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Romanian Road Infrastructure in the Frame of Sustainable Development Concept

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Summary

This article presents a brief but realistic evaluation of the present situation of the road infrastructure in Romania, in order to encourage the exchange of ideas about sustainable development in this important social and economical field. It presents the present technical state of the Romanian roads, the future requirements and the available resources to bring the road network at European standards.

KEYWORDS: road infrastructure, management system, transportation costs and resources, roads technical state.

1. INTRODUCTION

The Romanian road infrastructure constitutes a significant national asset, for which important human and financial resources are devoted. In the context of severe climatic and traffic conditions, specific to our country, a complex managerial strategy applied at national, regional and local levels is necessary to be conceived and implemented in order to preserve, modernize and extend the existing public road network .

Often, the absence of a correct strategy is justified by the permanent lack of funds and financial constraints, but in our opinion this is mainly caused by the lack of proper harmonization and adaptation of the general managerial principles to the specific social- economic development level attained by the respective countries.

At this crucial moment, when our country concentrates its efforts to enter into the European Union, and when the adhesion programs have to be developed in the context of the concept of sustainable development, the main objectives of the strategy adopted for the modernization of the road infrastructure have to be undertaken in a similar concept and to meet the European Commission requirements, proposed during 2001 year.

ISSN 1582-3024

Transportation Infrastructure Engineering
INTERSECTII
http://www.ce.tuiasi.ro/intersections
INTERSECTIONS

The following base principles involved in the sustainable development and specified by Clause 130 of the Maastricht Treaty has to be considered at the establishment of the programs of road works:

- the prevention against the serious and irreversible threats toward the environment;
- consideration of the environmental problems in defining and implementation of road policy;
- the participative principle , with the implication of the society in the process of taking major decisions;
- the obligation for the polluter agent to pay for the damages he is generating.

For our country, the implementation of this concept is rather complicated, considering the service level provided by the road infrastructure and its implications on the overall costs of the transportations system, taken as a whole.

2. COSTS IN TRANSPORTATION SYSTEM

The technical state of the road infrastructure can influence decisively the transportation costs. The specialized literature in this field stresses the correlation that exists between the infrastructure and the superstructure of the transportation system, represented in Figure 1. The percentages represent mean values, which may vary, depending on the country or region. A reduction of the transportation costs with only 5% may lead to double available funds for roads maintenance and, thereafter, a continuous reduction of the superstructure costs.

According to Japanese specialists (2), one less dollar in maintenance funds today is three more dollars in transportation costs tomorrow. Considering the presented structure of the costs, one can draw the conclusion that the necessary resources must be supplied by the user (the user is paying). This problem is complex and it is not the purpose of this article to analyze the worldwide used methods in this matter.

ISSN 1582-3024

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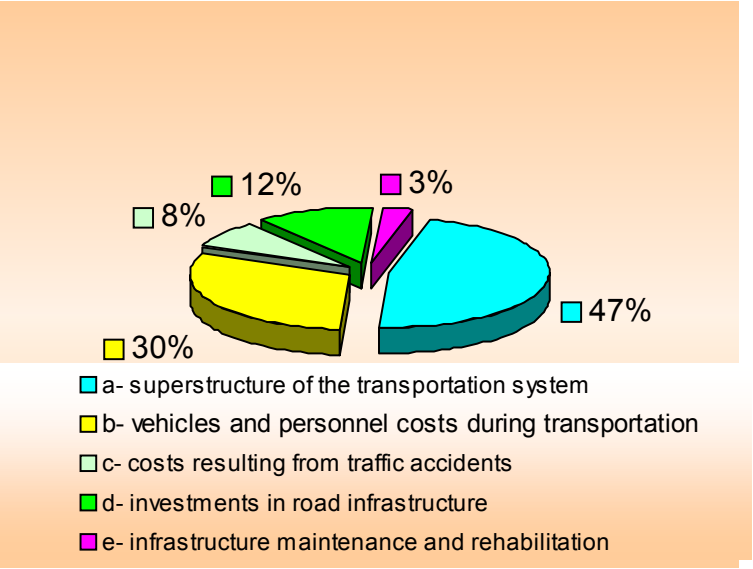

Figure 1: The structure of the costs in the transportation system

In the USA, a clearly defined principle governs the budgets of the all services (the road infrastructure representing also a service): there are no planned expenses without financing resources and also no taxes without a clear destination. In many other countries, there are cases when the money obtained from road infrastructure taxes are used in purposes other than road infrastructure works.

A very important study was done by C.E.S.T.R.I.N., analyzing the structure of taxes and tariffs applied to finance the road infrastructure works and it should be used as a strategic element for the roads management policy in our country (3).

