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ANALYSIS OF THE PUBLIC TRANSPORT FOR THE METROPOLITAN AREA OF TIMISOARA AND TIMIS COUNTY

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ABSTRACT: The paper presents the adoption of a set of measures which enable the implementation of an integrated and sustainable public transport system for Timis county with PT lines (road and rail) which are optimally configured and dimensioned at county level, the optimal connection of the urban and sub-urban passenger public transport based on a multimodal approach, which enable safe mobility with reduced energy consumption and transport costs.

KEYWORDS: public transport, urban transport, metropolitan transport, integrated system

INTRODUCTION

The quasi continuous reduction of the mobility based on public transport associated with the so-called urban sprawling and the changes in the localization of the workplaces were factors which imposed qualitative changes in the public transport at urban, sub-urban and regional levels, through the implementation of an integrated and sustainable passenger public transport system. This type of system needs the existence of a set of subsystems which have to be correct planned and dynamically coordinated in order to offer functional connections to increase the level of service of the public transport, including the schedules, some added services and real-time information.

The scope of the work was to configure an integrated passenger public transport system for Timis county using the suitable transport modes (road transport by buses and coaches, railway transport and inland water transport), including the components for passenger transfer between local and regional networks, dispatching and coordination of the services and information of the passengers. In the same time, it was in the center of the attention to configure a public transport network which is capable to attract and to respond to the mobility demand, both to those which are at daily bases (the professional trips) and to occasionally ones. Another factor which was taken into account was that the network of the public transport lines has to be configured in a way that the functioning could be splitted in subsystems between local and regional transport associations. It was previewed that the proposed network will increase the mobility of the population at Timis County level, but in the same time to facilitate a significant reduction of the private car usage in order to contribute to the increasing quality of the environment and to facilitate a sustainable development of Timis County.

THE REGIONAL PASSENGER PUBLIC TRANSPORT

The regional public transport network is composed of the railway network and the public transport bus and coach lines (see Figure 1).

The railway network of Banat region (a part of which is Timis county) is one of the oldest and most developed railway network in Romania, having the highest network density (90.5 km per 100 km²) and the city of Timisoara is the most important railway node in South-West Romania.

It is connected to all the important cities in Romania, most of the smaller localities in the region and two international railway lines make the connection to Budapest and Belgrade.

The railway public transport is organized and managed at national level. The local authorities (including those at county or regional level) have no competencies in these matters. The network of the railway lines which are in operation at this moment is presented in Figure 2. In the figure one could observe the lines which are operated daily (including all the lines, not only at county level) and the number of the trips per day.

Most of the network is operated by the Romanian National Railway Society (SNCFR), which is state owned, through regional and inter-regional trains. Nevertheless, an important number of lines

are operated by the private owned company Regio Trans. Actually, SNCFR operated a number of 16 lines having 67 pairs of trains per day, while Regio Trans operates on 21 lines having 52 pair of trains per day, all of them being regional units with smaller transport capacities and relatively low speeds.

