RESEARCH JOURNAL OF THE UNIVERSITY OF GDAŃSK

Transport Economics and Logistics Vol. 80 (2018)
http://dx.doi.org/10.26881/etil.2018.80.14

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DEVELOPMENT AND SOURCES OF FINANCING OF RAILWAY TRANSPORT INFRASTRUCTURE IN POLAND IN THE YEARS 1990–2016

Abstract

The article focuses on the development of railway transport infrastructure in the years 1990–2016 in Poland and presents sources and ranges of its financing from the funds of the Multi-Year Railway Investment Program for 2011–2015.

Keywords: railway transport, railway transport infrastructure, financing of railway transport infrastructure

Introduction

Transport infrastructure as an element of economic infrastructure plays a role determining the socio-economic development of individual countries and regions of the European Union. On the other hand, the pace of economic development affects the size of investments in infrastructure development and the speed of its modernization in a given area. Therefore, it is necessary to look for solutions that will enable the implementation of infrastructure investments while maintaining a dynamic pace of economic growth. It should be remembered that the lack of investment projects in the area of transport network may be the cause of marginalization of development of particular regions. In connection with that, investments modernizing transport infrastructure should be implemented with the use of the European Union funds in a way that guarantees harmonious development of Poland, while at the same time compensating for backwardness in the discussed topic in the regions that require it.

The aim of the study is to illustrate the level of railway infrastructure development in Poland in the years 1990–2016 and to analyze the level of use of available funds under the Multi-Year Railway Investment Program for 2011–2015 for infrastructure investments in the area of rail transport.

Achieving the objective of the study required the implementation of the research procedure in the context of the information sources used and the methodology for their use. The main source used to write this article was available literature on the subject of logistics infrastructure and publications on the sources of its financing. The statistics of public national and European origin were important for the writing of the work. The conclusions were carried out based on the results of empirically verified logical analysis.

1. Rail transport infrastructure in science

The concept of infrastructure, operating in science and business practice for many years, still has no generally recognized definition, which is why it is not always understood in an unambiguous way[15]. The most capacious definition is that assuming that the infrastructure consists of devices as well as institutions whose existence is necessary for the efficient functioning of the economy and the life of society[16]. For the purposes of this study, let us take a definition of what technical infrastructure is understood as linear and point public facilities located in a given area in a permanent manner that were created by man and form the basis of socio-economic life that results from their functions related to the movement of loads and people (transport) as well as news and energy and water[17].

Railway transport infrastructure, which is the subject of this study, constitutes a component of the logistics infrastructure, which is understood as the infrastructure of all existing modes of transport; we are talking about the linear and point infrastructure that enable the movement of goods and people[18].

Railway infrastructure should be considered on the basis of the Act of 16th November 2016 amending the act on railway transport and some other acts, according to which the railway infrastructure is created by:

– railway tracks (turnouts, track crossings, bumpers, guides, switches, crossings and railway sleepers with fastenings, as well as elements of the railway surface);
– turntables and traversers;
– track bed (embankments and cuttings, drainage systems, masonry trenches, curtain walls, vegetation protecting slopes);
– engineering objects (bridges, viaducts, culverts, tunnels, passages above and below the tracks, retaining walls, strengthening of slopes);

[15] R. Radziejewski, *Infrastruktura a bezpieczeństwo*, Zeszyty Naukowe AON 2013, 3(92), p. 251.
[16] Z. Borcz, *Infrastruktura terenów wiejskich*, Wroclaw University of Environmental and Life Sciences Publisher, Wroclaw 2000.
[17] W. Kozłowski, *Zarządzanie gminnymi inwestycjami infrastrukturalnymi*, Difin Publisher, Warsaw 2012, p. 9–10.
[18] E. Gołembska, M. Szymczak, *Logistyka międzynarodowa*, Poznań University of Economics and Business Publisher, Poznań 2000, p. 58.

– adjustable, railway traffic control devices at once with buildings in which such devices, track-side control devices for safe driving, track brakes, devices for heating turnouts;
– platforms with infrastructure enabling passengers to reach them;
– freight ramps with access roads to public roads;
– technological roads and walkways along the tracks, enclosing walls, hedges, fences, fire-fighting belts, snow curtains;
– rail and road crossings and rail level transitions, including systems to ensure road and pedestrian safety;
– lighting systems;
– electricity processing and distribution equipment for traction power supply;
– land, marked as plots of land, on which there are elements listed in items 1–11 of the Act[19].

