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From regression to success: The phenomenon of reactivation of passenger rail transport in Lower Silesia province (Poland)

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Abstract

The study considers the reactivation of railway lines in the Lower Silesian province. The choice of the research area was not accidental, since Lower Silesia is the region where the largest-scale activities restoring railway traffic were carried out. The factors that had a decisive impact on the reactivation process can be boiled down to several important aspects, such as: the relatively large number of previously closed lines with the potential to be reopened, the pro-railway attitude of the provincial government with a vision to restore the rail network, the establishment of a new carrier operating on different terms than PKP Przewozy Regionalne (regional rail operator), and new funding opportunities for modernization. Although the temporal scope of the study essentially focuses on the 2006–2024 period (i.e., the reactivation period), for a better understanding of the changes being implemented, a brief historical outline is included, covering the period from 1990 to 2006, when massive decommissioning of rail lines was carried out. In a sense, they show characteristic phases of development (a sinusoid) starting from progress, stagnation, regression or progress again. Based on the survey, it can be concluded that in the main the reactivated lines were single-track, without electrification infrastructure. For the most part, they underwent modernization and are operated by modern Polish rolling stock.

Keywords: Rail transport, Lower Silesia, rail infrastructure, public transport systems, transport

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1. Introduction

The issue of rail transport operations is becoming increasingly important in the context of creating regional transport systems. The popularity of rail transport among passengers has shown an increasing trend in recent years. According to data from the Railway Transport Office (UTK, 2024), in 2023, the number of passengers in Poland increased by 80% compared to 2020 (a total of 374 million people were transported). In all provinces in Poland (16), the number of passengers increased with varying intensity after the 2020 pandemic. Such relative growth was influenced by the 2020 pandemic restrictions.

Nonetheless, considering a longer time horizon, the growth in popularity of rail transportation in Poland is evident. In 2015, 280.3 million passengers were transported, and in 2024, 407.5 (an increase of about 45%). According to an analysis of rail passenger satisfaction, about 40% of those surveyed said that the number of post-pandemic trips they made had increased. The role of public transport is also becoming increasingly important in the context of society's changing mobility paradigm (Banister, 2008).

The rail network as a transport infrastructure system and regional public transport system is undergoing constant qualitative and quantitative changes. Qualitative changes include improvements in the quality of rolling stock, an increase in the number of promotions, a decrease in ticket prices, the introduction of loyalty programs and a reduction in travel time. The most

important quantitative aspects, on the other hand, include an increase in the number of services and the expansion of transport infrastructure with new sections of rail routes.

The rail transport system in Poland has undergone significant changes in recent decades (Taylor, 2004). After the processes of regression of the rail network (from 1980s to the beginning of the 21st century), efforts began to increase the role of rail transport in managing passenger traffic. Initially, these efforts were focused on urban and agglomeration traffic, but in recent years there has been a trend towards improving regional connections. The transfer of responsibility for provincial transport to local governments (the regionalization process in the rail transport sector) undoubtedly contributed to the increase in the importance of regional passenger connections. In addition, the awareness of policy makers has increased in the context of measures leading to further expansion of regional rail links.

Regional transport is the transport axis in many areas. The role of rail links is all the more important, since in many cases it is the only form of public transport. In many places, especially in outlying areas, bus/coach transport is underdeveloped. Therefore, rail is an important alternative for potential passengers, and its proper operation can influence the reduction of transport exclusion (Jaroš, 2017). It should be noted that, on the one hand, bus transportation is simpler and cheaper to organize transport. Due to its characteristics, it is characterized by greater capabilities in

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space penetration and theoretically allows to reach more potential travelers. On the other hand, however, rail transportation is characterized by greater dependence on provincial transport organizers. In addition, they are a more environmentally friendly mode of transportation than buses.

In many Central and Eastern European countries over the past decades, one can identify the phenomenon of reduced passenger transport, cancellation of rail routes or underinvestment in the rail transport sector (Taczanowski, 2012; Król & Taczanowski, 2016). The study of transportation systems is an important part of broader geographic research (Hoyle & Knowles, 1992; Shaw & Docherty, 2014; Rodrigue, 2024). Transportation geography is related to, among other things, spatial analyses and a comprehensive look at contemporary transformations of transportation networks, including public transportation (Kraft & Marada, 2017; Klapka et al., 2020; Kraft et al., 2022). However, it can address broader research aspects, such as network analysis, transportation system development studies and GIS analysis (Goetz, 2006). The study conducted is part of the analyses of the operation of transportation systems, in this case rail passenger transportation in the region.

Evaluating the performance of regional public transport systems is also important in the context of conducting regional policy (Rietveld & Nijkamp, 1992; Linneker & Spencer, 1996; Trembošová & Kohutiar, 2022). In Polish transport policy, the role of the provincial (regional) government is very important. It exercises supervision and functions of the organizer of public transportation at the regional level. The creation of effectively functioning public transportation systems is related to the need to identify the current state of transportation links and the characteristics of the connection network (Hrelja et al., 2020). Evaluation of the functioning and development of the rail component is one of the stages of assessing the performance of regional (provincial) transportation. This is all the more important because transportation accessibility also has an impact on local development (Lucas, 2012, 2019; Šfastná & Vaishar, 2017).

The main rationale of the authors for undertaking the chosen research topic was to pay attention to the phenomenon of the Lower Silesia province as a region that underwent a transformation in the saturation of railway infrastructure. After the construction phase (covering the years 1842–1945) of the basic shape of the transport system, a period of relative stagnation (1945–1989) and marked regression (1990–2006) can be determined. The next phase of development, which was initiated in 2006 (ignoring a few instances of unsuccessful reactivation in 2006–2008), refers only to contemporary processes related to the restoration of the railway network of Lower Silesia. It is this last phase of development (associated with the reactivation of the railway) that forms the basis for further research. The analysis of this phenomenon may influence similar activities in other regions of Poland, and more broadly, in areas where there is potential for reactivation of rail links.

The authors considered as the main research problem the need to fill the research gap in the literature on the processes of reactivation of the railroad network in the context of passenger transport. The analysis carried out on the example of the Lower Silesian province indicated the conducted directions of the revitalization processes and took into account the planned activities. A comprehensive look at the functioning of regional rail transport systems is in line with the vision of conducting a sustainable transport policy. The large financial resources directed to rail transport, the involvement of the provincial government and the general increase in popularity among passengers make the proper identification of passenger traffic reactivation processes on the existing transport infrastructure of both scientific and practical value.