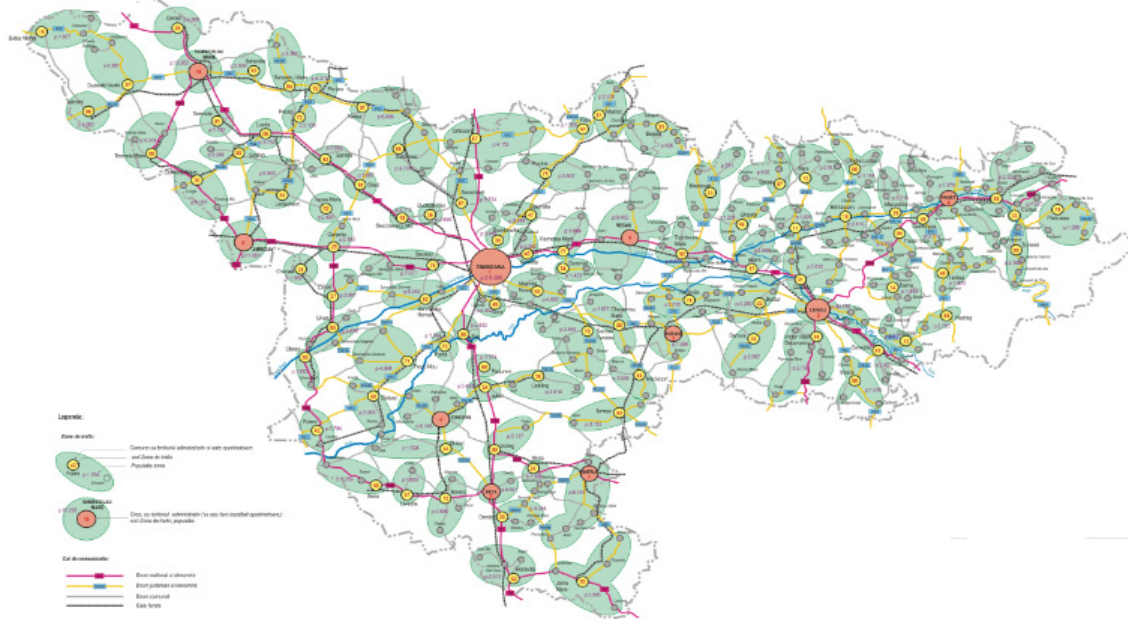


Figure 1. The regional passenger transport network (zoning)

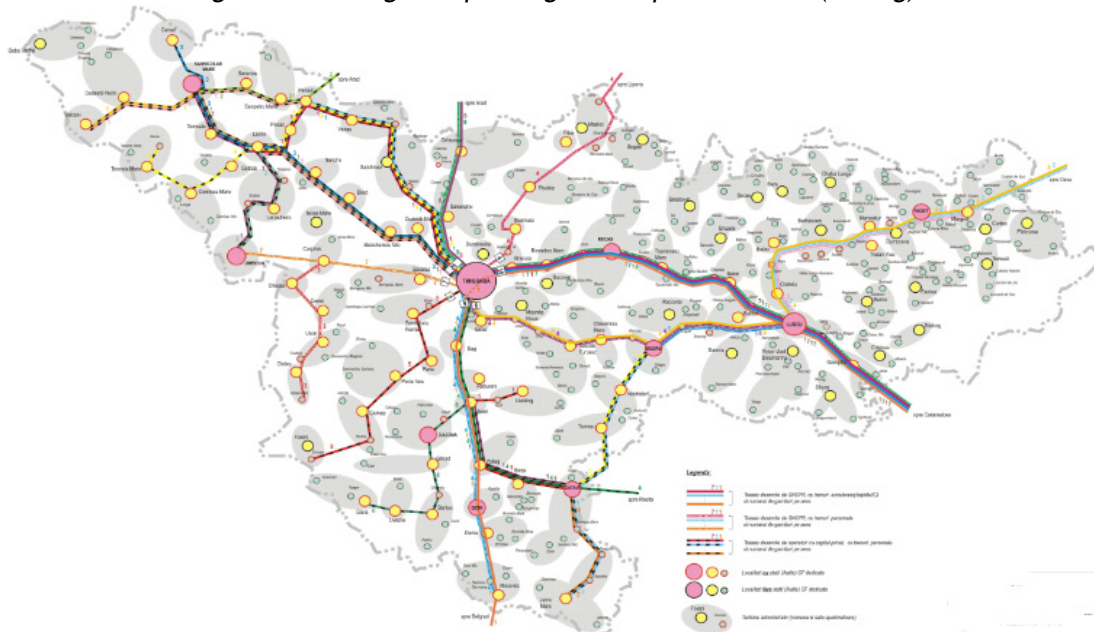


Figure 2. The network of the passenger transport on railways in Timis county

The road public transport with buses and coaches in the county (with the exception of the inter-regional, urban and metropolitan transport) is under the authority of the County Council and is regulated through formal Decisions of the County Council. There are three different groups of transport. The first ones are the normal lines which have a public schedule and are open to all the public. The second are the so called special scheduled lines, which are lines to transport the workforce to workplaces based on special conventions and they are not open to all the public. The third is the school bus transport system which is operated with vehicles owned by the Ministry of the Education or the local authorities.

