based on the development of a transport system strategy, branch strategies have to be made. In this sense urban public transport is an integral part of the urban and suburban transport, and the implementation of transport policy measures of urban transport assumes the adoption of an adequate development strategy for urban transport. The solving of transport problems in the cities assumes the implementation of regulatory measures and a complex of technological, operational and economic measures. The improvement of transport conditions in urban areas is a precondition for their sustainable development.

The effectiveness of implementing a development model is reflected proportionally in the level of political commitments and consistency in handling various interests of the state policy and subsidiary objectives, operators’ interests and users’ interests. In compliance with the ECMT Strategy of sustainable transport development and the White Paper of the European Commission on the European transport policy, further development of a transport system is based on the principles of integrity, inter-modality and sustainability, which mark to a great extent the development policy in the urban public transport as well. Transport policy needs to show a special sensitivity to solving the problems of urban transport management, so that in this sense, the combined instruments in cooperation with medical, social, and other departments should be used to influence:
• a shift in the existing transport demands from road motor transport to alternative modes,
• a shift of the transport demand from individual to public transport,
• the prevention of unnecessary traffic by reducing the travelling distance, through the use of IT technologies,
• the substitution of fossil fuels by alternative fuels.

The individual objectives of the European transport strategy, e.g., fair pricing, transport safety and the protection of the environment and the health of people, directly refer to the implementation of transport policy measures in urban transport. The policy action instruments refer to various policy areas: regulatory, investment and fiscal policy – policies of taxes and prices, environmental protection, transport management, physical planning, and social policy. The accompanying measures for implementing the mentioned guidelines refer to:
• preparation of expanded plans (and financing) for public passenger transport;
• promotion of environmentally acceptable transport modes, particularly pedestrian and cycling transport, as well as healthier transport modes;
• a program of restrictions in using motor vehicles in urban areas;
• a program for the comprehensive adaptation of a transport infrastructure and means of public transport to the needs of the disabled and the elderly.

There are three key elements in the strategic planning and transport policy in the development of urban public transport:
• institutional and legal frameworks – regulation and incorporation of EU regulations and best practices,
• infrastructure – targeted development programs of public and non-motor transport, and
• management – service providers (operators) in urban transport.

Although there are no concrete regulations at the European level for the segment of urban transport, some strategic documents and provision of international conventions are applicable to the transport sector, i.e., the urban transport sector.
• the Kyoto protocol provisions on the reduction of eight per cent of CO₂ pollution between 2008 and 2012 compared to the reference status in 1990;
• the provisions of the Green Paper of the European Commission on the substitution of 20 per cent of conventional fuel consumption by alternative fuels, and
• the provisions of the Green Paper of the European Commission on urban transport, which is in a draft phase.

The best practice, e.g., of the implemented measures of the transport policy on the CIVITAS pattern of 36 European cities, however, clearly suggest development guidelines for urban transport and can be entirely implemented in modelling the development of urban public transport in Croatia.

2. REGULATORY ASPECTS OF MODELLING URBAN PUBLIC TRANSPORT

The strategic objective of local communities is to achieve a configuration of the transport system which recognizes four vital dimensions:
• the transport dimension – an adequate balance between the percentage of public and private transport in satisfying the needs of all the market segments,
• the ecological dimension – maintaining the overall volume of pollution caused by transport modes at an acceptable level,
• the economic dimension – the potential creation of new financial resources by solutions of giving “value for money” and the capacity for inducing the desired behaviour (demand) of the users through fair charging mechanisms (without discrimination),
• the social dimension – providing the citizens with a transport system which suits their needs.

Since it is difficult to achieve an ideal system in modelling urban public transport, an acceptable solution will also be the one which establishes a certain degree of compensation among these domains in compliance with the socio-economic and cultural reality of every specific urban district, and the conditioned political options and accompanying financial support as the result of the interaction between the local, regional, and national levels of the interventions. The model, therefore, functions at the strategic level of defining the objectives as a response to the individual and social interests of the stakeholders.

There is no urban transport system option marked by bilateral agreements between the operators, who tend towards the maximization of their own profit, without offering a network whose size and form also efficiently assure acceptable economies for the users and the local environment.

The form of urban public transport organization is conditioned by the main variables at the tactical level, out of which the first three are internal and the last is external in relation to the mobility system:
• the plurality of initiatives and the level of freedom on the market and the entrepreneurship,
• the level of competition and incentives within the system,
• the level of technical competence of the complex of network planners,
• the political and administrative organization of the country / region.

The basic division is between a regime in which the initiative is taken over by the operator and one in which the initiative of creating the transport system is left to the authority. The advantage of the former model, as articulated by the notion of a market initiative, is that it actually allows for the active participation of the operators...
in the service design, the stimulation of improving the service, and the consequence that the operator takes over the majority of the planning and revenue risks.

The revenue risks are, as a rule, related to patronage and price, and the latter substantially affects the quality and adequacy of the service for the customers’ needs, so that it is very important to include the operator in the creation of the an urban public transport system.

