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## QUALITY OF TRANSPORT SERVICE AT SERBIAN RAILWAYS

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**Abstract** – The quality is a term widely used in many different aspect of present-day living. It is common to discuss the quality of any product or service used by people. Since transport represents a special type of service, the quality of the transport is a value that defines the transport itself. The paper is defining the parameters of transport and transport service that identify the quality of the provided service – transport. The quality level is estimated by questionnaire conducted on a certain number of people in European Union's countries. The result show that different nations have different points of view on quality of transportation in railways, they also have major differences in transport needs and habits. The overall conclusion is that the railways provide limited quality both in freight and passenger transport even thou the railway transportation is sustainable, efficient and less expensive than the other transport means. Serbia and its neighboring countries still have a lot to do and improve the quality of the transport service in railways.

**Keywords** – Rail transport quality, Quality parameters, Passenger transport, Freight transport.

### 1. INTRODUCTION

Quality has become a global term – it is a technical and sociological phenomena of the present days, important both for the manufacturer or service provider and for the user or service receiver. The term quality has been expanded from the elementary quality management approach (on products and services) to the total quality management.

Transportation is an important segment of the modern living and therefore is an object of constant investigation and improvement. The White Book 2011 of the European Union's (EU) commission has presented a plan of transportation within EU, with the special scope on the quality of the transportation. The scope of the book is summed as: „The quality, accessibility and reliability of transport services will gain increasing importance in the coming years, inter alia due to the ageing of the population and the need to promote public transport. Attractive frequencies, comfort, easy access, reliability of services, and intermodal integration are the main characteristics of service quality. The availability of information over travelling time and routing alternatives is equally relevant to ensure seamless door-to-door mobility, both for passengers and for freight“[1].

This paper describes the parameters of the

transportation service and discusses the grade of railway transportation quality in Serbia and some EU countries considering the transportation volume invested in cargo (freight) and passenger transport.

### 2. QUALITY PARAMETERS OF TRANSPORT SERVICE IN PASSENGER AND FREIGHT TRANSPORT

The quality is a pure measure of the product's usability – it is a value that shows how much is a system capable to accommodate customers' and market's needs. Therefore, the quality is a synonym for the product's value.

Services are nonmaterial products offered by certain providers. It is a kind of a property considering planning, selling, transportation, training etc.

Quality of a service can be explained as a sum of service's properties that define service's ability to fulfill needs of the customer. The modern way of living and communication demand a certain level of the transportation quality. Transportation and the quality go side by side and a direct product of the qualitative transportation is the number of passengers in a time unit, or the number of cargo units per time, or both [2].

Transportation is a type of service that has a goal

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to fulfill the need for transportation both passengers and material goods (freight). The users of the transportation are not interested in transportation technology, but they are extremely interested in the quality of the provided transportation service.

The literature defines quality of the transportation service over several primary areas [2]: traffic exploitation (vehicles, infrastructure, users etc.), safety and technical exploitation (traffic accidents, vulnerability of persons involved in traffic, resources sustainability etc.), environmental protection (noise, air, water etc.), business economy (expenses, prices, financial gain, investments etc.), social development (reduction of unemployment, regional development etc.).

Some researches [2] show that the most important quality parameters, in the passenger transport, are: transportation rate (time necessary for transportation from start to end location), transportation costs (direct travel passenger travel costs), comfort (wide scale of services available to the passenger with a goal to make transportation easier and more pleasant), safety (risk free traveling), reliability (guaranteed transportation in defined time) and passengers' pleasure (measured as repetitive use of the same transportation mean).

Basic quality parameters of the freight transportation are [2]: reliability, safety (quantity of the lost, damaged or destroyed cargo pieces), security, transportation time, door-to-door delivery system's applicability, adaptability, stability (considering technical and organizational possibilities of transportation), energy consumption, transportation prices, eco-friendly etc.

The user of transportation cannot estimate the quality of the transportation service merely on material senses (for example, noise, taste, color, smell etc.) but also on subjective sense (e.g. environment, politeness of the personnel, hygiene). The quality level is not constant from the passengers' point of view – it has to be measured and corrected continuously.

Transportation service does not have common realization manufacture-sell-consume cycle: the transportation is firstly sold and simultaneously manufacturing and consuming – but it cannot be stored. Transportation service requires constant interaction with the transportation user, even if the user is not present while transportation service is happening. Transport service itself has no significance for the user, because it is an integral part of other activities, from whose successful performance depends on its value.

### **3. QUALITY OF THE RAILWAY TRANSPORT IN EU**

Transport has significant impact to the quality of

life. Investigation described in the paper [4] suggests that the most frequently mentioned factors are: access, design, environment, maintenance, mobility, safety, and transparency (communications/planning). Mobility was a top-of-mind category in the discussion of future transportation related needs. Participants would like to see increased travel speed, more free-flowing traffic, less congestion, and reduced commute times [3].