Infrastructure, including rail infrastructure, is perceived as a public good. It is characterized by a relatively long period of formation, as well as the technical indivisibility of its objects infrastructure[20].

Technical features attributed to the infrastructure include: high capital intensity, a long period of creation and use, as well as the slow course of the process moral aging, limited opportunities for transformation, spatial immobility and inability to import[21]. Speaking of infrastructure, it should also be remembered that:
– it is important for the economy and society;
– it refers mainly to equipment and service institutions;
– it has important roles in economic and social development;
– the obligation to create and maintain it in the current economic conditions increasingly depends on the private sector, which becomes the owner of the infrastructure[22].

2. Railway infrastructure in Poland

Considerations in the area of railway infrastructure should begin with a discussion of the linear infrastructure, of which railway lines are understood as railway tracks.

Over the last twenty-six years (1990–2016), the length of operated railway lines in Poland has significantly decreased. In 1990, 26 228 km of railway lines were used, while in 2016 it was only 19 132 km (Figure 1). This means that in the analyzed period 7096 km of railway routes were excluded from operation. The reasons for this were many, ranging from the very poor condition of the railway infrastructure and the lack of funds for its modernization, by improper state policy towards

[19] Act of 16 November 2016 amending the act on railway transport and certain other acts (Journal of Laws of 2016, item 1923).
[20] E. Ćpak, *Inwestycje infrastrukturalne wyznacznikiem rozwoju gospodarczego*, Studia Ekonomiczne, Prawne i Administracyjne 2006, 2, p. 17.
[21] M. Ratajczak, *Infrastruktura w gospodarce rynkowej*, Poznań University of Economics and Business, Poznań 1999, p. 32.
[22] R. Radziejewski, *Infrastruktura a bezpieczeństwo…*, p. 253–254.

the railways (e.g. reduction of subsidies to statutory concessions for passenger transport and fossilized and fragmented structure of railway undertakings) and ending with on a significant increase in the length of motorways and other roads, which resulted in a decrease in the interest of passengers in the services of railway carriers due to the proliferation of other means of locomotion.

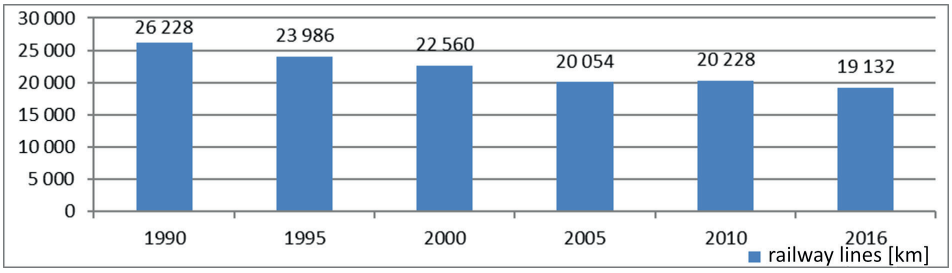

Figure 1. Length of railway lines in Poland in the years 1990–2016
Source: own elaboration based on GUS data: Transport. Operating results in the years 2000, 2005, 2010, 2016 and data contained in the artillery: T. Dyr, P. Wełnic, *Railway transport infrastructure in the European Union and Poland. Railway transport technique 7–8*, The TTS Scientific and Publishing Institute, Radom 2006, p. 25

Out of 19.322 kilometers of railway lines in use, the largest number is located in the Silesian Voivodeship (1964 km), Greater Poland Voivodeship (1878 km) and Lower Silesia Voivodeship (1750 km), while the lowest in the Podlasie Voivodeship (654 km) and Świętokrzyskie Voivodeship (721 km) – Figure 2.