The planning risks result from various sources – urban planning also raises the issue of mobility; road infrastructure planning denotes the quality of the public transport operative; and the plan realization may be of an advantage, while the deficiencies of their realization can substantially disturb the mobility system.

Within the mentioned entrepreneurial classification, two different regulatory regimes regarding the level of system competitiveness can be distinguished – deregulated (free competition) and control (concessionary) regime, which is a form of limited competition. The former is a good example of the lack of a market initiative system, which is reduced or sometimes non-existing, of network integration and coordination with a certain decline in the public transport system quality.

In such systems of limited competition the management can alleviate this barriers by assigning concessions, in order to satisfy the specific requirements of the system integration (physical, tariff) and to achieve a balance in the efficiency and consumption, i.e., allocate resources in compliance with the needs and preferences of the consumers and the operational efficiency.

Where the creating of the public transport service is the responsibility of an authority, the satisfaction of strategic objectives is theoretically much easier to achieve, and the implementation may be possible at a lower cost. The advantage of such a regime is in the structural priority of the integration and stability of serving, whereas the cost efficiency is achieved by other instruments.

In these systems the level of competition can vary, depending on the alternative methods applied by the management in achieving the planned and productive values.

3. INTEGRATION ASPECTS OF MODELLING URBAN PUBLIC TRANSPORT

In principle, quality influences consumer satisfaction. In urban transport, apart from the users’ satisfaction, the mobility system must also satisfy political objectives, particularly the increase in the market share of the public transport, the release of budget means and environmental protection.

Therefore, urban public transport planning must be coordinated at all levels of decision-making, both in conditions of a stable state regime and in variable market environments.

A management system is a unique and dynamic task, and there is no specific recipe or recommendation for the best system. However, the main requirement in undertaking moderate changes in a system is the identification of those persons who will be affected by the changes and to what extent. In managing a system of urban mobility, there are four interdependent factors of successful change processes:

- the regulative and organizational regime of public transport services and other transportation services,
- the charging and financial regime of the public transport support,
- the integration of mobility policy, urban planning and environmental protection,
- the information technology system to support the management of urban mobility.

4. THE FACTORS INFLUENCE THE EFFICIENCY OF URBAN PUBLIC TRANSPORT

In order to increase the usage and efficiency of an urban public transport system it is necessary to study the factors that move or restrict the effects of this system in more detail. These are primarily social and economic criteria of efficiency – increased use of an urban public transport system, improvement of the environmental quality conditions or contributing to employment. In this group one has to mention the accessibility, quality, availability and affordability of public transport services.

An important role also lies with the criteria for financial and economic efficiency, especially the internal cost efficiency and user-
oriented offer. This complex assumes interconnected objectives and the functioning criteria of urban public transport. The current meeting of such objectives of a transport policy should be explained by a package of generic and locally specific historical factors. An indication of the policy’s success is the usage of the urban public transport system, which is a composite indicator of numerous politically relevant criteria.

The characteristics of an urban public transport system, which is articulated through the notions of share and quality, crucially depend on a package of critical conditions for success. The majority of these critical conditions are divided into four groups – external, strategic, tactical and operative.

External conditions do not belong under the authority of urban public transport management, and therefore cannot be controlled – population, population density, population distribution, large incident gatherings and manifestations, etc.

The objectives of urban public transport are under the influence of strategic factors, which are determined by various stakeholders, particularly national, regional and local authorities – political interests, specific urban public transport regulations, integrated public transport and urban development.

The tactical level refers to the issue of how general objectives can be reflected in the implementation of urban public transport services – organizational frames, financial frames, subsidies, public-private partnerships and interfaces of urban public and other transport modes.

The operative group of conditions contains the service and performance of urban public transport services – diverse offers (bus, metro, tramway, etc.), the privileged position of urban public transport (the priority in using the infrastructure), traffic density (frequency, intensity), integration of public transport (maps, logistics, routes) and marketing and public transport information technology.

5. COORDINATION OF FUNCTIONS – PLANNING AND OPERATING OF URBAN PUBLIC TRANSPORT

The recognition of the interactions between the modules and functions requires the development of compatible policies by both sides in the process of strategic transport planning. This is often combined in a transport plan and urban planning or plan structures, which offer a strategic framework within which the modal and functional policies have been separately but consistently developed.

Short-term plans often assume the form of a rolling five-year program. Advanced management tools, such as planning, programming and budget system and the acceptance of a series of standards and guidelines for providing services, can help in converting good planning into well-guided implementation.

An entire spectrum of strategic functions is usually developed for an agency at the level of a metropolitan region, including:

- a development strategy for urban planning;
- an environmental protection strategy;
- road planning, including the supervision of the development of private concession;
- a transport management strategy;
- a parking and road charging strategy.

Determining the scope of functions for metropolitan area management requires the development of integrated strategies, knowing that, due to the restrictions of the normal democratic process, this will start their implementation as well. Agencies have to act within these comprehensive strategic frames, regardless of whether they are part of the authority, quasi-authority or an entity within the regulatory department.