The main objective of the study is to present the issue of railway line reactivation in the Lower Silesian Province in terms of time and space. The research questions assigned to such a main objective are as follows:

1. Since when did the process of reactivation of railroad lines in Lower Silesia province begin and what influenced it?
2. In what order were the lines reactivated (were they local routes or sections of greater importance to the provincial railway network)?
3. What are the plans for reactivation in the perspective of the coming years as part of regional transport policy?

The phenomenon of increasing popularity of rail transportation observed in recent years was an additional justification for trying to supplement the stages of rail development with phases of reactivation and densification of transport links in regional connections. The need to assess the role and functioning of regional rail transport in the context of the processes of reactivating transport links in areas (regions) that originally had a highly developed transport infrastructure and now show potential for its reconstruction was identified as the main research problem.

The role of geography in the creation of transport systems at various territorial levels is very important (Knowles et al., 2007). The field of transport geography (as a subdiscipline of geography) can be related to regional and local development policy (Lucas, 2012, 2019; Komornicki & Stepniak, 2015; Komornicki & Goliszek, 2023). The geographical and spatial approach can form the basis for drawing general conclusions about transport systems, but it can also be applied to research on the historical development of the railway network (Taylor, 2007). It can also be expanded to include network approaches (Derrible & Kennedy, 2009) and those using GIS (Thevenin et al., 2016).

The analysis carried out can complement geographical concepts related to, among other things: the assessment of the rank (importance) of existing and planned railway junctions, the identification of the level of transport accessibility (resulting in the designation of areas excluded from transport), the development of the transport network in the region (the Lower Silesian Province is an example of an area where an intensive period of expansion was followed by a period of decline, and then, after many years, a renewed development of rail transport), and the essence of pursuing a sustainable transport policy.

2. Theoretical background: The problems of operation of regional rail transport

In the subject literature, operating rail network is divided into phases according to the degree of development of rail transport (Lijewski & Koziarski, 1995). Taylor (2007) determined 9 periods of operation of the rail network, 6 of which were associated with construction and development (from 1842 to the post-war period), and 3 were periods of stagnation and regression (from 1944 to the 1990s). In fact, railway network development is the basis of many studies related to research conducted at the national level (Lijewski & Koziarski, 1995; Taylor, 2007; Ciechański, 2014). The phenomenon of rail network regression (especially regionally) is not an isolated phenomenon and can be observed at various stages of development in highly developed countries as well, including but not limited to: Great Britain, Sweden, France and Italy. However, there is a research gap in literature, which is related to the description of the processes of reactivation and restoration of infrastructure and rail links.

In general, it is possible to find very many reasons for the regression of the rail network and the liquidation of passenger traffic. It is possible to determine 5 groups of factors that determine the processes of traffic reduction and decapitalization of transport infrastructure. Entire rail routes can be decommissioned (physical dismantling) or only passenger traffic can be reduced. In the case of Central European countries, political changes associated with the collapse of communist rule in the late 1980s and early 1990s were also an important aspect determining the scale and nature

of the regression. In addition to attempts to map the reasons for the reduction in rail transport, various categories of affected routes were identified. Komusiński (2010) mapped out 6 types, including interprovincial, bypassing major urban centers, or unrelated to transit traffic. As early as in 1963, Domanski pointed out the high risks to the operation of transport on local routes. It is worth noting that the scale of rail regression in Poland in the 1990s was exceptionally intense and covered a significant part of the rail network, especially regional in nature (Taylor, 2004).

Over the past 15 years, the literature on the development of railways in Poland has increasingly emphasized activities related to the reactivation of this mode of transport (Smolarski, 2021). The phenomenon of rail reactivation can be considered in a multifaceted way. Although, in general terms, the common feature of any reactivation is that, as far as possible, we restore something to an earlier state, the success of any reactivation depends on many variables and is best when considered individually. Certainly, an important consideration is the period of time after which the railway was reactivated. A big problem can be getting potential travelers back into the habit of using the railway. Studies show that after reactivation, potential passengers need about a year to get used to rail transport. It is certainly more difficult to 'return' to the services offered by the railway when the reactivation occurred after, say, 30 years. Zajfert (2015) referred to this as the 'asymmetry of demand-supply adjustment'. In addition, an important issue is how competitive the transport offer will be after reactivation (number of connections, travel time, rolling stock used, and its overall reliability). Table 1 shows the main factors affecting reactivations.

In order to show the scale of the regression in the Polish railway system, it might be useful to compare it to the changes

in the Czech railway system. Between 1989 and 2011, about 90% of tertiary and 44% of secondary routes in Poland were closed. During the same period in Czechia, the rail network shrank by only 14% (Taczanowski, 2012).

For the purposes of this study, the authors proposed a typology of reactivation processes (Tab. 2) based on 3 categories. The 'simple' category is the restoration of traffic on sections where virtually no modernization work was done and the freight offer is relatively poor. This often leads to the rapid re-suspension of traffic. One example is the Legnica–Jerzmanice Zdrój section. Passenger traffic was suspended in 1996, in 2008 two pairs of daily services were restored at unfavorable times, and in 2009 the route was closed again. This type of action is not part of a coordinated and effective transport policy, and is only related to ad hoc measures without effect on the regional transport system.

In the next category ('expanded'), small-scale modernization works can be noted (not on the entire route), as well as the introduction of a better transport offer than before. The aspect of the number of connections is an important element affecting the evaluation of passenger transport. It is part of a group of internal factors that are dependent on the rail carrier (Chakour & Eluru, 2016; Pan et al., 2017). In transport systems that are expanding, it is the internal factors that are more important (e.g., timetable, vehicle size, ticket prices) than the external factors (e.g., population density, spatial-functional structure). The last category 'complete' is characterized by the modernization of the entire route, the introduction of an attractive timetable, the reconstruction of platforms, etc. To achieve such an effect, it is common practice to close the route (introduce substitute transport) to passenger traffic for the duration of these extensive works.

Main causes of reactivation

- Increased funding opportunities for rail reactivation activities;
- Pro-railway vision of local government officials regarding the restoration of the rail network;
- Taking over railway routes by the UMWD (voivodeship self-government) from PKP (Polish Railways);
- Reactivation based mainly on new rolling stock and improvement of transport parameters;
- Establishment of a carrier in the form of the Lower Silesian Railroad;
- Implementation of sustainable mobility through rail;
- Development of agglomeration railways and the fight against traffic congestion;
- Efforts to provide a transport offer that is beneficial to the passengers (appropriate tact, number of trips);
- Restoration of routes largely following previous modernization;
- High level of managerial preparation of personnel managing railroad companies (PKP).