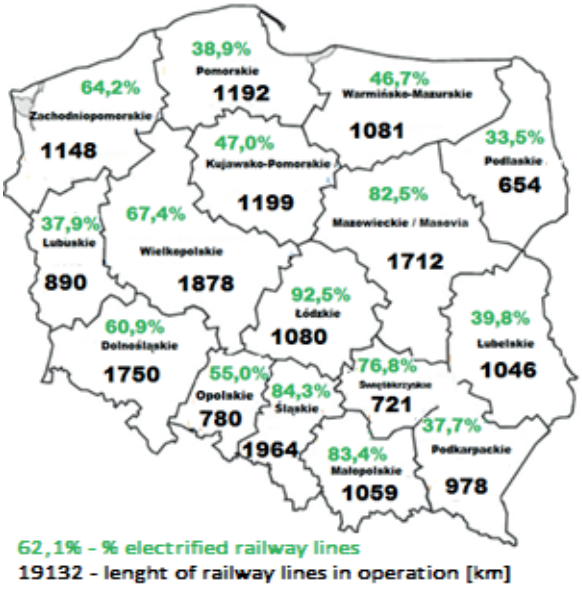

Figure 2. Length of railway lines in use in Poland and % of their electrification (2016)
Source: own elaboration based on GUS data: Transport. Operating results in 2016

The geographical distribution of railway lines indicates that the voivodships of the eastern wall (Podlasie, Podkarpackie, Lublin or Świętokrzyskie Voivodships) are characterized by the smallest length of railway tracks.

In 2016, 11 874 km of operated railway lines were electrified (62.1%). The highest degree of electrification can be found in Łódzkie (92.5%), Silesian (84.3%) and Lesser Poland (83.4%) Voivodships, while the smallest ones in Podlasie (33.5%) and Podkarpackie (37.7%). The share of electrified railway lines in the total length of the operated lines is illustrated in Figure 2. The density of railway lines in Poland is understood as the relation between the length of railway lines expressed in kilometers and the area of Poland is 6.12 km/100 km^2. The highest density of the railway network is marked by Silesian Voivodships (15.9 km/100 km^2), Lower Silesia Voivodship (8.8 km/100 km^2) and Opole Voivodship (8.3 km/100 km^2), while the smallest Podlaskie Voivodship (3.2 km/100) km^2), Lublin (4.2 km/100 km^2) and Warmia-Masurian (4.5 km/100 km^2). The density of the railway network in individual voivodships is presented in Table 1.

Table 1. Density of railway lines in Polish voivodships in 2016

Voivodeship	Area [km^2]	Length of railway lines [km]	Density of railway lines	Voivodeship	Area [km^2]	Length of railway lines [km]	Density of railway lines [km/100 km^2]
Lower Silesian	19 947	1 750	8.8	Podkarpackie	17 846	978	5.5
Kuyavian--Pomeranian	17 972	1 199	6.7	Podlaskie	20 187	654	3.2
Lublin	25 122	1 046	4.2	Pomerania	18 310	1 192	6.5
Lubuskie	13 988	890	6.4	Silesian	12 333	1 964	15.9
Łódzkie	18 219	1 080	5.9	Świętokrzyskie	11 711	721	6.2
Lesser Poland	15 183	1 059	7.0	Warmia--Masurian	24 173	1 081	4.5
Mazovian	35 558	1 712	4.8	Greater Poland	29 826	1 878	6.3
Opole	9 412	780	8.3	West Pomerania	22 892	1 148	5.0
Density of railway lines in Poland = (Length of railway lines in km/Polish area in km^2) × 100% Density of railway lines in Poland = (19 132 km/3 112 679 km^2) × 100 = 6.12 km/100 km^2							

Source: own elaboration based on GUS data: Transport. Operating results in 2016

The efficient functioning of rail transport is possible with the existing available railway infrastructure, which is operated by modern means of transport. Currently, Polish railways have 1814 electric locomotives, 2190 diesel locomotives, 1123 electric multiple units and 157 diesel multiple units. In addition, there are 87 598 freight wagons in use and 6975 passenger cars (Table 2).

Table 2. Railway transport means in Poland in the years 2005–2016

Specification	Year		
	2005	2010	2016
Electric locomotives	1 856	1 905	1 814
Diesel locomotives	2 520	2 358	2 190
Electric traction units	1 341	1 213	1 223
Diesel multiple units	91	–	157
Freight wagons	103 234	89 270	87 598
Passenger wagons	8 881	7 885	6 975

Source: own elaboration based on GUS data: Transport. Operating results in the years: 2005, 2010, 2016

The number of means of rail transport decreases year by year. This applies not only to locomotives, especially diesel, but also wagons, both freight and personal. Only in the case of diesel traction units, an increase in the number of units operated is observed. This is due to the fact that they are used on non-electrified lines as well as in local passenger transport. Their usefulness is determined by the fact that they are faster than warehouses run by electric locomotives.