3. TECHNICAL STATE OF THE PUBLIC ROADS IN ROMANIA

The public roads network in Romania, classified in national, departmental and rural roads, has a total length of 78658 km, according to Table 1. The evaluation of the technical state of this road network using a modern approach is practically impossible in our country At least for the departmental and rural roads, measuring some technical parameters such as surface distress, irregularities, roughness can not be evaluated observing the current standards.

ISSN 1582-3024

Transportation Infrastructure Engineering
INTERSECTII
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Table 1. Technical condition of roads and bridges – 31.12.2004

Components			Road category			
			National	County	Local	TOTAL
0			1	2	3	4
Wearing course type [km]	Bituminous	G	7318	5226	1015	13559
		S	3157	4522	1837	9516
		B	2944	6799	1456	11199
	PC cement	G	707	515	172	1394
		S	390	318	90	798
		B	646	443	102	1191
	Gravelly		269	15985	16064	32318
	Earth		35	1602	7045	8682
Total length (km) for road category			15467	35410	27781	78658
Bridges–number of bridges/length[m]		G	1441/47995	2594/49237	779/13772	4814/111004
		S	1330/35757	1172/18755	568/9220	3070/62832
		B	384/27729	701/5720	506/6362	1591/39811

Therefore, from the data existing in each administrative department, it results the following:

For the national roads, from a total of 15166 km paved roads, 8025 km are in a good state, 3547 km are in a satisfying state and 3590 km in unsatisfying state. Also, there still are 269 km stone roads and 35 km earth roads. It must be stressed that, in between 1995 – 2004, on the national road network, an extensive rehabilitation program has been applied. It was developed in four stages and it continues now with works on E – class roads and main roads. The total length of roads in service by the end of 2004 was 2490 km, with a total value of the works undertaken of 1494790000 € (see Table 6).

For the local roads:

- departmental roads: their total length is of 35410 km, of which 5741 km are in good service conditions, 4840 km – satisfying and 7242 – unsatisfying service conditions. The length of the stone roads is 15985 km, and 1602 km are still earth roads.
- rural roads: the total length is 27781 km, of which 1187 km are in good service conditions, 1927 km – satisfying and 1558 – unsatisfying service conditions. The length of the stone roads is 16064 km, and 7045 km are earth roads.

For the national roads, but especially for the local roads, the situation is rather difficult because, in time, intervention actions were not performed regularly, which

ISSN 1582-3024

Transportation Infrastructure Engineering
INTERSECTII
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led to the fact that most roads have exceeded their service life, with the only exception of the rehabilitated roads.

The situation is even worse if we consider the predicted evolution of the traffic in the future. In Figure 2, presenting the traffic values for each category of public roads, it can be seen that, at the level of the reference year 2012, on the national roads the traffic is double compared to the year 2000, on departmental roads the increase is 60%, and on rural roads the traffic increase is 50%, this data being the maximal, optimistic ones.

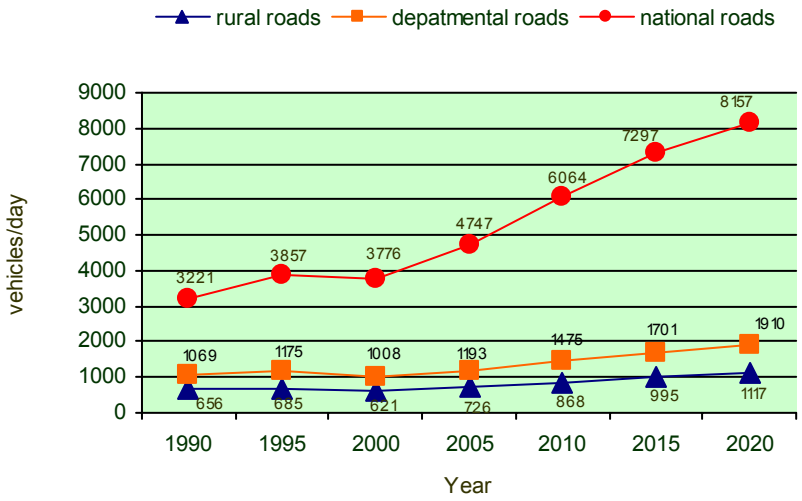

Figure 2: Traffic evolution on public roads, 1990 – 2000

4. ACTUAL RHYTHM OF IMPROVING ROAD NETWORK VIABILITY

If we consider the length of the public roads network, with various types of pavement systems – 37658 km – in between 2001 and 2004 there should have been carried out, according to the present technical norms prescribing the rhythm of interventions, maintenance and rehabilitation works on 12552 km, which means an intervention every 12 years. However, in Table 2 it can be seen that the total length on which such works have been carried out is 4864 km.

