

CONDITION OF THE SERBIAN RAILWAYS INFRASTRUCTURE AND CHANCES FOR ITS FAIR INCLUSION IN THE EUROPEAN RAILWAYS

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During the last decade, railways all around the world have experienced significant changes within the domains of the railways as a part of Civil engineering as well as regarding the organizational structure and market orientation in transportation. During the 90's, many countries of European Union have started the organizational restructuring of the national railways, and EU has established a policy of bringing the railways into life again. Efficient transportation policy should come as an effect of this. At the same time, while European railways are handling these organizational changes, having in mind that most of the technical problems have been solved successfully, Serbian railways are experiencing their hardest period ever. Because of the well-known political situation in the region, in combination with a bad and incompetent management, wrong investments and lack of real strategy in specific conditions, Serbian railways are now in disastrous condition. Infrastructure objects are in condition that endangers all comparative advantages of the railway traffic: efficiency, punctuality and security. During the last ten years, repairs on total length of 144.8 km of tracks had been done, while only the annual needs are bigger than that. The machines for maintenance of the tracks are in their second or third working age (amortization up to 300%), which is a state not known for Europe; 60-70% of vehicles are in very bad condition; 70% of telecommunications are on the edge of being useless, contact wire is on the edge of being damaged. All this is happening on a railway network with two European corridors and highly important geo-strategical position. Serbian railways need an urgent repair, but it is very difficult to choose the path for entering European courses as promptly as possible and how to overcome the technological gap. This report gives a suggestion for improvement of the present conditions regarding Serbian railways infrastructure with a use of European experiences and considering the present state and the specific moment for Yugoslavia.

Key words: infrastructure, condition, restructuring, modernization.

PRESENT CONDITINS OF RAILWAYS INFRASTRUCTURE IN SERBIA

General condition of Serbian railways can easily be described with a word: disastrous. Reasons like bad or lack of strategy for development, irresponsible and incompetent management, great financial funds spent on projects used in political and promotional purposes, megalomaniac ambitions in times when the country is under sanctions and is barely surviving, led Serbian railways to a really unenviable position. Railways-engineering infrastructure is in such condition that it came to a level of complete lack of functionality and endangered security.

During the last decade, Serbia has separated significant funds for construction on railways, but most of these investments were wrongly directed on a number of projects unsuitable for the situation in the country and circumstances in which it is trying to survive. The smallest number of the funds had been invested in process of current and investing maintenance of the existing objects, in order to preserve the infrastructure and its great capital value until the

times of stable economics come, which would enable effective exploitation and investments in new objects.

Consequences of such concept of work or lack of the concept are best shown in the data regarding the railways infrastructure in Serbia today.

The total percentage of tracks that are been written off RTO Belgrade (Railway Transportation Organization) is about 96%. The real data regarding the ties' and tracks' conditions on Yugoslav railways don't exist due to the fact that during the past few years, only the rails and ties on locations where the security of the traffic was seriously endangered, were changed. At the same time, rails were taken from one location and put on another. In RTO Belgrade (Railway Transportation Organization), out of 9 000 000 tracks that were built, 80% are wooden, and the rest are of reinforced concrete. The average age of the wooden tracks on major and first class railroads is about 30 years and on the rest of them is over 50 years. The average decay of the tracks on the major railroads is about 15%. On more than 55% of the total length of the tracks, permitted load of the axis is less than 22.5 tons, as a consequence of the lack of the current and especially the investment maintenance of the tracks. 60% of the railroad switches are 16-54 years old, i.e. 5% is older than 55 years.

Repair of the tracks in that period had been done with following dynamics:

Table 1: Repair of the tracks during the period of 1990-2000 in RTO Belgrade

Period (year)	Rapairs done (km)
1990 - 1995	110,0
1996	10,5
1997	13,5
1998	10,8
1999	0,0
2000	0,0
TOTAL:	144,8

In other words, during the ten years period, repair had been done on about 145 km of the tracks, which is less than it should be done in a year (about 200 km of repairs per year), according to the tracks conditions. Cycle of repairing the major railroads hasn't been done in last 34 years, and last time that section of the railroad Belgrade-Subotica (a branch of the Corridor X) was repaired was in 1984 on the length of 2.68 km.

