

Renewal of railroads, the first step towards ecological reconstruction

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ABSTRACT

The current trend of railroad transport defines a future scenario in which cost minimization strategies will be replaced by quality maximization strategies due to the continuous development of the society and the change occurring in consumers' preferences that are in a constant desire of more and better. The renewal of the European railroads is one of the main objectives of all representative institutions. This is the reason for which the current paper wishes to analyze the present state of the Romanian Railroad System from a passengers' perspective and to assess the trend of the following years.

Keywords: *railroad, infrastructure, rolling stock, intermodality*

INTRODUCTION

The world is in a continuous move and development, in a continuous desire of more and better. These principles apply to railroad transport as well where the improvement of the system tends to become a necessity for all communities everywhere due to road traffic, costs of operating and owning a vehicle, high risks of accidents and pollution which have become overwhelming. Moreover, the economic and demographic trends, represented by an aged population, a high fuel price, growing urbanization, larger concerns on health and environment, as well as major changes in consumer preferences, conduct to a higher demand of a quality transport. The latter requires a change at a high level, a change of the entire perspective of the way we address transportation investments. We are thus urged to make the shift from an evaluation based on cost minimization to one that focuses on quality maximization (Litman, 2012) which will generate more consumers than in the first option. Even though the idea seems idealistic, in reality it takes into account the present and future tendencies of transportation.

TRANSPORTATION, PART OF WORLD ECONOMY

Reducing traffic and road pollution are two consuming issues that do not need any other description as they are well-known. Authorities from everywhere have developed several mitigation measures, more or less reliable, in order to reduce their impact. Lately, they tried to change the way people travel insofar as to focus on a means of transport that is less damaging both for the environment and human health, but one that is able to carry large capacities at once and which is accessible to various categories of people. This is railroad transport.

Trying to define this type of transport could be a challenge indeed mostly due to the various elements that are included. Nevertheless, we could say that railroad transport comprises a set of services and movements of goods on long and medium size distances, accomplished by transport operators, with the help of specialized railroad personnel and with specific vehicles equipped with guidance systems such as wagons, engines and electric railcars, using a rail infrastructure made up of fixed railroads and rail stations (Gherasim, 2007).

Making an analysis of the term “railway”, Thompson (2010) notices a lower homogeneity of railroads compared to road, sea and air transport systems. For example, if a British driver is able to drive (even with small difficulties) on several roads from France despite the fact that his wheel is on the opposite side of all the other types of cars, a train from Portugal will never be able to move along the rails of Nigeria due to a gauge difference of over 600 mm.

The process of improving or developing public transport infrastructure has always attracted (and most probably will continue to attract) numerous discussions regarding the economic impact these types of initiatives can have from several points of view (Crampton, 2003). First of all, we have to talk about the financial resources involved, that is taxpayers’ money which represents the main source of support for these initiatives. The problem drives around the share that every citizen has to pay, if people are able to bear these costs and the way the money gathered will be justified. Secondly, there is always a doubt whether these investments will be successful or not, in other words if they can serve international purposes (such as international corridors) or they can be used only internally. Of course, the first case is the most suitable, but some governments wish to master this aspect before beginning work so as to avoid a huge failure. Last but not least, we must bring into discussion the issue of private funding which currently becomes a necessity as governments do not possess enough funds in order to start or finish certain investments. As long as we can prove that the sections which are about to be built or improved can bring commercial or any other kind of benefits to the investors or to different owners whose businesses or properties are in the way of these sections, the authorities are entitled to ask for personal contributions which can support the investments.

This problem is also encountered in railroad transport, where these investments hint mainly at the areas surrounding the big cities or which are close to them. We are thus speaking about short distance railroad transport which is suitable for commuters and which is assigned to several railroad sections that are frequently used. The necessity of improving these sections is absolutely mandatory due to a higher flow of people who work in the big cities but who live in the outskirts or up to 100 km away from their place of work.

Recent years have shown a trend directed to the development of business parks located at the outskirts of cities and which has contributed to an increase in the number of jobs for those who live nearby. Thus, the option of using the train when going to work seems more and more viable to everyone under the conditions of a deepening traffic. We can add here the low price of a train ticket and a safe journey. Starting from these reasons, improving and enlarging the railroad network (together with the railroad coaches that cater for these routes) on short distances represent two issues that need immediate solutions. The connection between economic growth and those areas is obvious, the results of the investments influencing each other in a positive way and changing completely the characteristics of the areas.