Tab. 1: Main causes of reactivation of passenger rail transport in Poland

Source: Authors' own study based on Taylor (2007), Taczanowski (2012), Ciechański (2014), Zajfert (2015), Król & Taczanowski (2016), and Smolarski (2023)

Reactivation type	Characteristic
Simple	• Restoring rail lines that have not actually undergone any modernization; • As a result, when the rail route is reopened, the freight speed is what it was before the closure and even lower; • In many cases, old rolling stock with significantly lower freight performance is used on such a reopened line; • Correspondingly lower comfort and longer travel time; • This results in lower competitiveness with respect to other modes of public transport; • Due to the average condition of the infrastructure, greater susceptibility to train delays or temporary shutdowns for repairs; • Higher probability of closing such a line again.
Extended	• Restoration of rail traffic based on partial modernization of the line (e.g., track rehabilitation not necessarily along its entire length, only on selected sections); • The reactivation of the line is not necessarily associated with the renovation or construction of stops or platforms; • Lack of comprehensive modernization has a direct impact on the formation of transport parameters (less competitive speed, greater susceptibility to delays); • Lower safety levels at stops without properly built platform infrastructure; • Relatively high traveler interest in the transportation offer, creates more chances for more comprehensive upgrades on such a line.
Complete	• Increasing freight performance (higher commercial speed, reduced travel time); • Construction or major renovation of platforms; • Competitive freight offer (number of courses their appropriate timing, modern rolling stock); • Applied technologies for traffic control infrastructure improve the safety of travelers to a greater extent; • Due to the good condition of the infrastructure, less susceptibility to train delays or temporary shutdowns for repairs/likelihood of the line being closed again.

Tab. 2: Types of reactivation processes of passenger rail transport in Poland

Source: Authors' conceptualization

Changes in the operation of rail transportation systems in post-socialist countries involved many aspects. They were related to the reduction in the number of services, the dismantling of rail infrastructure, and changes in passenger demand, among others. The factors affecting the operation of public transport (including the rail sector) can be divided into two main groups. These are internal and external variables (Thomson & Brown, 2006; Taylor et al., 2009; Boisjoly et al., 2018; Lierop et al., 2018). The first group includes those elements that are dependent on the transport organizer and the rail carrier. These can include ticket prices, timetables (number of connections), promotions, marketing, information policy, among others. On the other hand, the second group of variables relates to characteristics that are independent of the carrier. These include the age structure of the population, affluence, spatial policy, mobility of residents of a region. They also include the relationship between transportation infrastructure and land use (Polom et al., 2018). It should be noted that in many cases the inclusion of a particular feature in one of the groups is ambiguous (Taylor & Fink, 2003).

Railway regionalization measures, undertaken already in the 1990s, had a significant impact on the current principles of responsibility for provincial transport and the shape of the transport system of designated regions. The phenomenon of regionalization of railways is associated with the transfer of responsibility for regional rail transport to provincial governments. Such solutions were implemented in other European countries over the past years including Germany, the Czech Republic, Slovakia and Austria (Tomeš et al., 2014; Seidenglanz et al., 2015; Chlumecky et al., 2021). In Poland, the regionalization phenomenon began at the beginning of the 21st century. (Taylor & Ciechański, 2017; Smolarski, 2021). The result was the beginning of the operation of local government companies (Kruszyna, 2018) supervised by regional authorities which at the same time were responsible for the shape of public transport (Koloś et al., 2017). The processes of regionalization and deregulation of the rail sector were identified in, among others: United Kingdom (Knowles & Hall, 1992), Sweden (Fröidh & Nelldal, 2015) and Czechia (Tomeš et al., 2014).

In addition to the above-mentioned elements relating mainly to the administrative and organizational sphere of the operation of rail transport systems, reference should also be made to studies of a geographic and spatial nature. Studies have often concerned the national level. The evolution of the rail network of the Netherlands and its impact on population and transport accessibility was the subject of the study Koopmans et al. (2012). Petersen (2016), on the other hand, evaluated the operation of public transport in rural Switzerland. The cyclic schedule of public transport vehicles was also the subject of analysis. Research related to the evaluation of railroad operations in Slovakia was the subject of Michniak (2006, 2018). He drew attention to political and historical conditions in this context, including the phenomenon of passenger traffic extinction.

A separate group of analyses is the study of urban railroads. In Poland, only in some cities agglomeration transport is carried out by dedicated transport companies (e.g., Tri-City, Warsaw). Most often this type of connection is carried out as provincial courses, which additionally provide connections within cities (Kruszyna, 2018; Kowalczyk, 2019). The increased popularity of such solutions worldwide translates into a growing role of creating recommendations and implementing actions to improve their performance (Babalik-Sutcliffe, 2002; Mackett & Babalik-Sutcliffe, 2003). In addition, the literature singles out the Light Rail Transit (LRT) type as a model intermediately between the streetcar and the classic railroad (Topp, 1999).

From the point of view of the new approach to the study of rail transportation systems, network research is important. Graph (network) methods are an important part of transportation

geography research (Derrible & Kennedy, 2010). The main element in this method is the determination of nodes and edges. A node can be considered all railroad stations or only those at which interchange is possible (Derrible & Kennedy, 2010). The edge of a graph can be defined as the number of courses, passengers (Lin & Ban, 2013).

Rail transport should be coordinated with bus/coach connections and included in the organization of the system by provincial governments. The essence of the links should be based on bus and rail functions complementing each other (Chowdhury & Ceder, 2016). This is particularly important in areas outside the largest agglomerations (Boruta & Ivan, 2010; Šťastná et al., 2015; Smolarski et al., 2019) as it allows to reduce the phenomenon of transport exclusion (Šťastná & Vaishar, 2017). Moreover, rail transport can be seen as the axis of public transport in the region. As a result, it is important to properly maintain the transport infrastructure in terms of technical parameters, which affect the level of competitiveness of rail transport (Tomeš et al., 2014).

The goals and direction of public transport activities at the provincial level are defined in the Transport Plan. In the case of the Lower Silesia, it is more than 10 years old and was developed in 2014. In another study (Transport Investment Plan, 2023), the activities resulting from the planned infrastructure development include revitalization of railway routes (including freight traffic) and electrification of routes without a network. Transport (including public transport) is a very important part of strategic and spatial planning (Russo & Rindone, 2021) and the creation of a transport system should be based on a multi-faceted (policy, infrastructure, economics) decision-making process (Cascetta et al., 2015).

