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SUSTAINABLE DEVELOPMENT AND GLOBALIZATION: THE ROADS LINKS OF THE TRANSPORTATION CHAIN

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INTEGRATION OF THE ROAD NETWORK OF THE METROPOLITAN AREA OF THE CITY OF TIMISOARA TO THE NATIONAL TRANSPORTATION SYSTEM

ABSTRACT

The report shortly presents the studies realized for the development of the road infrastructure in the metropolitan area of the city of Timisoara in the context of its integration in the national transportation network. It mentions the condition of the Romanian road network and the strategy concerning the construction of highways and the rehabilitation of trunk national roads in the European network. The prospects of the economical and social development of the city of Timisoara, from the point of view of the European tendencies, foreshadow the creation of a metropolitan pole which integrates the important towns on a 30km radius.

The traffic study for the city of Timisoara has been realized in an integrated conception that treated the analysis of the present traffic, respectively the elaboration of the traffic forecast on average and long term. It emphasized the present and forecast values of the main traffic indicators on vehicle types (motorization degree and mobility). Based on the data obtained, arrangement proposals have been formulated to improve the present traffic, respectively the development strategies for the future road infrastructure.

Considering the development prospects for the area and the results of the traffic study, propositions for solutions have been formulated to integrate its road network in the national transportation system taking into account the strategies elaborated by the central administration in the context of the need to get connected to the European road transportation system.

The proposed solutions have taken into consideration the sustainable development of the regional road transport infrastructure, by properly dealing with the issues of the impact upon the environment and of adaptability to the future needs.

1. INTRODUCTION

The road infrastructure in Romania covers about 200,000km of roads, including streets in urban and rural settlements and is one of the less dense in Europe (about 0.83km/km²). The national road transportation network in Romania has the following structure:

- 218km motorways;
- 5,938km European national roads;
- 4,383km national trunk roads;
- 5,384km national secondary roads.

Also, the technical condition of the road network is poor, significant efforts being called for its modernization and rehabilitation.

In the context of the integration to the European Union, a pressing necessity is to bring the road transportation network to the level of performance compatible with the other European countries in the union. This situation generated the elaboration of strategies for building the national highway network, respectively for rehabilitating the paved roads and for paving the local loads. The programs in view took into consideration the integration of

the road network, as part of the national transportation system, in the development strategy of the European road transportation system.

The report presents the conceptions considered, the studies realized and the solutions proposed for the development of the road infrastructure in the metropolitan area of the city of Timisoara, laying in the west of Romania, seen in the light of its connection to the European highway corridors on Romanian soil. The sustainable development was one of the main criteria that form the basis of the development strategy synthetically presented in the following paragraphs.

2. STRATEGY FOR DEVELOPING THE ROAD NETWORK IN ROMANIA IN THE CONTEXT OF THE EUROPEAN TRANSPORTATION SYSTEM

During the last 15 years (1988...2004), the traffic intensity on the national roads witnessed a significant increase, as follows:

- on the European national roads: 87%;
- on the national trunk roads: 62%;
- on the national secondary roads: 66%.

At the level of the year 2005, the anticipated data show high traffic values on the networks converging towards the main cities, respectively values over the daily annual average of 8,000 or 16,000 physical vehicles/24 hours (on the roads with 2, respectively 4 traffic lanes), at the entrance and exit in and from the main urban agglomerations (Bucharest, Ploiesti, Timisoara, Brasov, Constanta, etc.). The further increase of the traffic on the national road network is foreseen in the rhythm of 5...7% every year.

The strategy for developing the road infrastructure in Romania is drawn up in the context of the European integration by realizing stage programs for the rehabilitation and modernization of national roads and a national program for building highways, meanwhile adopting a specific legislation for the purpose.

2.1. European road transportation corridors on Romanian soil

Aiming at ensuring a sustainable development, integrated in the strategy for developing the global European transportation system, the European countries have drawn up a coherent strategy for the realization of road transportation corridors, two of them being designed to cross Romania (figure 1):

- road corridor no. IV situated on the direction West – East, which connects Germany to Greece/Turkey by crossing the Check Republic, Slovakia, Austria, Hungary and Romania on the route Berlin/Nuremberg – Prague – Vienna - Budapest – Arad – Sibiu – Bucharest – Constanta and Lugoj – Drobeta Turnu Severin – Craiova – Calafat (1,203km, representing 33% of the total length, on Romanian soil, to which adding another 315km, corresponding to the route Sibiu – Brasov – Bucharest;
- road corridor no. IX situated on the direction North – South, which connects Finland to Greece by crossing 7 other countries: the Russian federation, Belarus, Lithuania, Ukraine, the Republic of Moldavia, Romania and Bulgaria, on the route Helsinki – St. Petersburg – Moscow – Kiev – Chisinau – Bucharest – Harkovo – Komotini – Alexandropolis (6,500km, out of which 418km on Romanian soil, representing about 33% of the “Southern” section).