These ideas are supported also by Lunyu Xie (2012) which states that the impact of improving railroad transport accessibility is a positive one, reducing significantly the percentage of car usage on the same distances where the train is preferred. In addition, it seems that walking or cycling are two additional means of transport besides the train, the rate of using these two increasing at the same pace as the improvement of rail transport accessibility.

The same author demonstrated that in the case of enlarging the railway system or building new stations, the impact of this measure is much bigger for the inhabitants of the respective areas than in the situation of only improving the existent network. Moreover, it seems that people who prefer the train instead of cars tend to live more closely to train stations, while those who have a higher income will never accept a shift from car to train.

According to a recent study (Marinov et al., 2013), a large part of the commodities shipped by high tonnage vehicles are not delivered up to the center of towns, their trip ending at the outskirts of cities. From here we can conclude that these transports can also be done via train,

without further increase of road traffic or pollution. The authors of the study go even further and propose, besides the above mentioned solution, to continue delivering the commodities within cities on railroad as well, more precisely by using the underground networks and those designed for aboveground rail transport.

While many of us would be tempted to believe that this could not be possible, some real-life examples have proved their high degree of feasibility during the long period they have been implemented. Among these we can mention CarGo Tram from Germany (operating since 2001), Cargo Tram from Switzerland (first appearance – beginning of 2005), CityCargo from the Netherlands (2007) and Monoprix, Paris (appeared in 2007). While the advantages of these transport solutions are the same as the ones mentioned before (from an economic, ecological and social point of view), their disadvantages mainly focus on the fact that future researches will help outrunning them.

First of all, we can refer to the cost of the investment which has to be as lower as possible, a situation that can be obtained only by making use of the existent infrastructure. Secondly (strongly connected to the first aspect), the transport of passengers following that precise routes will be disrupted, but if these people understand that by resorting to rail transport we reduce both the impact on the environment and pollution, then they will be more tolerant towards this measure (an alternative could also focus on freight transport which could be done during the night when travelers do not use these routes so much). In addition, a strong political support is needed, for example by granting incentives, as well as a thorough analysis of each case alone, without trying to generalize a project that has been successfully implemented somewhere.

Contrary to all beliefs, there are people who criticize railway transport, accusing it of being a huge fund consumer and that it does not represent an alternative to reducing road traffic and pollution. Litman (2012) has managed to overcome these accusations with a series of strong arguments, outlining in the same time the constructive character of some of these critics in the light of the fact that they can encourage finding new ways of improving existent projects.

The author emphasized that most of the time these critics are based on incomplete information and do not take into account the fact that railway transport addresses to everyone (including handicapped people or those whose financial situation is not in line with affording a car or using airway transport), not only to car drivers, that has lower operating costs, that a railway system implies the vehicles themselves, tracks and terminals, while a road system needs vehicles, roads and parking facilities for each destination etc.

Another type of urban rail transport is the subway transport which had strong expansion trends in Europe even from the beginning of 2000 (Deloukas & Apostolopoulou, 2003). At that time, public-private partnerships in the field of rail transport were something new, only 2% of world's investments being directed to this sector. By 2011, the percentage had risen to 32.9%, being ranked second after the road transport towards which almost half of the funds corresponding to investments have been directed (48.8%) and surpassing considerably sectors such as sea and air transport where 12.77%, respectively 5.43% of the funds have been allocated (World Bank Group, PPI database, 2012). Nevertheless, the conclusion is that funding an improvement or enlargement of a railway network cannot be accomplished without a public-private partnership which leads to economies of cost and to a distribution of risks.

THE LONG WAY TOWARDS A HARMONIZATION OF THE EUROPEAN RAILWAY SYSTEM

Along with the expansion of air and road transport, the railroad sector has lost ground especially for the niche of freight transport. Lately, governments are trying to reduce this gap by using economic (cheaper), ecological (less polluting) and social (offer more safety) reasons

and trying to overcome the weak points among which we can mention the lack of dynamism and flexibility. We can add here an old infrastructure and an obsolete rolling stock.