The availability of rail transport means determines the amount of work they do. In 2016, 222 523 tons of cargo were transported by railway means of transport, which in terms of ton-kilometres gives a value of 50 649.50. In the same year, the railways transported 291 981 passengers, which corresponds to 1917.60 million passenger-kilometers (Table 3).

Table 3. Work performed by rail transport in Poland over the years 2005–2016

Specification	Year		
	2005	2010	2016
Cargo transport (ton)	269 553	216 899	222 523
Cargo transportation (mln ton-kilometre)	49 972.1	48 706.90	50 649.50
Passenger transport (passenger)	258 019	261 314	291 981
Passenger transport (mln passenger-kilometre)	18 155.1	17 921.1	19 174.60

Source: own elaboration based on GUS data: Transport. Operating results in the years: 2005, 2010, 2016

3. Financing of railway infrastructure in Poland

The financing of railway infrastructure in Poland is multifaceted. The basic source of support is the state budget, which carries out investment projects on the railway based on the Multi-Year Railway Investment Program for the years 2011–2015, which was now replaced by the National Railway Program until 2023.

Infrastructural projects may be implemented with the involvement of the infrastructure manager and local government funds, as well as funds obtained as part of Poland's presence in the European Union.

This part of the study will illustrate the use of public funds allocated for infrastructure investments in the area of rail transport planned for implementation under the Multi-annual Railway Investment Program for the years 2011–2015.

As part of the Multi-Year Railway Investment Program for the years 2011–2015, a total of 22 732 948 000 were spent. zlotys for the purpose of investment works. Of this amount, most funds were distributed in 2015 (Figure 3).

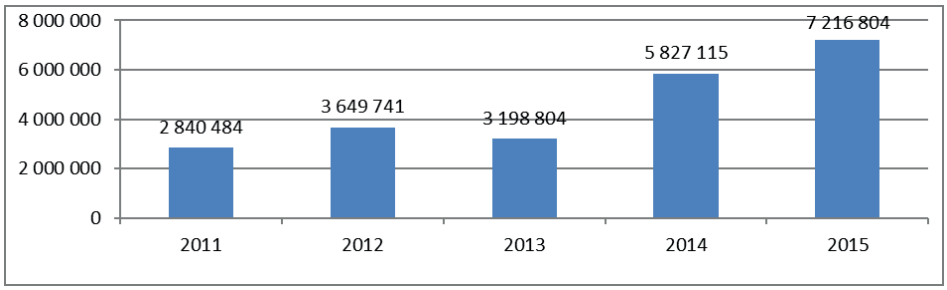

Figure 3. Implementation of the Multi-Year Railway Investment Program for the years 2011–2015

Source: own elaboration based on: the Report on the implementation of the Multi-annual Railway Investment Program for 2015 (Ministry of Infrastructure)

The funds available under the Multi-Year Railway Investment Program for the years 2011–2015 were spent under the Operational Program Infrastructure and Environment (OPI & E), Regional Operational Programs (ROP) and other programs (e.g. Railway Fund and TEN-T).

Table 4. Financial implementation of the Multi-Year Railway Investment Program for 2011–2015

Specification	2011	2012	2013	2014	2015	Total	%
Operational Program Infrastructure and Environment (OPI & E) [PLN]	1 142 675	2 280 477	1 676 221	4 394 800	5 861 211	15 355 385	67.5
Regional Operational Programs (ROP) [PLN]	466 428	317 681	318 988	197 879	222 854	1 523 830	6.7
Other programs [PLN]	1 231 381	1 051 583	1 203 595	1 234 436	1 132 739	5 853 734	25.7

Source: own elaboration based on the Report on the implementation of the Multi-annual Railway Investment Program for 2015 (Ministry of Infrastructure)

In the years 2011–2015, investments amounting to PLN 15 355 385 were carried out as part of the Operational Program Infrastructure and Environment (OPI & E), which constituted 67.5% of expenses realized in this period as part of the Multi-Year Railway Investment Program for 2011–2015 (Table 4).

Considering the implementation of tangible indicators of the analyzed program (2011–2015), it should be noted that in the analyzed period 2960 km of railway lines and 4746 km of track and main tracks were modernized. In addition, 1813 different engineering structures, 2442 intersections and 890 platform edge pieces were modernized and built. The degree of material investment in particular years is illustrated in Table 5.