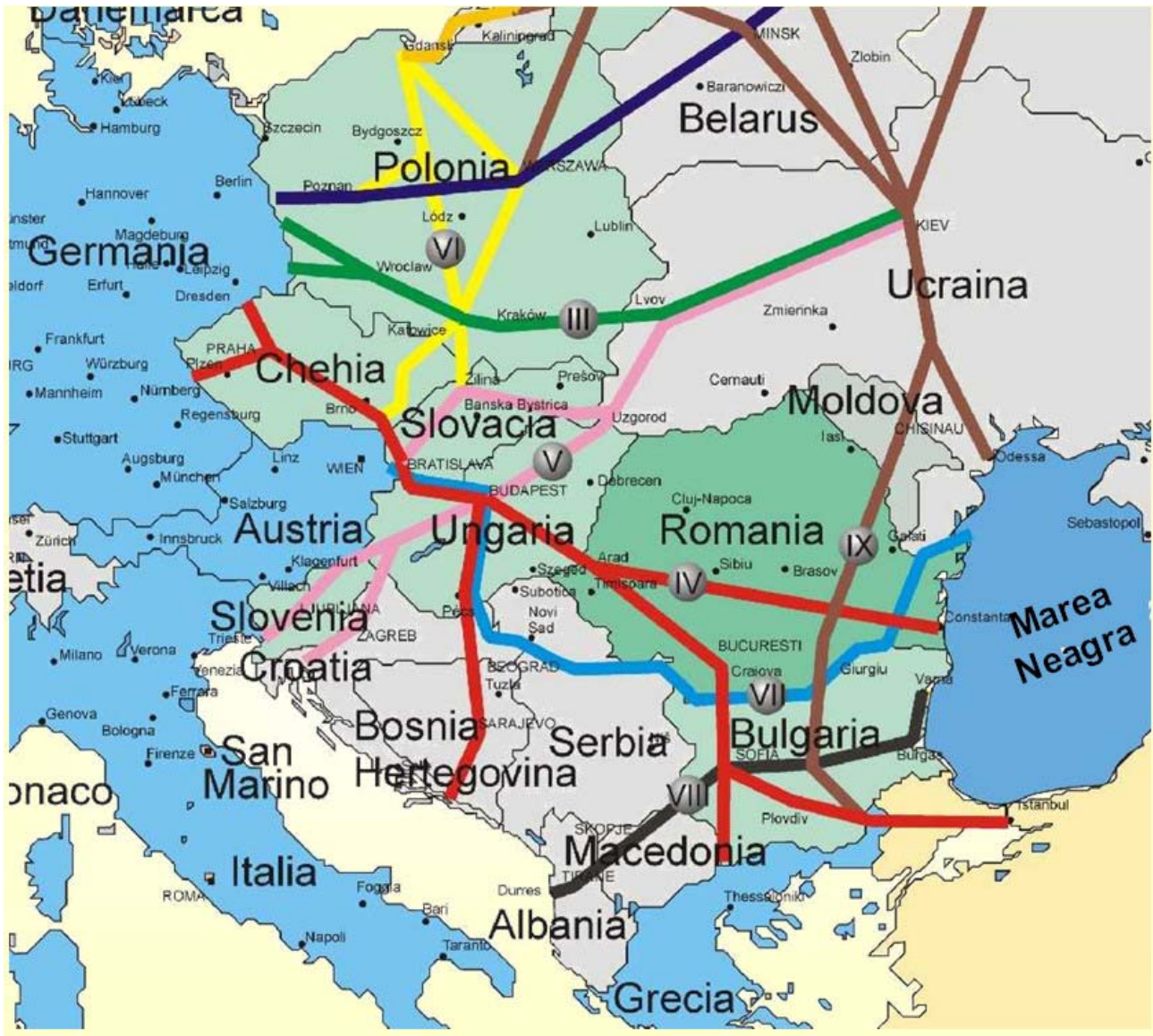


Figure 1 – European transportation corridors

The construction and modernization of the Romanian road infrastructure situated on the two European road transportation corridors contributes to the gradual integration of our country to the family of countries on the European continent and to showing to advantage our economic and tourist resources.