ISSN 1582-3024

Table 2. Road works carried out during the period 2001 – 2004

Type of works	Road category length [km]				
		National	Country	Local	TOTAL
0	1	2	3	4	5
Structural overlay	number	1797	373	116	2287
	value	327958428	19963139	6456886	354378453
Reconstruction	number	186	1534	61	1781
	value	17242103	72013053	3686096	92941253
Surface asphalt treatments	number	2885	3862	110	6857
	value	21132425	26466985	2143754	49743164
Thin overlay (I.A.U.)	number	17	679	470	1166
	value	1554021	39872661	46016373	87443055
Gravelly	number	0	1172	2175	3347
	value	0	6660819	112946025	119606844
Recycling	number	535	84	0	619
	value	57421004	4112663	0	61533667
Total value [euro]		425307981	169089320	171249134	765646436

The situation, for each road category, is as fallows:

- national roads: total length: 15163 km; works done on 2473 km;
- departmental roads: total length: 17823 km; works done on 1906 km;
- rural roads: total length: 4200 km; works done on 176 km.

Concerning the bituminous surface treatments, the situation is also difficult. According to the standards, every 5 to 7 years, any flexible pavement must be rejuvenated. This means that, in four years, at least 75% (28244 km).

Globally, only 6875 km roads were treated: 2885 km national roads, 3862 departmental roads and 110 km rural roads. A better situation exists in the case of stone paving earth roads, but still insufficient: 3347 km done, from 11000 km existing earth roads in 2001. The total value of the funds used in 2001 – 2004, presented in Tables 3 and 6, is 1.627.687.721 €, from which 269.500.000 € were for rehabilitation works.

5. GLOBAL REQUIREMENTS FOR PUBLIC ROADS NETWORK FOR SATISFYING ECONOMICAL AND SOCIAL NEEDS

For determining these requirements, the delays of the maintenance programs have been taken into account, as well as the objective of bringing the roads and bridges network to satisfying service levels.

Transportation Infrastructure Engineering
INTERSECTII
http://www.ce.tuiasi.ro/intersections

The structure of the costs involved is presented in Table 3.

Table 3. Road works budgeting during the period 2001 – 2004

Budget by source [euro]	Structure of the costs						
	Administration	Investments		Capital repairs		Current and periodical maintenance	TOTAL
		Roads	Bridges	Roads	Bridges		
0	1	2	3	4	5	6	7
Budget by source [euro]	8447268	19320062	5182773	8409706	1861085	380615479	423836374
Local budget	5419623	14025583	8665781	5939858	1583586	128581377	164215808
Own income	19067188	0	26796	0	0	87878968	106972952
Credits	4297522	3717787	154983	1358870	75421	111078799	120683381
Special fund	2503911	69510026	33046933	33300439	17621618	270759799	426742725
Other sources	850149	65816521	8954049	6328145	538469	33249146	115736480
Total value [euro]	40585662	172389981	56031318	55337022	21680184	1012163574	1358187727

The rehabilitation works for national roads have been estimated according to the strategy of the rehabilitation campaign, stating that at the end of this program (2012) the length of the European and main roads should be 6000km. For treatment works, the tasks were estimated according to the maintenance technical norms.

From Table 4, it results that the global cost is 10.407.830.689€: 4.343.565.324€ for national roads, 3.708.804.001€ for departmental roads and 2.355.465.364€ for rural roads.

Concerning the budget needed for bridges, the situation is presented in Table 5. The works considered were replacing provisory bridges, rehabilitation and maintenance. The total evaluated cost is 1.249.419.824 €. The global cost for finalizing this program is 11.657.250.513€.

6. AVAILABLE RESOURCES

After globally evaluating the required budget for improving the technical state of the road network, for the national, departmental and rural roads only, without

ISSN 1582-3024

Transportation Infrastructure Engineering
INTERSECTII
http://www.ce.tuiasi.ro/intersections
INTERSECTIONS

considering the highways and village roads, an inventory of the possible resources to cover these needs is done (Figure 6.1, Figure 6.2).