3. Methods and data

In this study, the Lower Silesia province was chosen as the study area (Fig. 1). Its strong 'railway DNA' (especially against the background of the other 15 provinces of Poland) is undeniably evidenced by the shaping parameters which unambiguously characterize the railway potential of a given area. Certainly, one such parameter is the density of the rail network. Lower Silesia, with nearly 9 km/100 km², is ranked 2nd in Poland. A better result is achieved only by Silesia (about 15 km/100 km²), but it should be taken into account that many of the lines there are strictly industrial in nature (Ciechański, 2014) (Tab. 3). On the other hand, the rail utilization rate (average annual number of trips per capita) in the Lower Silesian province in 2023 was 12.7 (national average 9.9), indicating the high transport potential of the region and the growing role of rail transport. The growth rate of the indicator for the region in question from 4.7 (2010) to the current value is also significant.

Lower Silesian province is a region characterized by a large share (among the total number of passengers) of regional and agglomeration services (85.9%) compared to long-distance courses (14.1%). Such proportions in terms of spatial preferences of travelers (mainly regional) may indicate the need for further launching of regional connections based on reactivation of rail routes or improvement of already existing transport links. A similar ratio of regional and express services has been maintained since 2000.

Among the most important considerations justifying the choice of Lower Silesia as a study area are:

- i. High degree of development of active railway infrastructure, which can be supplemented based on modernization (reactivation) of disused railway lines. Lower Silesian features a large number of regional routes which are complementary elements of the main trunk lines;

Voivodeship	Density of railway lines km / 100 km ²	Voivodeship	Density of railway lines km / 100 km ²
Lower Silesia	9.01	Subcarpathia	4.88
Kuyavia-Pomerania	6.67	Podlasie	3.56
Lublin	3.61	Pomerania	6.76
Lubusz	6.56	Silesia	15.13
Łódzkie	5.92	Świętokrzyskie (Holy Cross Province)	5.18
Lesser Poland	6.67	Warmia-Masuria	4.39
Masovia	4.85	Greater Poland	6.35
Opole	8.31	West Pomerania	5.00
Poland = 6.02			

Tab. 3: Density of rail lines in provinces in 2022

Source: Urząd transportu kolejowego (The Office of Rail Transport): Railway Data (2022)



Fig. 1: Research area. Source: Authors' elaboration

- ii. The local government of Lower Silesia is the only one in Poland to be very active in taking over disused railway routes from the Polish Railway Lines¹ (PKP PLK) in order to adapt them to passenger traffic;
- iii. Coexistence (since 2009) of two transport companies: PolRegio and the Lower Silesian Railways (Koleje Dolnośląskie: a company managed by the provincial government). In 2023, PolRegio carried about 40% of passengers in the region. It is planned to further increase the share of Koleje Dolnośląskie and expand the scope of transport tasks;
- iv. Complex historical conditions (intensive development of the rail network in the late 19th and early 20th centuries and further densification of the target transport system), which influenced the current shape of the rail network;
- v. A relatively well-developed settlement system comprising 93 cities (the average for the province in Poland is 63 cities) has an impact on the density of the public transport network.

The following methods were used in the adopted research procedure:

1. Analysis of planning and strategic documents at the provincial and national levels;
2. Analysis of railroad timetables;

3. Analysis of literature (subject literature) and Internet sources;
4. Cartographic method (including visualization of the railroad network, allowing to show changes in spatial terms in the adopted period of research);
5. Field inventory to determine the status of modernization activities carried out.

The following were used as source data: studies of railway companies (including annual reports and other reports), reports of the Railway Transport Office, statistical data obtained from the Central Statistical Office (in the field of transport infrastructure). In addition, data on the operation of railways in the province were obtained from the carriers' websites and map portals (including www.bazakolejowa.pl). In addition, classical railway atlases (Stiasny & Stankiewicz, 2010; Stiasny, 2022) were a source of data.

4. Results and discussion

4.1 Results

The study shows that between 1990 and 2006, within the borders of the analyzed province, passenger traffic was eliminated on more than 900 kilometers of previously used railway lines (a decrease from 2,055 kilometers to 1,138 kilometers). The fact

¹ It is the Polish national infrastructure manager

that the decommissioning efforts which shaped the new railway system boiled down to the maintenance of double-track lines falling mainly into the category of trunk lines and so-called ‘first-class’ lines. Lines of secondary importance, single-track and non-electrified, were decommissioned first. The study shows that over 16 years (1990–2006) the share of electrified lines in the total length of active railways increased by as much as 31.5 percentage points (from 44.7% to 76.2%).

When discussing the issue of reactivating rail transport, it is worth considering why Lower Silesia has seen above-average national activity regarding the reactivation of rail lines (Fig. 3). Certainly, there is a strong political will on the part of the local government, which expressed a desire to reuse the dormant potential in the form of the existing rail system (Małysz & Tomczak 2020; Smolarski, 2021). Paradoxically, previously taken large-scale measures to exclude a large part of the province from rail traffic, with adequate funding opportunities created favorable conditions for re-establishing railway connections according to a well-considered plan (mainly based on a reasonably constructed schedule of reactivation measures).

Among decision-makers, the key question has been asked more than once: can we squander such potential? The area which for many years (mass liquidations) was a certain cause for shame, now with the reactivation measures taken can become an example of efficient restoration of railways. This usually meets public acceptance of the future development of the transport system. It is also impossible to ignore the important fact that railways, for environmental reasons, are the preferred mode of transport in EU policy (see, for example, Sustainable and smart mobility strategy, 2021).

The study concludes that 2006 was the last year in which decommissioning activities were recorded on the rail network system of the Lower Silesian province. All subsequent closures of railway lines have involved lines that were either closed again, or closed for repairs. Initiated in 2006–2008, the first attempts to reactivate services on selected disused railway lines ended mostly with their closure (only 2 of the 6 reactivated lines are still in

operation today). It should be noted that prior to the reactivation of passenger traffic, no modernization works were carried out to improve technical parameters of the lines. Thus, trains before and after reactivation ran with the same travel time, and services were operated with old, worn-out rolling stock.