2.2. Development program for the highway network

In the context of the developmental requirements for the road infrastructure network and following the results of the negotiations for becoming a member of the European Union, Romania set out a highway building program on medium and long term, concretized by its inclusion in the Plan for Arranging the National Territory (P.A.T.N.), endorsed by the law in September 2006 (figure 2).

In the main, highways have been proposed on the route of the above mentioned European corridors crossing Romania. Concerning the phasing of their realization, table 1 presents the present stage, including the estimated values of the investment.

PLAN DE AMENAJARE A TERITORIULUI NATIONAL SECTIONEA I - REțele DE TRANSPORT A. DIRECTII DE DEZVOLTARE A REțeleI DE CAI RUTIERE

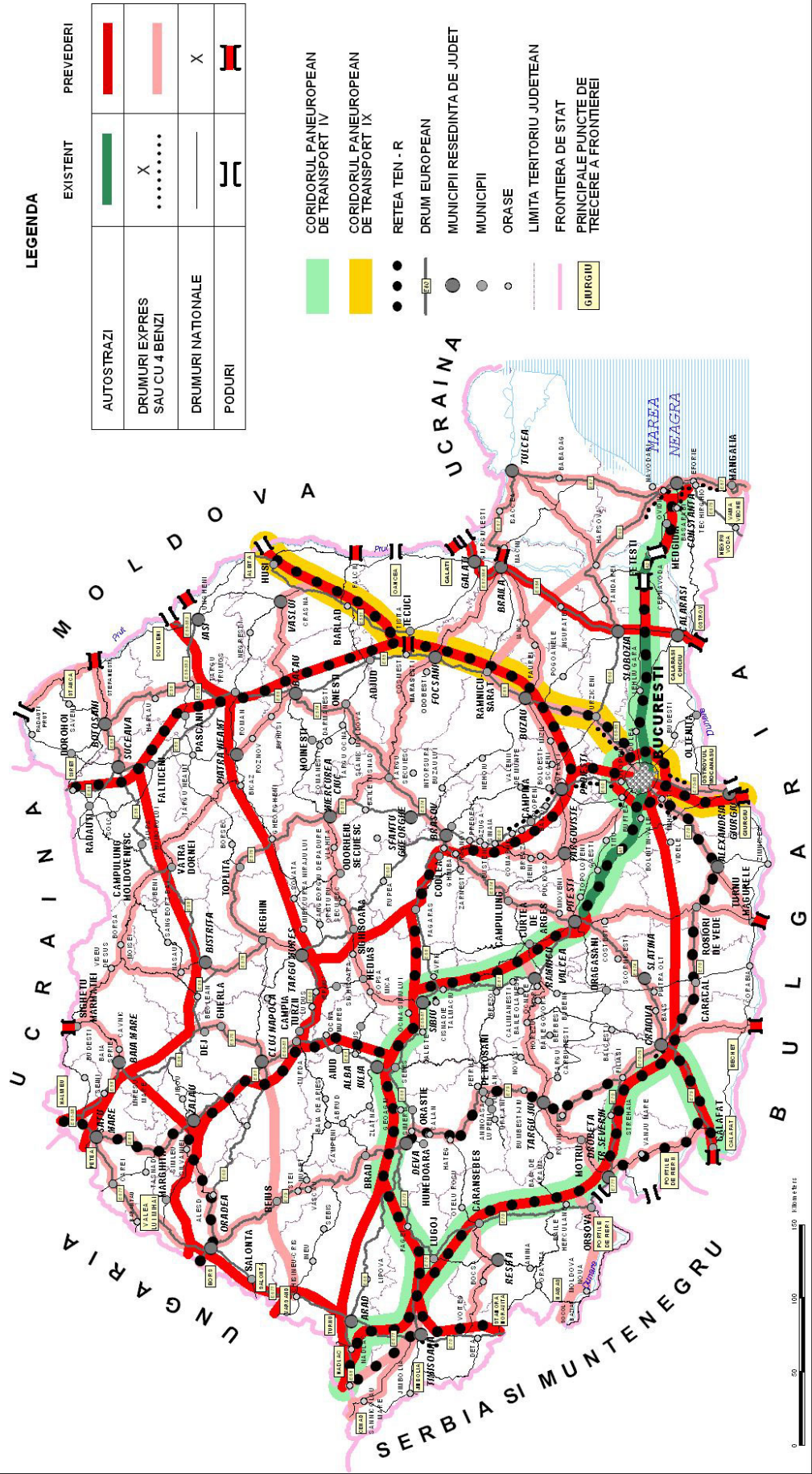


Figure 2 - Plan for Arranging the National Territory

Table 1 – National highway program

Present stage	Length, km	Value, Million €
Highways with concluded contract	507.90	3,723.48
Highways in preparation	393.42	2,485.12
Highways in prospect	697.00	4,182.00
TOTAL	1,598.32	10,390.52

The program for building highways is completed by the realization of certain express roads or 4 lane roads on the routes with intense traffic, as can be seen in figure 2. Also, the realization of bypass roads for the main cities, to take over the through traffic, represents a priority objective.

2.3. Rehabilitation of the national trunk road network

The present technical condition of the national road network, which takes over an important share of the traffic, is very poor on most of its length, which determined the promotion of a national rehabilitation program to bring it to the international operational parameters, to meet the requirements of the users from the point of view of comfort, safety and efficiency of movement. We also want to mention that the adopted technical solutions took into account the aspects imposed by the sustainable development, both in point of the adaptability to subsequent interventions, and concerning the impact upon the environment.

The objectives of the rehabilitation performed on the national roads are the following:

- increase of bearing capacity on paved road sections, by calculating it for the 115kN axle;
- dimensioning and paving the bridges for the loading class “E”;
- improvement of the geometrical elements according to the stipulations in the European Agreement concerning the traffic on large roads (A.G.R.);
- building an additional lane for heavy traffic on upgrades and downgrades with gradients over 5%;
- ensuring the drainage of rain waters;
- observing the European standards concerning the type cross profile.