According to the Directorate-General for Energy and Transport (2008), an efficient railroad sector is one where there is a separation between infrastructure management and the management of the rail services themselves. Shifting from a monopoly to a total open competitiveness of several companies which compete in order to win as many customers as possible represents the main reorganization direction. A financial transparency by separating funds corresponding to passengers from the ones associated to services is another essential condition for a maximum efficiency of the sector. A very important aspect that should be noted is that, at European level, the opening of competitiveness between companies is not encountered only at national level, but it exceeds physical boundaries and benefits from entire liberalization starting with 2007 for freight transport and 2010 for passenger transport. The settlement is done through Council Regulation no. 169/2009 regarding rules of competition among rail, road and inland waterway transportation (Official Journal of the European Union, 2009).

Probably the most important step towards the harmonization of all the elements of a rail structure (infrastructure, rolling stock, systems of signals etc) is represented by the European Rail Transport Management System which aims at standardizing the numerous national signage and speed control systems that can be found across Europe towards creating a single European railway area. We thus wish to overcome technical inefficiencies by creating a single standard for all the signage equipments (Business24.ro, 2012). Interoperability is the word that best defines the purpose of the European Union in this regard.

Another concept that the authorities are trying to implement is that one of intermodality, which is a combination of several means of transport that hints at obtaining a sustainable mobility and more efficient trips/transportation (Uniunea Europeana, 2013).

Starting from its two main advantages (which are less polluting and much safer), rail transport has to become more attractive to passengers. For this thing to happen, authorities need to strengthen passenger rights and to provide them secure and quality transport conditions. Consequently, beginning January 1st, 2010, the third legislative package came into force through the agency of which a legal and financial framework has been set up regarding the allocation of public service contracts, considering a much better quality-price relation for citizens (European Commission, 2011). Actually, even from 2007, in Europe, the legislation imposed the existence of a minimum set of common standards for passenger rights and from 2009 it has been decided that all passengers need to be informed as correctly as possible about their trip with the train.

In Romania, the history of rail transport finds its first act of affirming to the end of the 19th century when a series of foreign companies (I.T. Barclay, von Ofenheim, H.B. Strussberg, G.B. Crawley) were granted the franchise of the first thousand kilometers of railway (Serviciul de Informare Bibliografica, n.d.). While at the beginning this type of transport was only addressed to freight movement, today our country has almost 5000 coaches for passenger transport, with a total capacity of approximately 300000 passengers (Figure 1).

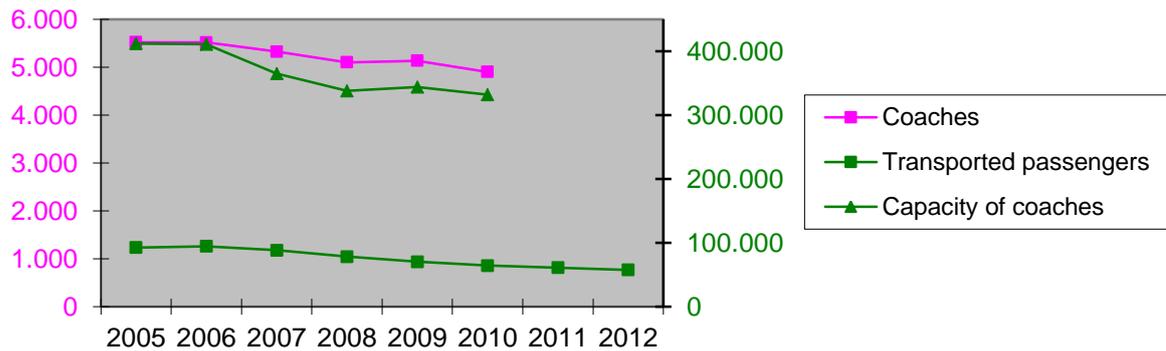


Figure 1. The number of coaches, their capacity and the number of passengers transported (thousands) from 2005 onwards

Source: author's own computation using data from the National Institute of Statistics (2011) and the Ministry of Transportation (2013)

Using just the information regarding the number of passengers transported on railways, we can replace the real terms (y_t) with theoretical values (Y_t) and based on a mathematical procedure we will obtain a series of adjusted values for this indicator which will help us estimate the number of passengers transported in the following years.