It was the experience of the first unsuccessful reactivations (including routes to Złotoryja and Lwówek Śląski) that allowed local authorities to draw conclusions for the future, which, among other things, boiled down to the fact that the effective restoration of railways should include such measures as: modernization of the railway route, purchase of new rolling stock, shortening travel time, increasing the comfort and safety of travelers. These reactivations were characterized by a lack of previous modernization work and a small number of connections. Particularly important in terms of increasing passenger demand in this case was the transport offer.

The reactivation of the lines, initiated in 2009, was a period of major change for the Lower Silesian railway. It was this time that put an end to years of degradation, rail line closures and, in the final stage, the cancellation of connections. The first attempts at reactivation, despite the fact that they ultimately proved unsuccessful, heralded positive changes in the operation of the regional railway. During this period, three key development factors emerged that provided a strong foundation for reactivation efforts. These included:

- Purchase of SA135 and SA134 series railbuses, which continued to form the rolling stock basis for the operation of non-electrified railway lines in Lower Silesia until 2024,
- Establishment of the company Koleje Dolnośląskie S.A. by a resolution of the Lower Silesian government (Sejmik),
- Reactivation of railway lines 286 Kłodzko Główny–Wałbrzych Główny and 326 Wrocław Psie Pole–Trzebnica, by the newly established Koleje Dolnośląskie (KD).

The aforementioned establishment of a local government company by the provincial government is part of broader transformations in this area that can be identified in Poland. Over the past few years, Małopolska Railway, Wielkopolska Railway, among others, have

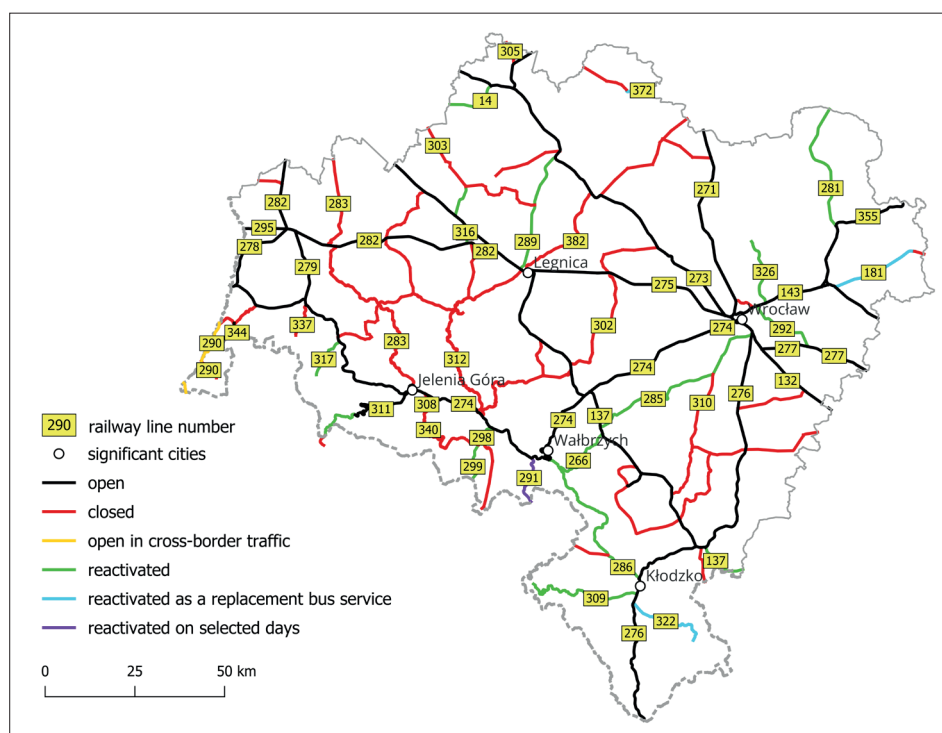


Fig. 3: Reactivated railway lines in Lower Silesia from 2009 to 2024

Source: Authors' elaboration, based on Railway Atlas of Central Europe (2025)

been established (Kruszyna, 2018). In the case of other countries (e.g., Czechia, Slovakia), the establishment of regional companies is not a common phenomenon (Król & Taczanowski, 2016). In Polish realities, this was dictated, among other things, by the need to move away from the dependence of local governments on cooperation with PKP. This company faced numerous economic and financial problems, and its operations were inefficient (Zajfert, 2013).

Based on the data in Table 6, it can be concluded that 20 different sections of railway lines were reactivated in the study area between 2009 and 2024. In total, the railway lines reactivated during this period amounted to about 360 kilometers. These were mainly single-track and non-electrified lines. Interestingly, most of the railway lines were reactivated by the Polish Railway Lines (PLK), i.e., the assets were not transferred to the provincial government and the lines were reactivated by the owner (PLK) with funds from the headquarters or the local government. Only a few sections were reactivated by another company i.e., the Lower Silesian Road and Railway Service (DSDiK). All DSDiK lines were repaired or upgraded. These lines differed from the routes under PKP PLK management primarily in the length of closure. PLK lines were used for freight traffic or closed for 3–5 years. The lines which were reactivated by DSDiK by 2024 were closed for more than 20 years and no freight traffic was carried out on them. This also meant the need to renovate the lines along their entire length. Initially, DSDiK railway lines were repaired only to achieve passability.

The reactivation of railway lines in the Lower Silesian province, carried out between 2006 and 2024, made it possible to expand the active network of railway routes by 360 km (from 1,138 km

to 1,497.9 km). A comparison of the current state of the rail network's length with the base year (1990) shows that in 2024, it overlapped by 73% (1,497.9 km in 2024 and 2,055.1 km in 1990). It is worth recalling once again that during the period of greatest regression (2006) this share, compared to 1990, was at 55%.

Most routes carry both freight and passenger services. Virtually every route carries freight runs. Among the lines on which relatively intensive cargo depot traffic can be found are for example lines: 322, 285, 292, 14, 289, 281, 137, and 298. These are mostly lines with the character of main lines – trunk lines. For shorter routes, the running of freight trains is very rare, sporadic. Such lines include: 372, 303, 316, and 317. These are usually types of routes that are either ‘dead-end lines’ or that are short sections connecting other routes.