Consequences of such a "dynamics" of repairs are: disastrous state of the tracks, complete destruction of the infrastructure, decreased speed and slow driving on a great part of the railroads.

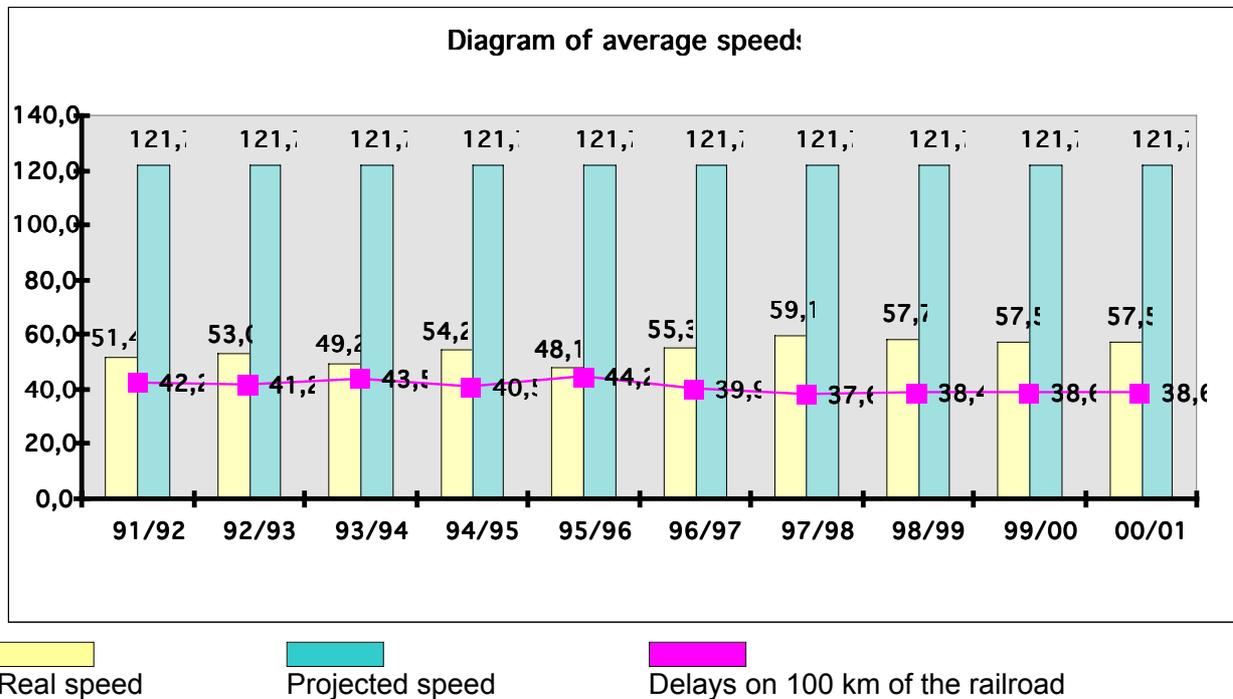
It is also interesting that the repairs, even when they were done, were done on wrongly chosen locations: on Corridor X, which is the most important railroad direction through country, on the section Belgrade-Mala-Krsna-Velika Plana, railroad was closed almost two years, due to the repairs. This is unfamiliar method according to the literature regarding rational maintenance of important railroad sections. The repairs were not adequately executed, with used tracks, and although the whole action was carried out under the name "2:58", which was supposed to mean that the traveling time from Belgrade to Ni_ is going to be 2 hours and 58 minutes after the repairs, the fastest trail crosses the distance in 4 hours and 1 minute, with an average speed of 63.29 km/h, and with decreased speed on repaired tracks.