Even though time is just a reference point, which helps at arranging every term of the chronological series, the analytical adjustment of such a series allows us to express the main evolution trend. At the basis of all these calculations is the linear adjustment series, $Y = f(t) = a + bt$, where t is the value of the variable time and a and b are the parameters of this function which can be obtained based on the following normal equation system:

$$\begin{cases} na + b \sum t = \sum y_t \\ a \sum t + b \sum t^2 = \sum t y_t \end{cases}$$

Table 1. Analytical adjustment of the number of transported passengers by rail (thousands)

Year	y_t	t	$t*y_t$	t^2	Y_t	$y_t - Y_t$	$(y_t - Y_t)^2$
2005	92424	-7	-646968	49	96282	-3858	14884164
2006	94441	-5	-472205	25	90435	4006	16046033
2007	88263	-3	-264789	9	84589	3675	13501950
2008	78252	-1	-78252	1	78742	-490	239855
2009	70332	1	70332	1	72895	-2563	6568969
2010	64272	3	192816	9	67048	-2776	7707564
2011	61001	5	305005	25	61202	-201	40200
2012	57562	7	402934	49	55355	2207	4871953
Σ	606547	0	-491127	168	606547	0	63860688

Source: author's own computation

Once we apply the condition $\sum t = 0$ (which is met according to column 3), the function will have the following structure: $f(t) = 75818.37 - 2923.37t$ with $t = -7, -5, -3, \dots, 5, 7$. Because parameter b is negative, the linear function expresses a downwards trend for the transported passengers which decreases by approximately 2923.37 people per year (during 2005 – 2012). Also, from an economic point of view, parameter a has no significance. In order to check the correctness of our estimations, we will apply the following two relations:

$$\sum Y_t = \sum y_t \text{ and } \sum (y_t - Y_t) = 0$$

Following columns 2 and 6, as well as column 7, we can observe that these two equalities are met and thus we can proceed with the following step that is appreciating the quality of the analytical adjustment function. At this stage, we will analyze the residual variation using two indicators which are represented by the standard deviation (or standard error) of the adjusted values in comparison with the real values and the error coefficient of this function. The formulas for these two indicators are:

$$S_{y_t/Y_t} = \sqrt{\frac{\sum (y_t - Y_t)^2}{n}}, \text{ respectively } e = \frac{S_{y_t/Y_t}}{\bar{y}} \cdot 100 \quad (\bar{y} = a).$$

After using the formulas we will obtain a value of 2825.34 passengers for the standard error and 0.0373 for the coefficient error. Because the latter is under 5% ($e = 3.73\%$), we can state that the adjustment function has a good quality and it can be used for future estimations through an extrapolation of the function.

Regarding the extrapolation, specialists recommend not to surpass half the number of observations when making our estimations. This is the reason for which I have chosen to mold the forecasting for the next four years following the analyzed period. Thus, table 2 describes the evolution of the number of transported passengers by rail between 2013 – 2016, using an adjustment function, with an error of 3.73% and $t = 9, 11, 13, 15$.

Table 2. Forecast for the number of transported passengers by rail between 2013 – 2016 (thousands)

Year	Extrapolated values of the function
2013	49508
2014	43661
2015	37815
2016	31968

Source: author's own computation

We can thus observe a continuous decrease in the number of transported passengers, the value from the last forecast year being almost three times lower than the one from the beginning of the analyzed period. Keeping this pace, the national railway transport company could lose all its clients by the beginning of the second decade of this century, a situation that is out of the question taking into consideration the European common effort conducted to recover the sector and to transform it in a fierce opponent for the road transport which currently holds the lead.

CONCLUSION

If doubt still has control over the current state of the European railways, one thing is certain: the objectives proposed at European level are as realistic and suitable as they could be for the current rail circumstances, but no results will be obtained unless a common effort on behalf of everyone will be seen. Once the plan will be implemented at regional level, success is likely to appear on a large scale, on condition that the above mentioned imperative is respected. All the more for Romania, once an important European and across continents supplier of engines and coaches, the action of revival of railways should raise awareness to everyone due to the current downwards trend. Even though the analysis of the current paper focused mainly on passenger transport, where according to the forecast all the clients could be lost by the beginning of 2020 if the present characteristics are kept, we must not forget about the freight transport, our country facing at this moment a process of change to private ownership.

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