In some cases, the operation of freight traffic was the basis for the operation of a particular route, where traffic was based on serving specific industrial plants. Such a situation occurred on the lines, among others: from Świdnica Miasto to Wrocław; from Kłodzko to Stronie Śląskie; Kamieniec Żabkowicki–Nysa (numerous quarries). In the near future (2025–2028), the rail network system in the studied province will expand by another 228 km. Based on the data included in Table 7, it can be stated that in 2024, as many as ten sections of railway lines were under construction, or preparatory work was underway, for future reactivation of the railway. Five sections were managed by the Lower Silesian Road and Railway Service. The remaining rail lines are being modernized, or will be modernized, by PKP PLK. Construction work is planned or underway on all lines. Full implementation of the reactivations planned in this way

Nr	Route	Length (km)	Closure period	Reactivation
298	Sędziszów–(Lubawka)–Trutnov	20.2	2004–2008	2009
326	Wrocław Psie Pole–Trzebnica	19.8	1992–2009	2009
286	Kłodzko Główne–Wałbrzych Główny	60.0	2006–2009	2009
311	Szklarska Poręba Górna–Harrachov	14.7	1962–2010	2010
309	Kłodzko Nowe–Kudowa-Zdrój	40.0	2010–2013	2013
137	Kamieniec Żabkowicki–(Doboszowice)–Nysa	10.9	2004–2018	2018
291	Boguszów–Gorce Wach–Mieroszów–Meziměstí*	14.9	2004–2018	2018
281	Grabowno Wielkie–(Cieszków)–Krotoszyn	38.3	2016–2019	2019
289	Lubin–Rudna Gwizdanów	39.4	2004–2019	2019
14	Głogów–(Głogówko)–Leszno	13.8	2011–2019	2019
372	Dzierżoniów Śląski–Bielawa Zachodnia	6.1	1975–2019	2019
292	Wrocław Sołtysowice–Jelcz Miłoszyce	21.4	2002–2017*, 2018–2021	2017/2021
285	Wrocław Główny–Świdnica Miasto	60.2	2000–2022	2022
322	Krosnowice Kłodzkie–Stronie Śląskie**	24.3	2004–2022	2022
303	Rokitki–Chocianów	10.4	2000–2022	2022
316	Chojnów–Rokitki	8.0	2002–2022	2022
266	Świdnica Kraszowice–Jedlina-Zdrój	21.4	1990–2023	2023
317	Gryfów Śląski–Świeradów-Zdrój	16.5	1996–2023	2023
181	Oleśnica–Syców	25.5	2002–2023**	2023
372	Bojanowo–Góra Śląska	7.41	1991–2023**	2023

Tab. 6: Reactivation of railway lines in Lower Silesia from 2009 to 2024

Notes: *Railway reactivated seasonally; **Railway reactivated in the form of Railway Substitute Transport, pending completion of modernization

Source: Authors' compilation based on Official Train Timetables (Służbowy Rozkład Jazdy Pociągów/SRJP)

Nr	Route	Length (km)	Planned reactivation	Stage of work
181	Oleśnica–Syców–(Kępno)	28.36	2026	Construction work
308/340	Jelenia Góra–Mysłakowice–Karpacz	15.73	2025	Construction work
284	Legnica–Jerzmanice-Zdrój	24.27	2026	Construction work
283	Zebrzydowa–(Świętoszów)–Żagań	27.01	2026	Construction work
310	Kobierzyce–Piława Górna	39.39	2026	Construction work
318	Bielawa Zachodnia–Bielawa Nowa	3.78	2025	Ongoing tender
274/275	Wrocław Muchobór–Wrocław Świebodzki	1.56	2028	Design work
308	Mysłakowice–Kamienna Góra	30.37	2026	Site cleanup
322	Kłodzko Nowe–Stronie Śląskie	24.32	2026	Site cleanup
290	(Zgorzelec)–Studniska–Bogatynia	33.21	2028	Design work

Tab. 7: Railway lines in Lower Silesia where preparatory or construction work is carried out (as of Jan 2025)

Source: Authors' compilation based on the Railway Atlas of Central Europe (AtlasKolejowy.net), and press materials

will contribute to extending the active rail network to 1,725 km. Calculations show that the 2028 network will coincide 84% with the active railway system registered in 1990.

Planned revitalization activities related to further restoration of the rail network (Fig. 4) may in the future affect activities related to the provincial public transport system based on coordination of bus/coach and rail services. As Smolarski et al. (2019) notes, railways can form the basis of a public transport system to which transport provided by buses/coaches can be adapted. The creation of such a system should be based

on econometric analysis, which will indicate which mode of transport (given the broad catalogue of costs) will be more cost-effective (Avenali et al., 2020). In Lower Silesia, cost analysis should be applied to routes where rail reactivation processes are not very advanced and modification of transport policy is still possible.

The analysis conducted was also based on case studies, with reference to the typology of reactivation types proposed earlier. Three representative examples of reactivation processes in the study area were selected (Fig. 5).

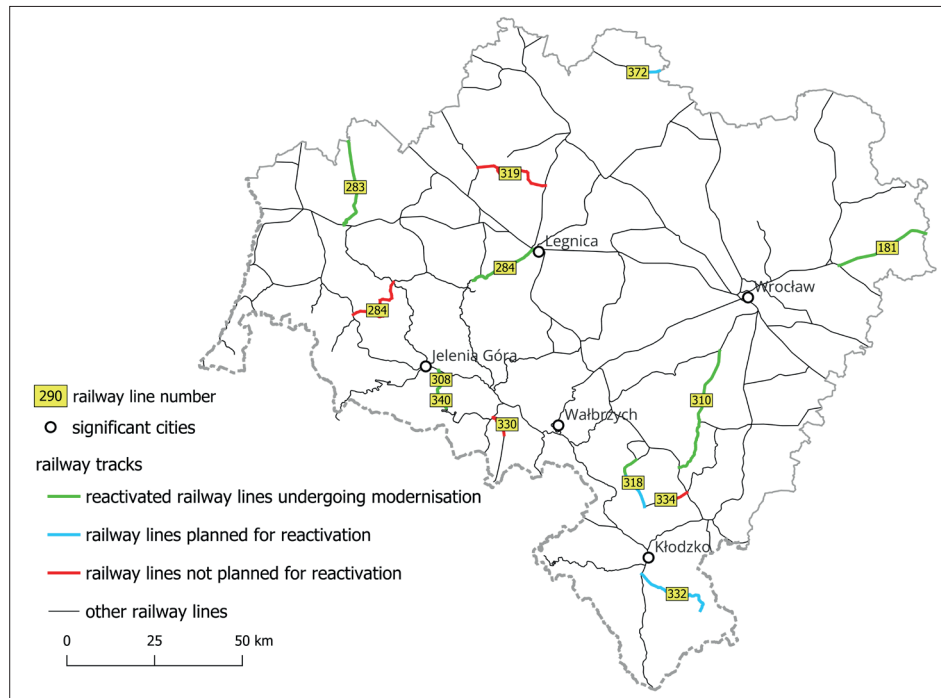


Fig. 4: Plans for reactivation of railway lines in Lower Silesia. Status as of May 2024