In the case the normal scheduled public transport, there is a County Passenger Transport Plan which was adopted by the Decisions of the County Council number 17 / 2008 (completed and/or modified through other Decisions of the County Council). Through this plan there are 120 public transport lines defined (containing the routes, the number of pair of vehicles per day, the active vehicles which are operated on the lines, the transport capacity and the transport schedules) which are attributed to companies through public procurement procedures. The lines are presented in Figure 3a and 3b.

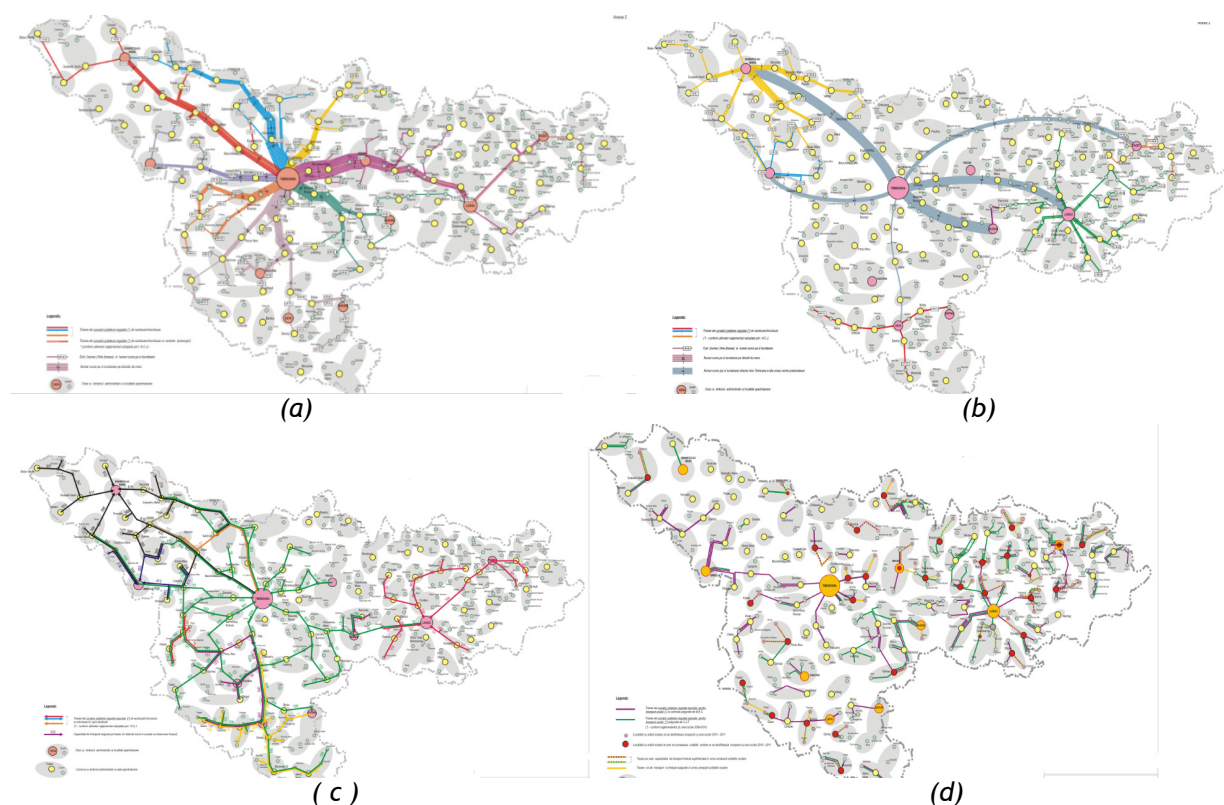


Figure 3. The bus network of Timis County. a. Normal scheduled lines which are connected to Timisoara. b. Normal scheduled lines which are connected to other towns. c. Special scheduled lines. d. School bus lines.