The National Road Administration started to implement the rehabilitation program in the year 1993; it has stages until 2015 (table 2), when the rehabilitation of the main national roads is to be finished. Certainly, in Romania other programs administrated by the central or local administrations are developed in the same time, aiming at ensuring an adequate level of viability.

Table 2 – Rehabilitation program for the main national roads

Stage	Length rehabilitated roads, km	Value, Million €
During the period 2005...2006		
STAGE III	207.680	235.232
STAGE IV	653.550	695.840
During the period 2006...2008		
STAGE V	661.360	507.569
STAGE VI	786.780	773.423
During the period 2007...2009		
STAGE VII	516.410	399.759

Stage	Length rehabilitated roads, km	Value, Million €
During the period 2008...2011		
STAGE VIII	394.630	406.000
STAGE IX	493.000	413.000
During the period 2009...2012		
STAGE X	373.000	260.600
STAGE XI	702.000	604.400
During the period 2010...2013		
STAGE XII	512.000	423.050
STAGE XIII	515.000	632.550
During the period 2012...2015		
STAGE XIV	568.000	421.100
STAGE XV	448.000	484.400
TOTAL	6,736.920	6,106.49

During the first two stages (1994...2004), 2,164km of national roads were rehabilitated. During the period 2005...2015, the rehabilitation of the national roads will continue (according to table 2), attention being paid to the roads that are part of the T.E.N. network (Trans European Network).

3. PROSPECT OF THE DEVELOPMENT IN THE METROPOLITAN AREA OF THE CITY OF TIMISOARA

The city of Timisoara, laying in the west of Romania, is placed on the Pan European Corridor of transport no. IV. It has a population of about 400,000 inhabitants, being one of the most important poles for the social and economical development in the country.

3.1. Prospect of the urban development of the Timisoara metropolitan area

If the classification of the city of Timisoara is analyzed according to the "Provisional Report concerning the Territorial Cohesion" of the General Direction for Regional Policies within the European Commission, issued in 2004, we find that, from the point of view of the FUA (Functional Urban Areas), of the three categories, namely the "Metropolitan areas of European importance (MEGA)", the "Functional urban areas (FUA) of national or transnational importance" and the "Functional urban areas (FUA) of regional or local importance", we are in the second category. The metropolitan areas of European importance, in the first category, are considered the engines of the European development. They are the development poles at the European scale. These poles are divided according to their power on three levels, namely: strong metropolitan areas, potential metropolitan areas and week metropolitan areas. In the same research, Timisoara Metropolitan Area is present on the last place at the level of the week metropolitan areas with a blank card. In all these hierarchies, a basic criterion is represented by the access to the transportation system, which means also access to the road networks.