The aim of the European Commission's Directorate General for Mobility and Transport (DG MOVE) is to promote transport solutions that are efficient, safe, secure and environmentally friendly and to create the conditions for a competitive industry, generating growth and jobs. The survey was conducted in order to gather information from European citizens, understand their habits, hear their opinions and analyze their perceptions of transport related matters [4]. Among others, the survey focused to the perceptions of the quality of rail transport over the last five years and the most serious problems affecting this mode of transport.

Investigating the serious problems affecting rail transport, 26865 respondents from 26 countries opinions were collected (table 1). The following parameters were offered: ticket prices, lack of reliable or punctual services, missing railway links (between cities or across borders), rail maintenance, quality of services and facilities on board, lack of high-speed lines, lack of railway stations, security, accessibility, noise pollution, and other.

Every respondent gave the three answers. Almost half of all respondents in EU said ticket prices were the most serious problem for rail transport in their country (46%) – considerably higher than the proportion who mentioned the lack of reliable or punctual services (33%). Missing links and rail maintenance were considered serious problems by at least one in five (21%). On the other hand, accessibility and security (both 10%) and noise pollution (4%) were far less likely to be considered serious problems for rail transport [4].

Data that are related on railway in Bulgaria, Croatia, Hungary, Romania and Slovenia are discussed in this paper. These countries are chosen because these are Serbian neighbors and their rail transport affects to Serbian transport.

It can be concluded that users of rail transport service in Bulgaria, Croatia, Romania and Slovenia consider that the most serious problem is rail maintenance, while Hungarian respondents consider that the most serious problem is ticket prices. A large number of respondents from these countries consider that lack of reliable or punctual services, missing railway links and quality of services are the serious problems.

Tab. 1. Results of the questioning of respondents in some EU countries [4]

	Ticket prices	Lack of reliable or punctual services	Missing railway links	Rail maintenance	Quality of services and facilities on board	Lack of high-speed lines	Lack of railway stations	Security	Accessibility	Noise pollution
EU 26	46%	33%	21%	21%	16%	15%	13%	10%	10%	4%
Bulgaria	14%	20%	18%	36%	23%	24%	13%	32%	7%	3%
Croatia	23%	21%	25%	46%	22%	30%	17%	22%	6%	4%
Hungary	35%	26%	19%	33%	27%	19%	15%	9%	13%	5%
Romania	34%	18%	15%	38%	22%	28%	13%	14%	5%	3%
Slovenia	12%	9%	30%	44%	20%	37%	12%	5%	19%	6%

The conclusions that rely on questionnaires are always relative and the results extremely differ from country to country. It is obvious that passenger habits and technological level of the railway and railway infrastructure imply the answers of the questioned passengers. As a support of such questionnaires, it is necessary to analyze achieved effects of the transport: energy consumption, carbon dioxide emission etc.

Figure 1 shows energy consumption per passenger kilometer in EU in 2000 and 2012, comparing public transportation, railway, bus and personal vehicle transportation (cars) [5]. In average, cars require three times more energy for one passenger-km than public transport (rail transport and buses), and six times more energy than rail transport (trains, metros and tramways).

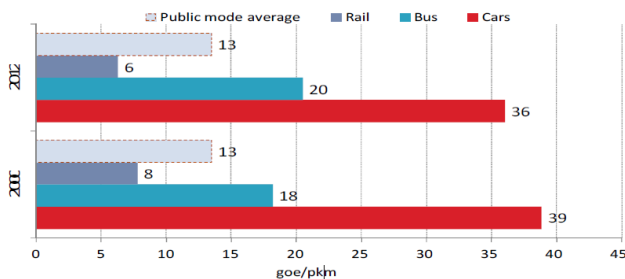


Fig. 1 Comparison of specific energy consumption for passenger transport in EU [5]

The figure 2 shows carbon dioxide emission per passenger kilometer in EU in the time period 1995-2011 [6].

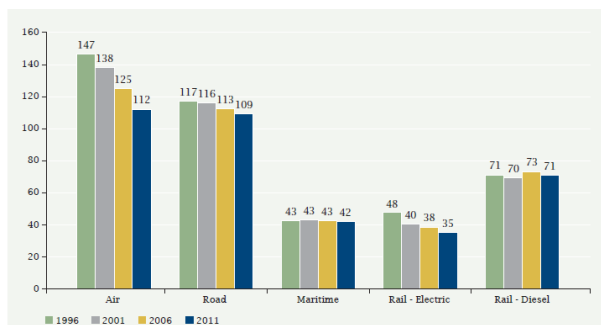


Fig. 2 Carbon dioxide emission per passenger transport in EU from 1995 until 2011 [6]

Based on figure 2, air and road transportation means are the greatest polluters while electrified railways has the smallest impact on the environment. This data always has to be analyzed when planning and development of the transportation are done.