The special scheduled lines are regulated by the County Council but if there is a demand from companies which have to transport their workforce to the workplaces. Most of them are relatively big companies, with hundreds of employees, working in two or three shifts and the employees having their home at relatively large distance from the workplace (typically at around 10 to 50 km). At the moment, there are 138 lines, operated by 27 companies. The structure of the network is presented in Figure 3c, including the transport capacity of the lines.

The school bus network is regulated by the County Council too and its function is to transport at daily bases the students living in small rural localities to the designated school centers, which normally is the closest. That network is presented in Figure 3d, based on the last two years.

The commuter (sub-urban) bus network of Timisoara city is organized under the umbrella of an association called The Metropolitan Transport Society of Timisoara. The establishing protocol was signed by the mayor of Timisoara and the mayors of a number of small villages and commuter towns in the vicinity of Timisoara. As a consequence, the RATT (the Public Transport Company of Timisoara) began to operate lines on some relations with good results.

THE TRANSPORT DEMAND IN TIMIS COUNTY

The methodology which was used to assess the transport demand was based on the acquisition and statistical processing of the data which was measured through census and surveys. The data acquisition was organized in home based surveys, surveys and passenger count in the public transport stops and terminals (mainly train and bus terminals), acquisition of social and economic data for the transport zones (there were 99 traffic zones, consisting of 10 cities and 89 smaller towns and villages). There were passenger counts in order to assess the spatial and time distribution of the passenger flows. We count the number of the exiting and entering flows in the vehicles. There were origin - destination surveys on the main penetration roads in Timisoara and we studied the commuter flows. The total number of trips and their modal shift is presented in Table 1.

ANALYSIS OF THE ACTUAL SITUATION

The detailed analysis of the actual situation makes possible to assess the level at which the passenger mobility demand is satisfied by the existing system and helped in the definition of improvement proposals, mainly on short term level.

From the point of view of the spatial covering of the network, there are some places which have no normal scheduled public transport service. The number of such places is very small and total number of the population which has no access to normal scheduled public transport is around 4,000 to 5,000.

Based on quantitative criteria, the network is characterized by an excessively high density, a very high level of branches of the network, a very high level of redundancy (many partially overlapped

lines), low levels of demand / capacity rates, very low level of attractivity (only 29% of the trips are using public transport) and a very weak level of interconnection of the transport system components. On the other hand, the level of adaptability of the system seems to be very good.

Table 1. The modal split of the total number of trips

Mode of Transport	Transport relation						TOTAL	
	TIMISOARA- Rest of the county		Cities - Rural localities		Between rural localities			
	# of trips	%	# of trips	%	# of trips	%	# of trips	%
Passenger car	76848	78,1	9266	46,6	5257	50,8	91371	71,0
Bus and coach	16261	16,5	8950	45,0	4129	39,9	29340	22,8
Railway	5306	5,4	1688	8,5	962	9,3	7956	6,2
TOTAL	# of trips	98415	19904	10348	128667			
	%	76,5	15,5	8,0	100			

One of the biggest problems is related to the very low level of attractivity of the public transport system which is showed by the modal split. Only 6.2% of the trips are linked to railway transport, 22.8% to buses and coaches while the share of the passenger cars is 71%.

Another issue is related to the fact that the share of the normal scheduled lines compared to that of the special scheduled lines is not high enough. The trip distribution between the three public transport modes by buses and coaches is presented in Table 2.

Out of the total number of trips per day of 128.667, only 13.049 (10,1%) are related to normal scheduled bus line and 13.829 (10,7%) to special scheduled bus lines. Especially in the case of the trips which are not related to Timisoara the distribution is not suitable.

Table 2. Trip distribution between public transport modes by buses and coaches

Type of bus lines	Transport relation						TOTAL	
	TIMISOARA- Rest of the county		Cities - Rural localities		Between rural localities			
	# of trips	%	# of trips	%	# of trips	%	# of trips	%
Normal scheduled	9610	59,1	2710	30,3	729	17,7	13049	44,5
Special scheduled	6651	40,9	5988	66,9	1190	28,8	13829	47,1
School buses	0	0	252	2,82	2210	53,5	2462	8,4
TOTAL	# of trips	16261	8950	4129	29340			
	%	55,4	30,5	14,1	100			

Finally, there is a very low level of interconnections between the different sub-systems of the transport system of the county. Actually there is no integrated intermodal transport system in Timis County. There is an important deficit in the connection between the county system and the local public transport of Timisoara.