The state of the complete railways infrastructure (tracks, number of vehicles, electro and installations regarding signalization and safety), together with organizational weaknesses, leads to the fact that the major railroad Belgrade-Ni_, on the section from Belgrade to Velika Plana, whose length is 90km, the fastest train crosses in 2 hours, i.e. with an average speed of

45 km/h. The distance from Belgrade – _id – national border, whose length is 122 km, on the right track, the fastest train crosses in 2 hours and 15 minutes, i.e. with an average speed of 54.22 km/h. The distance from Belgrade – Vr_ac – national border, whose length is 98 km, the fastest train crosses in 2 hours and 4 minutes, i.e. with an average speed of 47.54 km/h and the distance from Belgrade – Zaje_ar, whose length is 254 km, the fastest train crosses in 5 hours and 53 minutes, i.e. with an average speed of 43.17 km/h. In 1970, trains were crossing the same distance for 4 hours and 30 minutes. In addition, these are data for fastest trains from the timetable, which is rarely being respected. Today, it takes 4 hours and 30 minutes to get to Kikinda from Pan_evo, and 1958, it took only 2 hours and 58 minutes to get to Kikinda from Belgrade. Train delays of 5-6 hours are regular occurrence, even the delays of international trains of 9 hours.

Diagram 1 shows the data for railroad Belgrade – _id- national border (Corridor X, right track.), where the difference from the projected speed (average speed on the section) and the real speed is evident as well as the delay of the trains on 100 km of the railroad.

Diagrams 1: The speed on the railroad Belgrade – _id – national border (Corridor X, right track)



The last time when the machines for mechanical maintenance of the tracks were purchased for RTO Belgrade was in 1985 and these are being used even today as the most modern machines of this type. Very bad, in some cases even disastrous state of these machines is a consequence of the age of these machines, complete cessation of purchasing some new capacities, long duration, inadequate maintenance, lack of spare parts, insufficiently trained staff and complete demotivation of the maintenance staff. According to the analysis for the period from 1990-2000, and the conditions of the mechanization for maintenance of the railroad tracks, one comes to following data:

- machines used on complex mechanical maintenance of railroads:
 - the percentage of amortization of all available capacities is higher than 100%

- The average percentage of tamping machine amortization is 188.7% (3 out of 5 tamping machine for switches are in their third working age, i.e. more than 200% of amortization)
- machines used for investing maintenance of the railroad tracks:
 - the average percentage of machines amortization is 308.5%

All the machines, except one used for planning of ballast, are at the end of their fourth working age, i.e. they are between 28 and 34 years old

- machines used for maintenance and control of technical conditions of the tracks have an average amortization of 143.14%.

The consequence of such a condition of mechanization concerning maintenance of the tracks, among many others is that the index of planned and fulfilled ballast cleaning of the tracks and switches in 1999, in regard to 1998 is between 18.8% and 61.2%.

The state of the means of transportation is not any better than the state of the stable installations. The total inventory park of the traction means of RTO Belgrade, i.e. locomotives with diesel and electro-engines, diesel-motor trains, buses moving on rails and trains with electromotor is consisted of 513 vehicles. At this moment, and that is an average state, only 133 traction vehicles are functioning properly, i.e. the degree of mobilization is 74%. RTO Belgrade has 392 passenger cars, and 130 of them are functional and 262 aren't. Of 14601 freight cars, only 5264 cars are functional, i.e. the percentage of mobilization is 64%. The average of 90 passenger and 20-30 freight cars are being cancelled every day.

ELECTROTECHNICAL INSTALLATIONS, TELECOMMUNICATIONS AND SIGNALING-SAFETY DEVICES

Devices used for electro technical purposes are more than 30 years old and are on the edge of their amortization. Conductor of contact wire is on the edge of being worn out after 30 years of exploitation, and if their massive replacement doesn't take place soon enough, the traffic on electrified railroads could be seriously endangered.

The state of telecommunication systems is also critical. Automatic telephone and telegraph network as well as the analogue system of transmission are between 25 and 40 years old and are completely out of date. Therefore, their repair is not possible at all – spare parts for such machines are not manufactured any more. The most critical parts of the telecommunication system are air routes of TT lines, where the condition on 70% of their length is completely unstable and chaotic. On a great number of sections there is no communication as a consequence of above-mentioned state, which is absolutely inadmissible. The mobile part of the locomotive ground-train radio link is 60% damaged, therefore on major railroads this communication is not working at all, phone-registers are broken and railroad phones are stolen. Such a telecommunication system cannot be a base for installing a modern informational system, which is absolutely necessary for Serbian railways.