6. APPLICABLE URBAN PUBLIC TRANSPORT MODEL IN CROATIA

In considering the applicable models and scenarios for the development of urban public transport in Croatia, the starting basis lies in evaluating the status of the levels of its establishment regulation and organization.
About 70 per cent of the population and about 80 per cent of the traffic are concentrated in the urban areas of Croatia; the regulation of this transport segment at a government level does not exist, and the authority for managing urban transport has been delegated to the level of local authorities.

The municipal authorities have no autonomy of action in the regulation of transport; there is a lack of integration of the segments of the planning, monitoring, management and controlling of urban transport, and a large number of cities in Croatia have no organized urban public transport modes.

While in bigger towns, such as Zagreb, Split or Rijeka, the solving of urban transport issues, due to the negative impacts of uncontrolled growth in individual road transport on the quality of living, has become a question of the sustainability of further development; in smaller towns and urban settlements the failure to organize this transport mode has made the realization of the basic rights of citizens to mobility and freedom of movement questionable.

The complexity of the problems regarding urban transport management is reflected in different, yet interdependent, factors of influence:

• economic, regarding the efficiency and effectiveness of the public transport system expressed as the value of transport effects and economic benefits,
• social, regarding the provision of public services and the principles of accessibility for all the citizens in all areas, and
• ecological, regarding the provision of mobility which will not endanger environmental protection and the health of the people.

The sectors of demographic policy, urban planning policy and environmental protection have to be integrated into the strategic planning and urban transport policy. Besides, the subsidiary objectives of sustainable development impose the implementation of the principles of integration, inter-modality and sustainability in the regulatory and organization of urban transport.

It is not possible to realize the required integration and implementation in the existing regulatory and organizational regime of urban transport in Croatia, since in the existing system of "deregulated" urban transport management, the public authorities at the local level have neither the authority nor the autonomy, the competencies for such action.

Therefore, the model assumes the regulatory organization of urban transport at all the decision-making levels – the state and local levels of the county and municipal authorities. The regulatory organization of urban transport, apart from the mentioned vertical coordination and cross-sector integration, assumes as well the horizontal coordination of the transport sector, particularly in the issues of the modal structure of urban transport (modal share).

At the state level and local county level, it is necessary to organize the authorities for urban transport with the function of the strategic planning of transport development and the authority function in the standardization of the minimal conditions of the construction, organization and regulatory levels of urban transport, and other instruments in the realization of national and county strategic objectives, which principally or conditionally denote the segment of urban transport. In this context, these levels have to insure the budget means for the implementation of the dictated conditions in urban transport.

According to the model, the authority for urban transport at the local level of a city has the executive functions regarding strategic development and the policy of urban public transport – the planning, regulation, organization and management of the urban public transport system. Therefore, the urban transport authority at this level has to have autonomy of action and budget means.

Recognizing the good practice of separating the regulatory and operative functions, the model of urban public transport assumes the establishing of an agency for urban public transport with the tasks of certification, licensing and concessions of operators in urban public transport and the contracting of all the outsourcing arrangements.
for the realization of the operational plans and programs in urban public transport. The organizational model of urban public transport should be based on the semi-market operational concept in order to insure a balance between the economic interests and the uniformity of the public service offer and quality of service. For the requirements of monitoring and management of urban transport as well as the public transport, the model foresees the establishment of a series of support units of urban transport entities – an operational centre for transport management, the statistical and analytical sector and the urban transport police. The public transport segment, as part of urban transport, should not be treated here separately, and the model assumes that in these entities of planning, management and control, all the urban transport modes are uniformly represented and integrated.

7. CONCLUSIONS

Solving the problems of public transport, especially in urban areas, directly correlates with numerous non-transport disciplines. Therefore, the wider themes of area (physical) planning, sustainable development and environmental issues are noted within the context of this paper. Problems in the integration of the objectives of the physical planning, environmental protection and mobility in transport policy are real both in the cities of the European Union, as well as in the cities of the transition countries. The models for the improvement of urban transport in the pilot projects realised are analogously applicable at a regional level. This fact is of great importance for the regulatory harmonisation, strategic planning and policy of urban transport management in Croatia.

In aiming to reduce undesired effects primarily caused by the uncontrolled growth of individual road transport, the conceptualisation of the branch strategy of urban transport is suggested a long with the application of related instruments of transport policy. Using the examples of the European cities included in CIVITAS initiative, the improvement of the public urban and suburban transport is proposed by combined measures of transport policy and innovative technological, operational and economic solutions. Targeted benefits can be recognised in the concept model of an urban public transport system, which assumes a system of multi-level decision making on the strategic development of urban transport and respect all the relevant parameters of the development of urban public transport – regulatory, organisational, socio-economic and ecological. By applying this model of urban transport organisation within the conditions of limited competitiveness, the balance of the cost efficiency of operators and the interest of the users and the social interest of sustainable city development would be assured. Standards and best practices of the European cities involved in programmes of improving urban mobility would also be complied with.

(Footnotes)

1 Final report on the Green Paper "Towards a European strategy for the security of energy supply", (COM/02/321).
2 City VITALity Sustainability Initiative – eight demonstration projects within the schemes of the 5th and 6th Framework Programmes.
REFERENCES