PROPOSALS TO IMPROVE THE REGIONAL AND SUBURBAN PASSENGER TRANSPORT

On short term the target of the proposals are only the elimination of some disfunctionalities which were revealed in the analysis of the actual situation and refers to the optimization of the normal scheduled public transport with buses and coaches and to the establishment of a commuter (sub - urban) transport system for the Timisoara which have to be extended to the Metropolitan area of Timisoara. The latter is based on The Metropolitan Transport Society of Timisoara and its future development. The main idea is the establishment of commuter sub-urban lines of two types. One type is a line which is similar to a normal urban line with high frequency (with intervals of 5 to 7 minutes in peak hours and maximum of 20 - 30 minutes in off-peak) and metropolitan lines on a radius of 15 - 20 km with an interval of 30 to 60 minutes, which are connected to the urban public transport network (buses, tramways and trolleybuses). These metropolitan lines could increase the capacity and the attractivity of the public transport and could take from the private passenger cars around 40 - 50% of the trips (see Figure 4a).

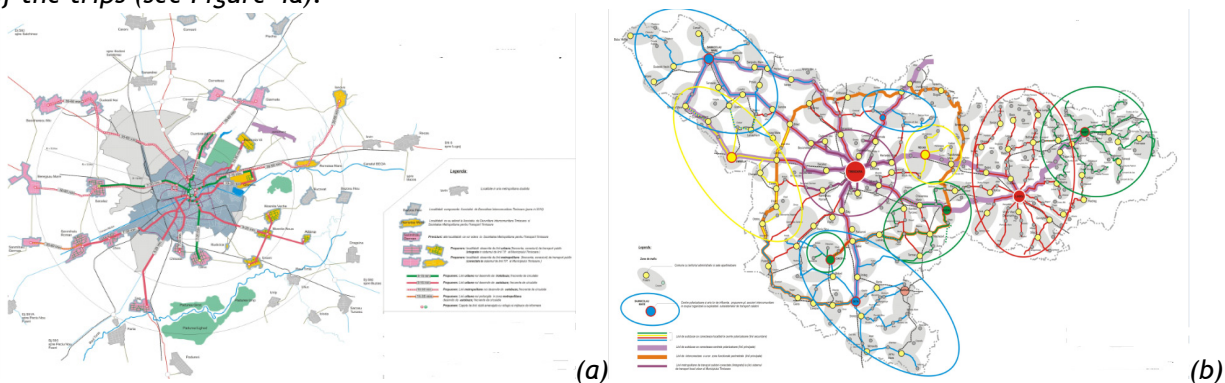


Figure 4. Proposals for restructuring (a. At metropolitan level; b. At regional level.).

At regional level, the proposed measures are related to the configuring of a much more efficient network through the restructuring into a two level hierarchical network. The first one is networks of main lines, which connects the main cities and towns and have the highest capacities. The second level is a network of secondary lines which are feeder lines for the main network (see Figure 4b). Today the network has 99 lines, the new, hierarchical network will have only 77 lines. The number of vehicle trips per day will increase from 250 to 350, the total per day mileage will increase from 19 196 km to 18 704 km while the transport capacity will amplify from 9 149 to 14 920 passenger per day.

On medium and long term, the elements of the actual matrices and the forecasted values of the trip generator factors were taken into account and based on them the forecasted mobility matrices were computed. In the forecast of the social and economic parameters, different development plans were taken into account.

The main scenario was based on the assumption that on medium term we will have an integrated and intermodal system and the modal choice will reflect the effects of that new system (see Table 3). The forecasted evolution was mainly characterized by the increase of the total number of trips per day (from approximately 128 thousand to 155 thousand) and higher percentage of the railway transport and of the normal scheduled bus lines in the modal split to the detriment of the passenger cars.