Table 5. Tangible performance of the indicators of the Multi-Year Railway Investment Program for the years 2011–2015

Indices	Year					
	2011	2012	2013	2014	2015	Total
Railway lines [km]	506	556	796	742	360	2960
Main tracks [km]	734	850	1241	1235	686	4746
Engineering objects	214	413	646	8755	540	1813
Crossroads	207	296	390	714	835	2442
Platform edges	105	138	171	291	185	890

Source: own elaboration based on: the reports on the implementation of the Multi-Year Railway Investment Program for the years 2011–2015 (Ministry of Infrastructure)

The investment projects listed in Table 5 are not the only ones implemented under the Multi-annual Railway Investment Program for 2011–2015. Currently, the continuation of the Multi-Year Railway Investment Program is the National Railway Program (NRP), which assumes the investment of PLN 67 billion in railway infrastructure by 2023. This means that within six years (2018–2023) Poland will spend 10 billion PLN a year in the development of rail infrastructure. It is an organizational and technical challenge, the success of which can change the image of the railway in Poland. The plans assume the creation of a High-Speed Railway, which are to be a revolution in domestic public transport, and in relation to the existing infrastructure, guarantee the maintenance of technical parameters of newly modernized railway lines, as well as the elimination of maintenance arrears. These projects are to lead to shortening the travel time and the purchase of a new rolling stock is to ensure a higher quality of services.

Conclusions

The development of railway infrastructure is an important factor determining the socio-economic development of the regions, but it is also a factor facilitating the implementation of the occupational mobility of the society. In the opinion of The World Economic Forum, infrastructure, including rail infrastructure, is one of the twelve pillars that determine the competitiveness of economies of individual countries, and at the same time it is counted among four basic factors of their development. The condition of transport infrastructure affects the location of economic activity in individual regions of the country. The high level of railway infrastructure development "reduces distances" between particular geographic regions of the country and has a positive effect on the integration of the domestic market, which is included in the global economy system. Infrastructure has a significant impact on economic growth, as well as reducing economic inequalities

and eradicating poverty. It combines academic research centers, schools, residential districts[23], as well as jobs and recreation[24].

In the coming years, the country's effort should be directed at raising funds for the development of railway infrastructure, as well as on effective and rational spending of acquired funds. It is important to modernize the railway infrastructure in the regions that particularly need it; this applies mainly to eastern voivodships, which will be able to change the state of the railway infrastructure thanks to the measures of the Eastern Poland Program 2014–2020, which under the Supra-regional Railway infrastructure will provide over 330 million euro for investment activities.

References

Act of 16 November 2016 amending the act on railway transport and certain other acts (Journal of Laws of 2016, item 1923).

Borcz Z., *Infrastruktura terenów wiejskich*, Wroclaw University of Environmental and Life Sciences Publisher, Wroclaw 2000.

Ćpak E., *Inwestycje infrastrukturalne wyznacznikiem rozwoju gospodarczego*, Studia Ekonomiczne, Prawne i Administracyjne 2006, 2, p. 17.

Gołembska E., Szymczak M., *Logistyka międzynarodowa*, Poznań University of Economics and Business Publisher, Poznań 2000, p. 58.

Kozłowski W., *Zarządzanie gminnymi inwestycjami infrastrukturalnymi*, Difin Publisher, Warsaw 2012, p. 9–10.

Miłaszewicz D., Ostapowicz B., *Stan transportu kolejowego w polskiej gospodarce*, Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania 2012, 25, p. 93.

Radziejewski R., *Infrastruktura a bezpieczeństwo*, Zeszyty Naukowe AON 2013, 3(92), p. 251, 253–254.

Ratajczak M., *Infrastruktura w gospodarce rynkowej*, Poznań University of Economics and Business, Poznań 1999, p. 32.

The Global Competitiveness Report 2009–2010, World Economic Forum, Geneva 2010, p. 4.

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[23] The Global Competitiveness Report 2009–2010, World Economic Forum, Geneva 2010, p. 4.

[24] D. Miłaszewicz, B. Ostapowicz, *Stan transportu kolejowego w Polskiej gospodarce*, Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania 2012, 25, p. 93.