Source: Authors' elaboration based on data from the Marshal's Office of the Lower Silesia province, Railway Atlas of Central Europe (AtlasKolejowy.net), PKP Polskie Linii Kolejowych data, and rynek Kolejowy.pl

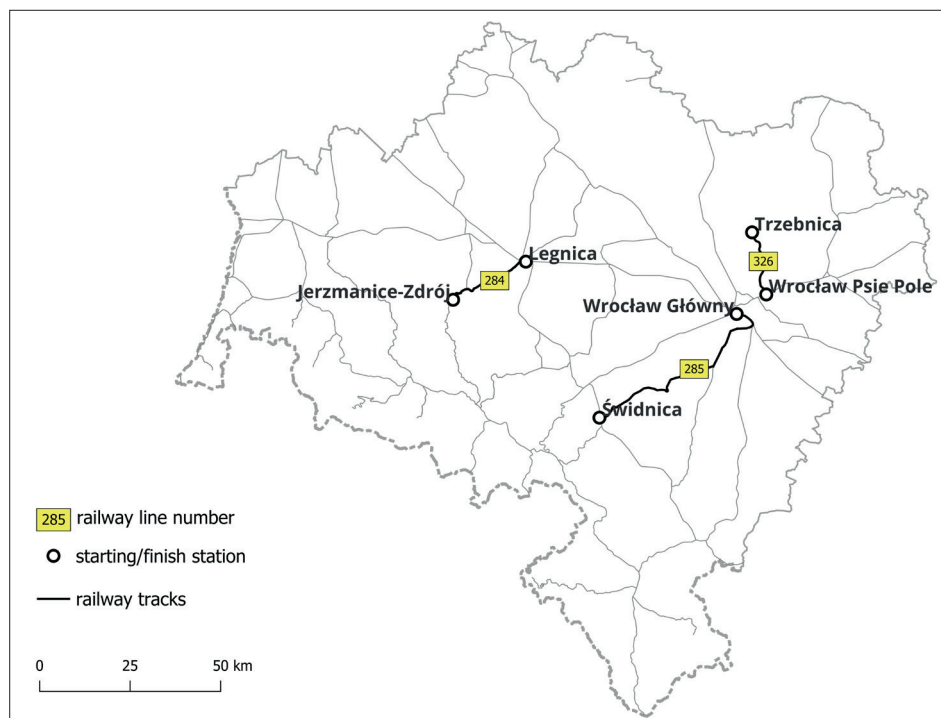


Fig. 5: Case studies in Lower Silesia

Source: Authors' elaboration

4.2 Examples of specific reactivation types

The first example is railroad line number 284 connecting Legnica and Złotoryja. In the context of the typology proposed earlier, this is a simple reactivation type. This is a specific route in terms of transport policy in the region. Passenger traffic was suspended there in 1996. In December 2008, passenger trains were resumed. Significantly, virtually no modernization work was carried out on the route. The line was used by heavy freight trains, which affected the decapitation of the track infrastructure. Nevertheless, after less than a year, passenger services were again suspended in September 2009. It should be noted that during this period there were only two pairs of services a day, which, with the developed bus service², did not provide any alternative for the passenger. Importantly, given the plans for the operation of this route, a reactivation of the comprehensive type is likely to be carried out in the coming years. Stops and platforms will be rebuilt, the road speed will be increased (120 km/h), in addition, the overhead line will be upgraded and the track will be replaced. The work should be completed in 2028. The line has been incorporated into the regional rail network as an infrastructure with significantly improved parameters.

Another state route is an example of a route serving agglomeration passenger traffic. Railroad line number 326 is a 19.7 km long line connecting Wrocław Psie Pole and Trzebnica. It was reactivated for renewed passenger traffic in 2009. It was one of the first lines in the Lower Silesian province to be decommissioned in 1991. The line is single-track and non-electrified. There are no passing points on its nearly 20-kilometer stretch. Between 2009 and 2024, the number of connections offered on the line increased fourfold (from 4 pairs of connections to 16). The analyzed line is the first railroad in Poland to be taken over from the infrastructure manager by the regional government³. The reactivation work was divided into several phases. The first of these, for about 11 million (€ 2.5 million), was not exactly an upgrade of the line but more a repair/enabling of full passability. Modernization measures carried out in subsequent years mainly consisted of providing higher train speeds (up to 80 km/h). In 2024, there were 9 train stops and stations on the line. The line was served by diesel and hybrid rolling stock available from Lower Silesian Railways. It is worth noting that without a passing, terminating station with traffic control systems (or electrification), there is currently no possibility of increasing the number of trains running.

It can be expected that the line will undergo further upgrades in the coming years. Referring to the previously proposed typology, this reactivation was an extended reactivation.

Railroad line number 285 is a line about 60 km long, connecting Wrocław with Świdnica via Sobótka. Currently, there are 16 stops and railroad stations on the line. This route for rail traffic was closed in June 2000. In 2019–2022, at a cost of 200 million zlotys (+/- 47 million EURO). Modernization work has been undertaken. As part of these measures, the track along the entire length of the line was replaced and the line was adjusted to 120 km/h in certain sections. This reduced the travel time from about 150 minutes (in 2000) to 67 minutes. In addition, new platforms, bus shelters were built at each stop, and all road crossings were upgraded. Two new stations were also built within the city limits of Wrocław (Wojszyce, Partynice). The line is served

by the Lower Silesian Railways mainly with 36WEh series hybrid vehicles (three-segment cars with a capacity of about 300 people). Currently, 11 pairs of connections run on the line, which is single-track. During the reactivation, only 4 passing stations were planned for the entire line (Bielany Wrocławskie, Kobierzyce, Sobótka Zachodnia and Świdnica Przedmieście). A larger number of passing stations would certainly improve train travel on the line and allow for more connections. The electrification of the line and the addition of a second track are planned. The measures taken in this case to restore railroad connections can be attributed to the type proposed earlier – complete reactivation.