In the spatial distribution of the network, the main alterations were related to a larger metropolitan zone of Timisoara, the introduction of some new metropolitan public transport lines, mainly based on electric powered vehicles (tramway and trolleybus) and the establishment of scheduled public transport on the Bega canal, in order to satisfy the forecasted demand (see Table 3). There are proposals to rehabilitate some of the railway station, the development of intermodal terminals and transfer points in all of the main transfer centers.

Table 3. The forecasted modal share - medium and large foresight

The forecasting level	Transport Mode	Type of mobility relation						TOTAL	
		TIMISOARA-rest of the county		Cities and towns - small villages		Between small villages			
		# of trips per day	%	# of trips per day	%	# of trips per day	%	# of trips per day	%
The actual situation	Passenger cars	76848	78,1	9266	46,6	5257	50,8	91371	71,0
	Buses and coaches	16261	16,5	8950	45,0	4129	39,9	29340	22,8
	Railways	5306	5,4	1688	8,5	962	9,3	7956	6,2
	TOTAL	# of trips per day	98415	100%	19904		10348		128667
	%	76,5		15,5	100%	8,0	1		100%
On medium time horizon	Passenger cars	41200	41,2	8700	29,1	5600	46,3	55500	39,1
	Buses and coaches	32000	32,0	11500	38,5	5100	42,1	48600	34,2
	Railways	26800	26,8	9700	32,4	1400	11,6	37900	26,7
	TOTAL	# of trips per day	100000	100%	29900		12100		142000
	%	70,4		21,1	100%	8,5	1		100%
Large time horizon	Passenger cars	35000	31,8	9000	28,6	6000	44,4	50000	32,3
	Buses and coaches	42000	38,2	11500	36,5	5500	40,7	59000	38,1
	Railways	33000	30,0	11000	34,9	2000	14,8	46000	29,7
	TOTAL	# of trips per day	110000	100%	31500		13500		155000
	%	71,0		20,3	100%	8,7	1		100%

Based on the transportation modeling system analysis, one could estimate that the redesigned network of the normal scheduled bus lines in Timis County will be able to satisfy the forecasted demand even on large time horizon if the fleet of the buses and coaches will be renewed and the railway could increase its modal share.

In the case of the railway transport, the actual spatial structure of the network corresponds to the demand even on long term, but in order to increase the attractivity and the modal share of the railways, important improvements are necessary in the frequency and the speeds of the commuter and regional trains.

From the point of view of the costs of the transport, the main proposal is related to implement such a public procurement system which could assure that the transport tariffs will be the smaller which are economically acceptable and sustainable, efficient resource management have to be the normal functioning and, last but not least, implementation of state-of-the-art ticketing systems and charging schemes. In the last case, the probability of application even in an integrated transport system is relatively low because of the relatively high number of operators.

The economic and technical analysis demonstrated that the Metropolitan Transport could be operated by a single operator in a feasible and efficient way. In the case of the secondary lines which are the feeders for a single center it seems that it is important to have a single operator for all the

lines in the group. In this case, modern ticketing systems could be operated at least in the case of such subsystems.

CONCLUSIONS

The implementation of an integrated and inter-modal public transport system for Timis County, which could offer a more suitable modal share between all modes of transport, will offer the possibility to a higher degree and in the same time more sustainable mobility of the population. This could be a starting point of a healthier economic growth without jeopardizing the environment, mainly through the decreasing of the level of the traffic congestions, the increasing of the road safety and through the transport cost reductions because of the reduction of the passenger car usage. A well planned, dimensioned and operated public transport system will be much more attractive for the population.

REFERENCES

- [1.] Ghionea, Florian - *Urban Transportul*, Editura MatrixRom Bucuresti, 2005.
- [2.] Ghionea Florin - *Public Transport - Editura "MatrixRom", București*, 2004;
- [3.] Ghionea, Florian - *Public passenger transport technology*, Editura MatrixRom Bucuresti, 1999
- [4.] Iftimie, Constantin - *Towards an effective and efficient transport*, Editura MatrixRom Bucuresti, 2004;
- [5.] Hensher, David, Button, Kenneth, *Handbook of transport modelling*, Pergamon 2005.



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