Table 4. Funds necessary for roads, for the period 2006-2012

Type of works	Road category							
	National		County		Local		TOTAL	
	number	value[euro]	number	value[euro]	number	value[euro]	number	value[euro]
0	1	2	3	4	5	6	7	8
Administration	-	131962013	-	321186647	-	141286774	-	594435434
Rehabilitation	3400	1428187000	-	-	-	-	3400	1428187000
Structural overlay	3229	919353136	7090	1134400000	1672	267520000	11991	2321273136
Modernization	483	167376048	4157	760731000	2116	387052370	6756	1315159418
Thin overlay (I.A.U.)	144	18000000	3357	453195000	3920	529200000	7421	1000395000
Gravelly	0	0	2206	173985000	8605	678667740	10811	852652740
Maintenance total	-	1678683127	-	865306354	-	351738480		2895727961
From which, surface asphalt treatments	13850	179898014	5761	110900595	1997	28189586	21608	318988195
Total	-	4343561324	-	3708804001	-	2355465364	-	10407830689

Table 5. Funds necessary for viaducts and bridges, for the period 2006-2012

Road category	Necessary works							
	Finishing already started works		Capital repairs		Maintenance		Total value	
	pieces/ length [m]	value [euro]	pieces/ length [m]	value [euro]	pieces/ length [m]	value [euro]	pieces/ length [m]	value [euro]
0	1	2	3	4	5	6	7	8
National	171	422960339	939	248853365	1607	229924967	2717	901738671
	6104		43463		55125		104692	
County	125	37542769	653	154785427	2160	74726274	2938	267054470
	2656		8609		35523		46788	
Local	65	15100745	385	45441413	573	20084525	1023	80626683
	896		1991		5809		8696	
TOTAL	361	475603853	1977	449080205	4340	324735766	6678	1249419824
	9656		54063		96457		160176	

6.1. Transfers government budget – this resource has been used continuously and many times exclusively. It could never withstand the real needs, being insufficient for the whole network, but especially for local roads.

ISSN 1582-3024

Transportation Infrastructure Engineering
INTERSECTII
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INTERSECTIONS

6.2. Taxes and tariffs – this must be paid by those who use the road network, directly or indirectly. This resource is broadly used abroad, with various modalities of collecting and managing the funds. For our country, the system, only partially used now, must be reconsidered and adjusted to observe the European standards.

Table 6.1. National roads rehabilitation with external and internal resources

Stage	Length [km]	Value(including VAT) [thousands euro]	Completed %
I	1031	334310	100
II	714	406175	100
III	412	323610	84
III	bridges	13849	100
IV	315	225456	40
TOTAL	2472	1303400	92

Table 6.2. National roads rehabilitation with ISPA and PHARE funds

Stage	Length [km]	Value(including VAT) [thousands euro]	Completed %
III	182	80858	75
III	bridges	9626	100
IV	109	85271	50
V	35	15635	3
TOTAL	326	191390	67

According to the norms of the European Union concerning taxes for roads users, the value of these taxes must reflect the wearing of the pavement due to the axle loads, the distance, the pollution due to carbon dioxide (CO2) emissions. In this matter, The European Commission has published The White Book, referring to the taxes for using the road infrastructure.

The taxes and tariffs types, some of the also used in our country, are:

- taxes included in the price of the fuel, in most countries used for road maintenance works. Unfortunately, the management of these funds is done by the Ministry of Finance, which sometimes leads to the situation presented in Figure 3, where funds for roads works are allocated arbitrarily.
- transportation authorizations;
- custom taxes and excises for motorized vehicles imports;
- taxes and tariffs for transportation authorizations for high tonnage and special transportations ;

ISSN 1582-3024

Transportation Infrastructure Engineering
INTERSECTII
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- taxes and tariffs for alien transporters, replaced more and more by transportation authorizations released on reciprocity bases.

Normally, the funds obtained from all these taxes, as well as others, such as those obtained from envelopes or vehicles selling, should be used for financing roads works.

The taxes for roads infrastructure from fuel purchase varies in every country, being in the range of 25% to 50% from the total price. Usually, these taxes decrease as the number of registered motorized vehicles increases.