Signalization and security installations are also in condition when general reconstruction is necessary because their malfunctioning and lack of the devices directly endangers the security of railroad traffic. Because the security is being endangered, one resorts on an unpopular, but the only possible action in this case, decrease of speed. Therefore, trains in Serbia are being slower and slower every day. Due to the decrease of speed, more passenger and freight cars are needed. The railway doesn't have these additional cars so the magical circle of inefficiency closes here.

As shown in this short review of conditions of Serbian railways infrastructure, it is evident that major changes are necessary. The entire system needs to be based on different

foundations, regarding the technical, organizational as well as personnel matters. The state must take a clear position of what is expected from the railway as a system, which assignments of traffic policy are being placed in front of it, and what is the general development strategy of different traffic branches in Yugoslavia like. Only with circumstances defined like this, with precisely formulated assignments and principles regarding the survival on the traffic services market, railways will be able to start recovering. This path of recovery will certainly be long and filled with temptations. With the analysis of possibilities of connecting Serbian railways with European, one must start from the conditions of Serbian railways, regarding technical, organizational and legal matters.

According to general data regarding the area and population of few European countries, as well as data regarding the railway network, it is possible to make a relation between the population density and the density of the railway network. Serbia is one of the European countries with an average population density (80-130 pers./km²). Regarding the railway network density in relation with area and population, Serbia is not far from developed European countries. Logical conclusion would be that there is no necessity for essential expanding of the Serbian railway network, but for improvement of the existing parts of the system, because it is clear that the present problems are not caused by the size of the railway network, but by the quality of its offer.

Relation between the length of electrified railway and length of the entire railway network in Serbia is almost the same as in France and Germany, and it's bigger than in Great Britain. It is evident that electrification of the railway is not the elementary and sole parameter, which guaranties the high level of services. Great efforts and investments in electrification of the railways in Serbia were not followed by appropriate actions in other elements of the system (for example, organization and traffic management, reconstruction and maintenance of the upper and lower chassis, rolling stocks). Therefore the real effects in most of the cases were not evident and traveling time on major routs in Serbia was not significantly shortened, nor was regularity in traffic increased by installing the electric pulling system.

In order to have the railways in Serbia embedded in European railways system as efficiently as possible, which is a mutual interest and demand of the time and geographical position of Serbia, actions must be abundant and all-inclusive.

At this moment, one can separate two kinds of the most important assignments for that purpose: conceptual and direct. Conceptual assignments mean changes in levels and manners of decision-making when it comes to complete traffic basis, as an integral part of complete missions of the State. Through the traffic basis, which all-inclusively treats all means of transports, future of all means of transport must be objectively and practically estimated. This needs to be coordinated with general trends in Europe and realistic necessities and possibilities of Serbia, taking care of needs and possibilities of international surroundings, regarding the most important sections, such as International Traffic Corridor X. Former experience thought us that numerous problems are consequence of (dis)organization of decision-making and management, as well as uncleared relations regarding the legal rights and responsibilities. In order to solve these assignments, further steps are of great importance:

- Homogeneous definition and organization of the relations in decision-making between state levels and lower levels of authority, in accordance with hierarchy of organization which dominates in European countries; Federal Administration makes decisions for federal systems and sections, Republic or Regional Administration makes decisions for republic or regional sections and Local Administration makes decisions for local

sections. Prerequisite for such organization of responsibility are uniformed and complete technical regulations and standards, documentations regarding plans and projects must be expertly done, and perhaps the most important matter of all, maximal and democratic inclusion of public in the process of decision-making.