Any growth or decrease process on the area of a locality is performed after studying its position in the European, euro-regional, national, regional, local context. This preceding research is required to take into consideration the problem of the bigger whole which includes that locality and to be able to integrate the sub-objective road network in the objective of the transportation system next to the other main objectives which need to be determined for the respective urban development.

If we look at the positioning in the euro-regional context, we find that the distance between the two important metropolitan areas in the zone (Budapest and Bucharest), with over 1 million inhabitants, is over 800km, which renders necessary the emergence of a new powerful metropolitan area between them; Timisoara is found in a very favorable position from this point of view. This favorable position of the city of Timisoara in the European and euro-regional context is also found in the national context according to the law 363 of 21 September 2006, concerning the endorsement of the Plan for Arranging the National Territory (P.A.T.N.), Timisoara laying at the intersection of the main European highways.

These favorable positionings at European, euro-regional, national, regional and county level are not enough, they being mere arguments for the drawing up of a development strategy to avoid economic, social, ecological unbalancing, through the efficient and flexible harmonization of the strategic planning with the financial and spatial one.

In order to realize a sustainable development of the Metropolitan Areas, several essential principles are to be observed, out of which we mention:

- realization of the balance between the modernization at urban level and controlled urban development through developing the rural area, respectively preserving the areas altered by agricultural activities;
- taking into account the diversities of the urban functions and the social diversities in the urban and rural environment, stipulating construction and rehabilitation capacities large enough to satisfy without discrimination the present and future requirements as far as dwellings, economic activities, especially commercial and tourist ones, sports or cultural activities and general interest ones as public endowment;
- a good and balanced put to use of urban, peri-urban and rural natural spaces, monitoring of the movement requirements and the vehicle traffic, preserving of the quality of air, water, ground and underground, ecosystems, green areas, natural or urban places and environments, decrease of phonic pollution, protection of the remarkable urban ensembles and of the buildings part of the architectural heritage, preventing the foreseen natural risks, the technological ones, the pollution in general.

Therefore, a sustainable urban development of the Timisoara Metropolitan Area needs a harmonious and flexible cooperation of the strategic, spatial and financial planning.

3.2. Research of the road traffic and the road network

The road network of the city of Timisoara is of radial – ring-shaped type, providing connections on the direction of the main interurban roads in the national and European network.

The traffic study was realized in an integrated conception by approaching all its components, namely:

- analysis of the present traffic;
- drawing up proposals to improve the traffic for the present stage (proposals for arranging certain intersections and analysis of the signalized intersections);
- drawing up the Plan for Traffic Organization (P.O.C.);
- traffic forecast and therapy;

The traffic study considered an area centered on the city of Timisoara, with an about 15...20km radius. The following were taken into account to this effect:

Indices motor-cars and light goods	2003	2010	2020	
			Pessimistic variant	Optimistic variant
Motorization degree(physical vehicles/1,000 inhabitants)	300	350	400	400
Mobility (journeys/vehicle)	2.23	2.01	1.78	1.66

Table 4 – Indices for heavy freight vehicles

Indices heavy goods	2003	2010	2020	
			Pessimistic variant	Optimistic variant
Motorization degree(physical vehicles/1,000 inhabitants)	19.08	17.96	17.06	16.02
Mobility (journeys/vehicle)	1.06	1.37	1.57	1.60

Figure 4 shows the spatial distribution of the population at the level of the peri-urban areas of the city of Timisoara.