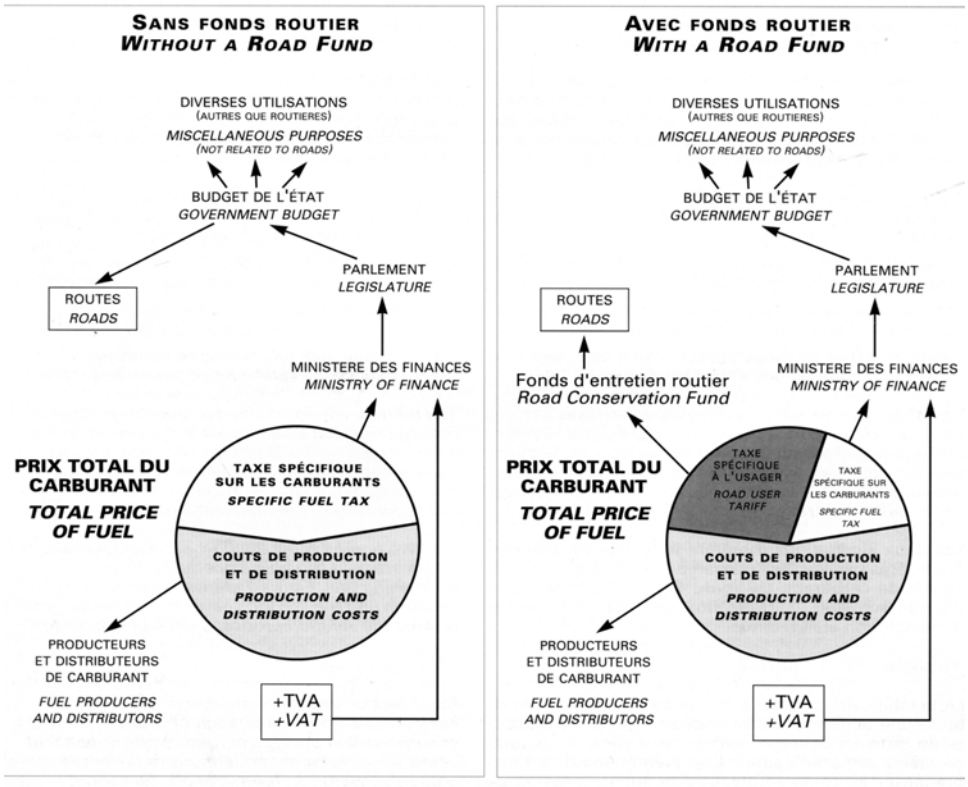

Figure 3: Use of money paid for the purchase of fuel

6.3. A very important resource can be considered the savings due to good timing interventions for preventing the degradation of the road. This could dramatically decrease the maintenance costs, witch increases exponentially with the delay of the intervention works. An example is the decision of withdrawing the technical agreement for bituminous treatments and recycling.

For Romania's situation, if a strategy to realize the objectives (7 years) is found, so that the repairing works amount is reduced every year, the saved funds could

ISSN 1582-3024

Transportation Infrastructure Engineering
INTERSECTII
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INTERSECTIONS

constitute real resources to cover the payments and the interest rates for the credits used in the program.

6.4. The volume of the works done by the Road Agency compared to those executed based on contracts also represents an important resource. In countries such as Sweden, Finland, Great Britain, important savings have been obtained by executing the current maintenance and winter works.

6.5. A resource difficult to evaluate, but extremely important to manage all categories of costs affecting the road infrastructure, is the quality of the specialists in this activity field and the quality of the management.

The training and the stability of the human resources in a pavement management system is a must. At this point, there exists a shortage for highly qualified personnel. The number of future graduates in this field must be reconsidered.

6.6. Early execution of studies and projects for road infrastructure development, done and supervised only by specialists. The cases when unfounded decisions were made were more than few, leading to increased costs or inefficiency. Preparation of consistent projects is even more important in the following period, as Romania will have access to important financing resources from European Community funds.

6.7. The structure of the works program may and must influence the costs on medium and long term. The works aiming for conserving the pavement systems must have top priority. As an example, it can not be allowed that an agency executes structural overlaying, but skips the surface treatments works (6).

Although the issues presented at points 6.3 – 6.7 can not be exactly evaluated, these aspects represent certain measures for reducing the maintenance costs as well as strategic elements in the frame of the national pavement management system.

7. CONCLUSIONS

This article presents a brief but realistic evaluation of the present situation of the road infrastructure in Romania, in order to encourage the exchange of ideas about sustainable development in this important social and economical field, and it is addressed to all the decision – makers, at all levels, with various responsibilities in initiating and promoting new development strategies for the Romanian road infrastructure.

The problem presented is very important also because it involves difficulties in assuring the necessary financial support. However, accomplishing the objectives of the proposed program for 2006 – 2012 could dramatically change the image of Romania.

ISSN 1582-3024

Generally, a document such as this article presents at the end vast conclusions and program of measures. Still, we consider that a main conclusion, and measure to be taken, is of the most importance: the Romanian road infrastructure must be managed by a National Roads Program, elaborated by the National Roads Administration on legal basis. This program will eventually define a balance of requirements and resources, as well as the responsibilities of those who will carry out the objectives and who will assure the resources.

The National Roads Program, on medium and long term, will be approved by the Parliament and actualized by Governmental Ordinance. This objective is in accordance with the present Government Program. Chapter 17 – „Transportation policy", point B – „Road infrastructure strategy".

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ISSN 1582-3024