- Forming of technical State Administration whose number and personnel would be in accordance with estimated importance of railway transportation for the state, and within the proportions of the necessary and planned investments. It is incomprehensible and inadmissible to leave the decision-making regarding very important and great investments in railway infrastructure, management and supervision, to a small number of individuals or to a public business organization. Naturally, such business organizations take care of its immediate interests, above all. In such conditions, every investment in development of the railway infrastructure, can take to ineffective and irrational consumption of budgetary funds, with a present danger that a positive effect would be evident only in the public organization or even individuals.
- While defining the manners and methods for recovery of Serbian railways and their connection to the more developed European railway network, it is necessary to clearly separate missions of the profession from politics. It is known that such separation was not possible in Serbia during the previous period of time and in contemporary societies this is inadmissible. Society and profession didn't own or just didn't want to use the mechanisms for prevention of latent inclusion of this wrong policy into the profession or no democratic imposition of incompetent "professional" decisions. Therefore, while solving these problems, we must return to basic professional assignments which are completely precise: all-inclusive consideration of problems, defining of possible solutions, reliable and objective stating of all positive and negative aspects of possible decisions as well as documented and authoritative suggesting of optimal solutions. Politics should make the final decision regarding the adoption of one of the options, considering that the professional personnel have done its work responsibly. Optimal solution should be chosen in this manner.
- The most important obligation of the highest levels of authority is coordination of technical regulative (regulations and standards), since this documents provide effective management for development of some transportation systems, consistent standardization of functional and technical characteristics of the elements which make the system, certain sections and entire network, providing embedding in complete European technical-technological system. Condition of technical regulative of railway transportation and infrastructure in Serbia is unsatisfying and often opposite to the practice of other European countries. In order to fulfill this very serious mission of the highest importance, Serbia railways will undoubtedly need help of European experts, expert services and financial institutions.

Most of the immediate assignments, which will at least alleviate present problems until fundamental actions take place, are shown in the previous report with a purpose to estimate the present condition and causes, which led to it.

In any case, beginning steps should be recording of the real condition of the complete railway infrastructure, state of all of its elements and precise location of infrastructure elements on some sections and within the whole network, with all the elements of organization of system work, ways of elements maintenance and management of the maintenance, personnel structure and all the other elements of the system. All this should be done according to uniformed methodology and how it's already been done in more developed railway departments. The view obtained in such a way, should enable homogenous comparison with

conditions of other surrounding railways. Even on this level, major differences, which bring the necessity of interventions, would be differentiated.

Carrying out of an objective analysis of the present conditions would be a base for determining all the critical points and elements of the transportation services offer. By introducing the relatively reliable short-termed prognosis of demand, it would be possible to determine the relative degree of the importance of finding the solution from the railways system' standpoint as well as from the viewpoint of its contribution to the whole transportation basis of the country.

The assignment of great importance is realistic recognition and estimation of volume and demands regarding the transit flow of cargo and passengers, from the viewpoint of Serbia's needs. These aspects essentially make an important motivation for other countries in closer and further surrounding to take an interest. The result would be balanced relations, which is a mutual interest.

Answer to essential question of rational determination of dilemma: new building or reconstruction should be made in accordance to the analysis of present conditions and estimation of consequences of different relations between some transportation systems. This decision must contain the decision regarding the priorities of the traffic base as a totality and priorities within every traffic system, therefore within the railway system. From this determination comes the size of the resources, which will be invested in the railway infrastructure, new building, reconstruction, or in accordance with an expert estimation in to some other necessary interventions. Determination regarding this matter is very important and that's why the balanced actions on basic sections and entire network are an important prerequisite to balancing of the entire railway network.

Unfortunately, such approach was not present in former actions and didn't find approval, above all, due to the inadequate order in the state within that area.

The consequences of the above mentioned problems, mostly within the area of State Administration, processes of decision-making and vague criteria and procedures of defining the priorities, are best shown in the fact that today, at the moment of announcement of considerable funds for investments into the infrastructure, documentation regarding plans and projects is not prepared in order to enable rational and effective use of the funds. Namely, considerable funds and time needed for production and development, were invested in some projects and planes, although, an objective consideration would have shown that these were premature, and even unnecessary (for example, high speed railroads, luxurious train stations). On the other side, the investments on the parts of the railway infrastructure, which are easily provable as investments that should be of the highest priority and above all justified, even today have very modest documentation regarding plans and projects, or don't have it at all. In other words, fundamental informative and temporal aspects of the space planning, projecting of the most important traffic lines and objects as well as planning of the investments, are completely neglected. Of course, the leading process in that procedure is projecting with a full width of the approach and with the necessary level of detailed work in accordance with generally accepted methodological principles in European countries.

For overcoming this problem, necessary are:

- Determination of the real conditions of the documentation regarding plans and projects, as well as their quality according to the European norms and standards
- Introduction of an objective and impartial revision of the documentation in order to provide minimal quality in accordance to the importance of the object and the amount to be invested

- Bringing the studies of justification of the investment to the level of reliable and objective document, on which basis confident decisions can be made.