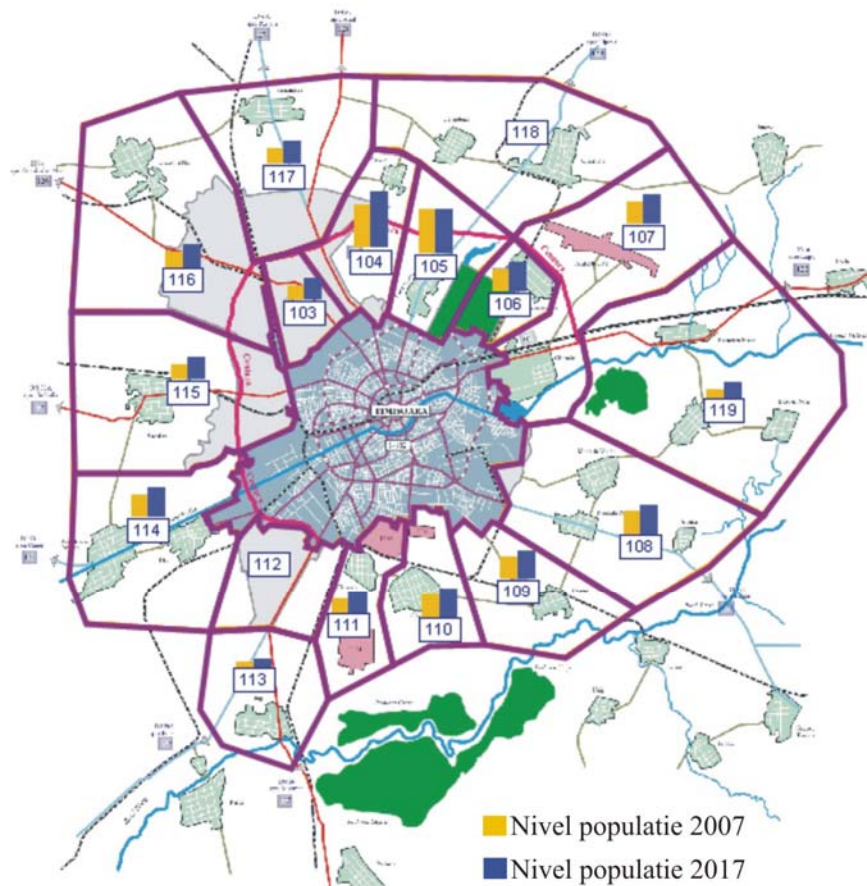


Figure 4 – Evolution of the population in the peri-urban areas of the city of Timisoara

The forecast of the road traffic consisted in the determination of the forecast matrix for the year 2010, as intermediate stage, respectively for the year 2020, in optimistic and pessimistic variants. The results are shown in figures 5 and 6.

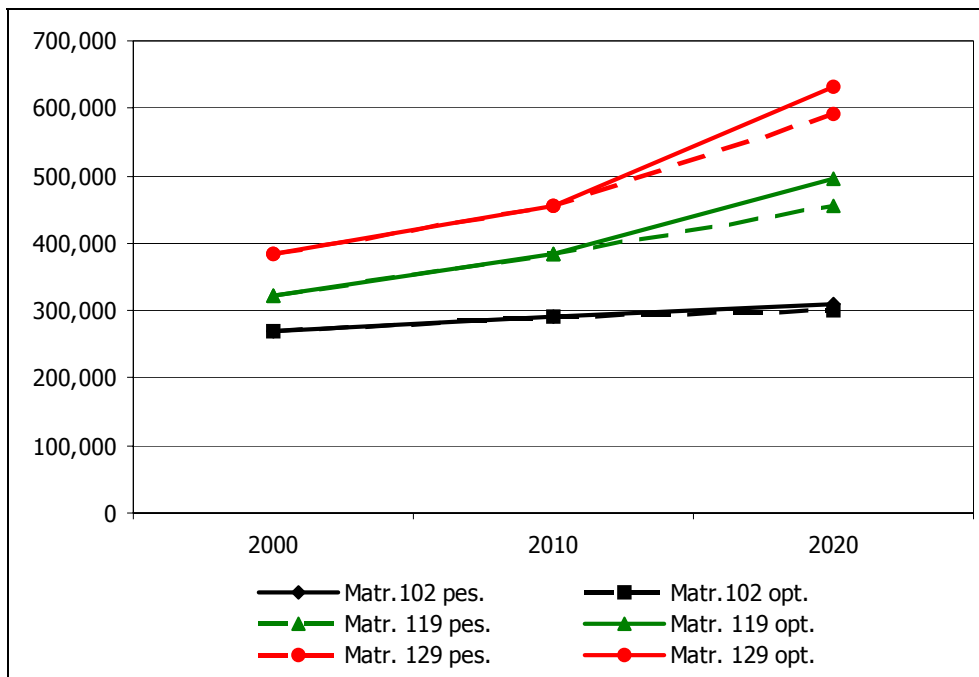


Figure 5 – Evolution of the prospect traffic forecast.