#### 4. INDICATORS OF RAILWAY TRANSPORT VOLUME IN SERBIA AND NEIGHBORING COUNTRIES

Road transport is the most developed transportation type and the greatest amount of the passenger and freight transport is done over roads. Railway and water transportations have much less percentage in transportation rate.

Passenger cars accounted for 83.2 % of inland passenger transport in the EU-28 in 2013, with motor coaches, buses and trolley buses (9.2 %) and trains (7.6 %). The share of EU-28 inland freight that was transported by road (74.9 %) was more than four times as high as the share transported by rail (18.2 %), while the remainder (6.9 %) of the freight transported in the EU-28 in 2013 was carried along inland waterways [7].

Tab. 2. Some data on railway transport in Serbia and neighboring countries

Country	Number of inhabitants	Length of railway lines [km]	Rail transport	
			passenger [10 <sup>6</sup> pkm]	freight [10 <sup>6</sup> tkm]
Bulgaria	7,185,000	4.159	1.700	3.439
Croatia	4,230,000	2.974	917	2.119
Hungary	9,835,000	7.942	7.710	10.158
Romania	19,822,000	22.298	4.970	12.264
Slovenia	2,065,000	1.228	620	4.110
Serbia	7,103,000	3.808	617	2.988

There is a great difference in volume of transport (pkm, tkm) among EU countries. This paper is analyzing the statistical data of railway transport in

Bulgaria, Croatia, Hungary, Romania, Slovenia and Serbia. Table 2 gives data about the number of inhabitants and passenger and freight transportation in 2014. The analyzed countries are the countries in the neighborhood of the Serbia.

In Serbia 4223 million passenger kilometer [pkm] was executed in road transport in 2014 [8] what is 7 times greater than transportation in railways, while, at the same time, the volume of freight transport as approximately the same for road and rail transport 2959 million ton kilometer [tkm].

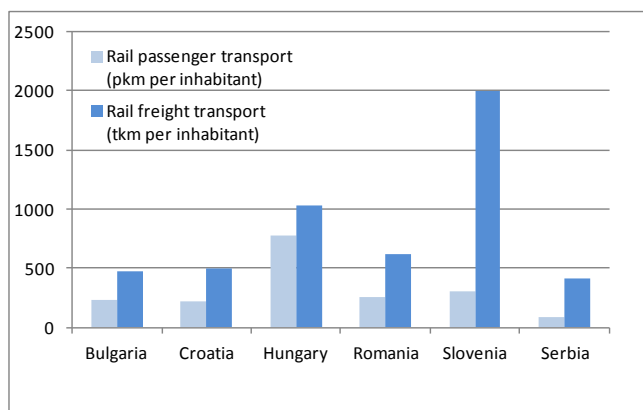


Fig. 3 Rail passenger and freight transport in 2014 per inhabitant

In order to compare the relative importance of rail transport between countries, the data can be normalized by expressing the level of passenger and freight traffic in relation to population, as shown in the Figure 3. Inhabitants of Hungary each travelled, on average, 782 passenger-kilometers in 2014, and the biggest freight transport 1993 tkm per inhabitant was executed in Slovenia. In Serbia 86 passenger-kilometers per inhabitant and 415 tkm per inhabitant were executed in 2014.

## 5. CONCLUSIONS

Based on the presented quantitative data on transport volume in railways, presented as tkm and pkm, it is obvious that the capacities of the Serbian Railways are not used efficiently, even though the transportation costs and environmental impact of the railways are much smaller in relation to other modes of transport.

The main reason for insufficient use of the railway transport capacities in Serbia are unsatisfactory quality of transportation services for customers,

considered in terms of quality parameters, specified in the carriage of passengers and cargo (e.g. low transport-rate, low level of comfort, lack of reliability and punctuality of trains, too much handling of cargo during loading and unloading, the inability to transport "door to door", difficulty in planning and implementation of transport due to organizational changes in the structure of the railways, etc.).

The increased quality of the transportation service might redirect the passengers to the railways. In favor of this: the data from the Marketing Sector "Srbija voz" shows that use of the new diesel multiple units (imported from Russia) mainly used in mid Banat has increased the number of passengers and also increased profit. The explanation is quite simple: reliable trains have enabled reliable and punctual time-table and the passenger have started to use the benefits of qualitative and pleasant transportation.

The railway has to increase the quality of the transportation service to become attractive for users and concurrent to the other transportation modes. This might become major strength of the industrial progress in Serbia.

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