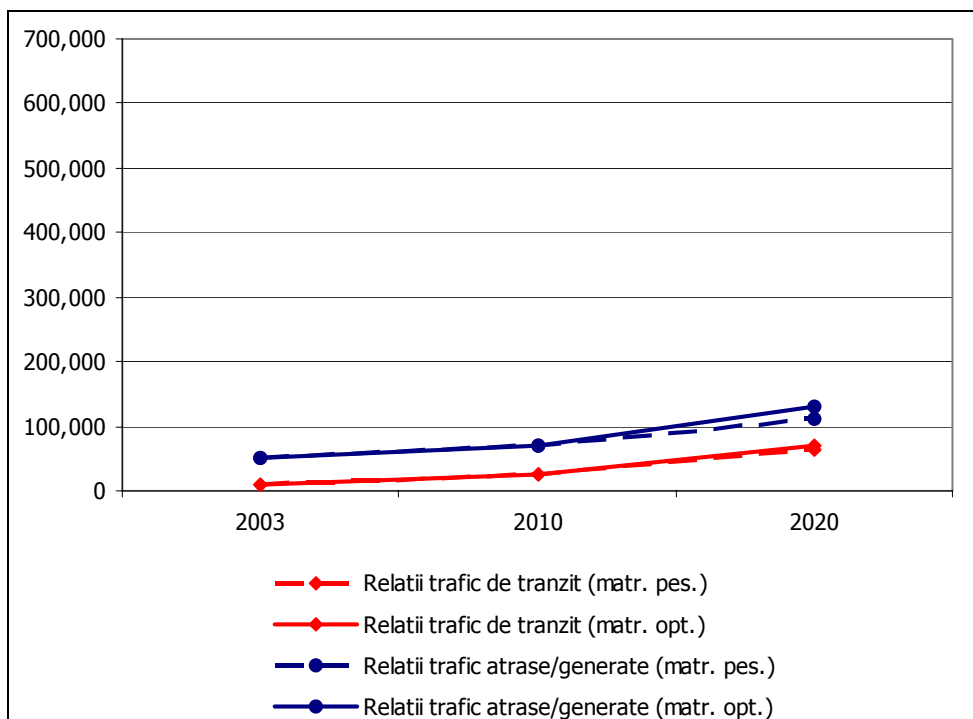


Figure 6 – Evolution of the through traffic.

The results of the traffic study allowed the proposition of solutions for the development of the road network in the area of the city of Timisoara, with stages at the level of the years 2010, 2015 and 2020, including their connection to the highway network, which is the corridor IV.

The simulation of the forecast traffic flows was realized on the graph that models the street/road network corresponding to each development stage of the network capacity. The used traffic matrixes were built specifically both to each time horizon considered and to each variant of traffic evolution.

With the forecast traffic flows, a series of specific indicators were analyzed, of the type: route, average speed, average travelling time and fuel consumption. It was found that the developments of the capacity in the street network in Timisoara lead to a significant improvement of the above mentioned specific indicators.

For the prospect stages a series of propositions were formulated concerning the development of the traffic capacity of the street network. The capacity analysis was realized taking into account the proposed capacity and the traffic volumes resulted from the simulations.

The results showed the need to increase the capacity on almost all the penetration arterials of the city/radial arterials, due to the development of the peri-urban areas/towns that will form the metropolitan area of the city of Timisoara. As in the case of the bypass road, these radial axes take over important traffic flows due to the developments in the metropolitan area.

We must keep in mind the analysis of the prospect enlargement possibility to 6 lanes and a synchronization of the traffic in the intersections on the penetration routes towards the ring arterials. It is also necessary to review the general organization of the traffic in the presently built area of the city of Timisoara.

3.3. Integration of the road network of Timisoara metropolitan area to the interurban road network

For each of the planning objectives of Timisoara metropolitan area (realization of a G.I.S. (Geographical Information System), infrastructure, housing, industry, services, tourism, university environment, etc.), a series of sub-objectives is required, to be reflected in the spatial planning, for the objective “infrastructure” taking into consideration the movements efficiency, water and sewerage network, waste pit and cleaning and the filtering plant.

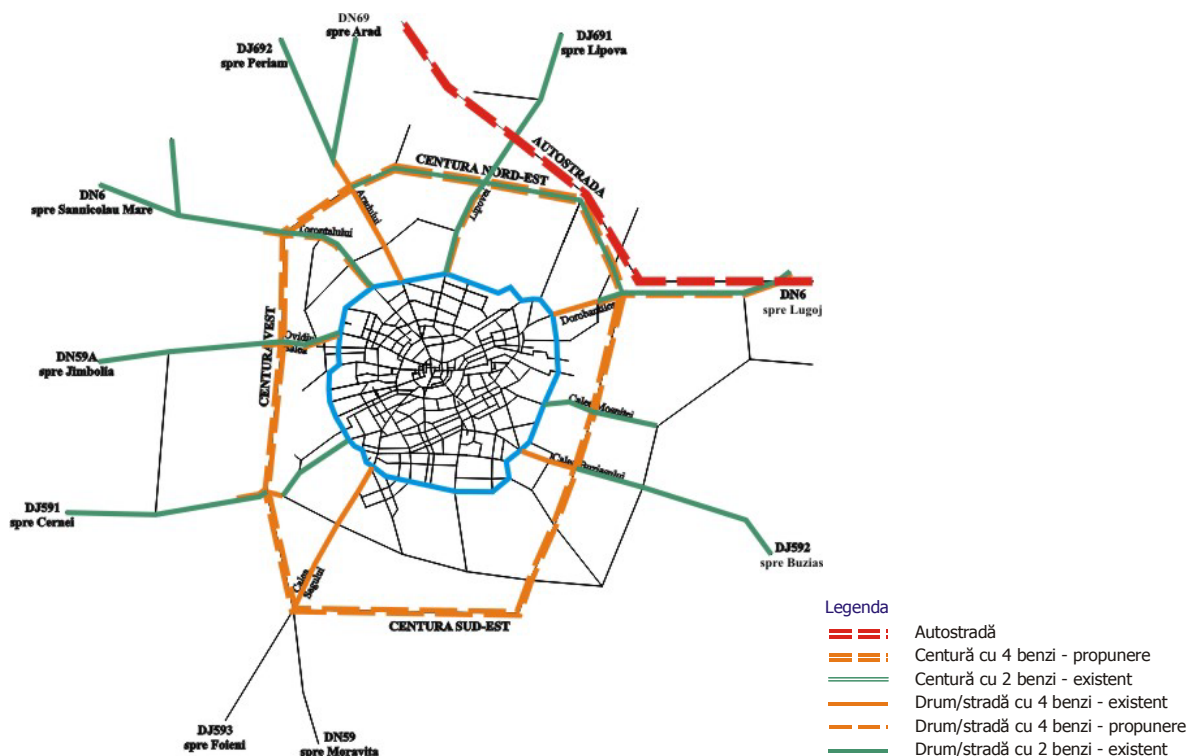


Figure 7 – Development proposals for the road network in the influential area of the city of Timisoara

The results offered by the traffic study, corroborated with the consideration of all the aspects connected to the prospect of the social-economical evolution, in the context of integrating the road infrastructure in the Timisoara metropolitan area to the national and regional (European implicitly) global transportation system, offers solutions ranging in the concept of sustainable development, which the local administration has already begun to include in its programs. Figure 7 shows the chart of the city's road network structure, with its connections to the highway on the pan European corridor no. IV.

4. CONCLUSIONS

The research performed concerning the development of the Timisoara metropolitan area has taken into account the prospects of its evolution in the context of the European tendencies and on the strategies for the realization of a high quality national road infrastructure, integrated in the Plan for Arranging the National Territory. These studies allowed us to draw up concrete propositions to render the movements more efficient, namely:

- realization of main rings and radials;
- building bypass roads for each town in the metropolitan area, crossed by national roads;
- rendering the public transport more efficient;
- realization of interchanging stations between the urban and the extra-urban transport;
- realization of parking areas;
- promoting other transportation means to clear the traffic (intra- and extra-urban cycle tracks);
- realization of intra- and extra-urban pedestrian areas;
- realization of residential areas with speed limits under 30km per hour.

Each of these programs comes with afferent measures, namely: bypass roads with continuous 50m high vegetation screens on each side, 3.5m high earthwork walls or 7m high panels for the phonic protection of the adjacent residential areas, ecological crossings for the nature reserves, 36m wide radial and ring-shaped roads outside towns, inter-modal terminals adjacent to road bypasses, highway and railways, efficient public transport.

5. REFERENCES

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Law no. 363/2006 PLAN DE AMENAJARE A TERITORIULUI NATIONAL – Secțiunea CĂI DE COMUNICAȚIE (PLAN FOR ARRANGING THE NATIONAL TERRITORY – COMMUNICATION WAYS)