4.3 Discussion

Bus/coach transport is characterized by a greater flexibility and network density compared to rail. As Ben-Akiva and Morikawa (2002) noted, there is no clear preference between bus/coach and rail transport as long as they offer similar levels of service (comfort, travel time, etc.) It should also be noted that for the passenger, the psychological factor preferring to choose rail rather than bus/coach for travel is also important (Scherer & Dziekan, 2012). Integrated public transport systems are widely used in the Czechia (Boruta & Ivan, 2010). In Lower Silesia, Koleje Dolnośląskie organized bus transport existing only between: Oleśnica and Syców, Rawicz and Góra Śląska, Kłodzko and Stronie Śl. The trip requires a change from the train and is possible with a single ticket. The time to change the means of transport is included in the timetable.

The transport policy that is created and implemented should be territorialized, i.e., defined and specified for a specific administrative unit. It should be adapted to the characteristics and development conditions of a specific region (also taking into account problem areas). Transport policy should be part of regional development activities (Kulmer et al., 2014). As Rosik and Wójcik (2023) point out, the above-mentioned aspects should be consistent with the policy implemented at the European level, also in terms of planned and implemented transport investments (Rosik & Wójcik, 2023). It is equally important to introduce aspects of proper management into the process of implementing transport policy objectives (Radtke & Kanzler, 2025).

The process of reactivating railway lines should be considered in a broader context. This study focused on infrastructure issues, i.e., answering the question of which routes were reactivated and when. In the context of the reasons for the renewal of railway infrastructure, many aspects need to be taken into account. One of them is the proximity of large urban centers, which have population potential and, consequently, high potential passenger demand. As Jurkowski and Smolarski (2021) have shown, this feature has a very significant impact on passenger numbers. In the case of the studied area, it can be assumed that some routes (main and trunk lines) are already well-developed elements of the provincial rail transport system, and in their case, the importance of external factors increases (Chakour & Eluru, 2016; Pan et al., 2017). However, the study identified a number of local connections where internal factors continue to be important. This points to the need for a long-term transport policy aimed at increasing passenger demand (Lucas, 2012; Chowdhury & Ceder, 2016).

Issues related to the demographic potential of the region are equally important. While the number of passengers on the main routes serving agglomerations is relatively high

² These were transport services provided by private carriers, often only during peak hours on weekdays. This affected the overall low level of transportation service on this line. Trains could provide a significant strengthening of transport links between the regional city and the Legnica agglomeration.

³ Currently (05.2025), the provincial government, using its own infrastructure manager, administers about 60 kilometers of active rail routes. Repair work is currently underway on additional sections. This is likely to be the basis for further reactivation of passenger traffic. These are non-electrified routes with relatively low (current and planned) train speeds. The regional manager is involved in both the restoration of track infrastructure, but also stop infrastructure and road crossings.

(Smolarski, 2023), it may be problematic to create high passenger demand in peripheral areas. The settlement structure influences the distribution of potential passengers. In the context of the bus transport sector in rural areas, Zhang and Xu (2022) pointed out that there is a strong correlation between the number of inhabitants and the number of passengers. As Börjesson et al. (2020) rightly point out, in an extremely negative scenario, a decline in the number of residents may result in the elimination of rail connections while maintaining bus services. In this case, integrated public transport systems are particularly effective, as they allow transport connections to be maintained (Šťastná et al., 2015; Šťastná & Vaishar, 2017; Kraft et al., 2022).

Another aspect relates to the provision of rail transport services to areas attractive to tourists. In the area under study, these are mainly border areas, where rail transport is less developed than in the central part of the region. This does not change the fact that the reactivation covered routes to important tourist centers (Świeradów Zdrój); in addition, there are plans for services to Łądek Zdrój (an important health resort in the region). As Becker & George (2011) noted, urban rail transport has a significant relationship with tourist activity. They pointed to the benefits of reducing traffic congestion and parking problems. It seems that similar relationships can be identified outside urban areas.

The study showed that the spatial pattern of reactivated routes in the studied area is mainly based on regional lines without overhead contact lines. Around the provincial capital (Wrocław), two agglomeration routes and one regional route have been reactivated. This is important because in the peripheral, rural areas of the province, there is no single regional bus operator, and transport services are provided on a free market basis (without coordination at the central level). In such cases, trains are often the only means of public transport (Smolarski et al., 2019).

5. Conclusions

The considerations undertaken in this research proceeding dealt with the issue of railroad reactivation, which is relatively poorly recognized in the literature. The adopted research area (the Lower Silesian Voivodeship) is, like no other region in Poland, an excellent example of the transformation of passenger rail transport. The research carried out relating to the development of this mode of transport after 1990 made it possible to delineate two extreme periods. The first period of regression covered the years (1990–2006) and concerned the massive liquidation of railroad lines actually reducing the rail network system to trunk and first-class lines. On the other hand, since 2008 (and continuing to this day), only measures to restore the railroads back to traffic have been observed. Such a different approach to the role of passenger rail transport in carrying out the mission of public transport (in this case carried out at the regional level) appropriately fits into the path of rail development from regression to success proposed in the title of this study. Hence, the use of the phrase reactivation phenomenon in the rest of the title is no abuse on the part of the authors, but is a fact that has been adequately documented.

The local government of the province has developed a document that contains the main demands and assumptions for the operation of public mass transport in the region (Smolarski, 2023). This is a plan for sustainable development of public mass transport. The document was developed in 2014. After more than 10 years, it should undoubtedly be updated in accordance with the current state of rail infrastructure (in the context of reactivation of routes) and the needs of society (increased mobility). The revision of the plan should take into account the thread of coordination of bus and rail services. The lack of current assumptions of the shape of the public transport network influences the inefficient transport policy of the region.

The research carried out allowed us to answer the previously posed research questions. Referring to the first research question which is: what influenced the reactivation of the railroad lines, several decisive factors can be mentioned. Among the most important of these are: the increasing role of the provincial government, which has a vision of development written down in official documents (including the transport plan) and, as far as possible, implements it in real space, the availability of various monetary resources (mainly from European Union funds) that allow the financing of activities restoring rail transport, the operation of a new carrier in the form of the Lower Silesian Railways, which has modern rolling stock, the takeover of rail lines by the provincial government from PKP PLK, which was not interested in their reactivation.

Based on the research, an answer was obtained to the next research question posed, which was in what order and on the basis of what key railroad lines were reactivated. In the first order, traffic was restored on lines where the condition of the railroad infrastructure was good enough to make the route passable with minor upgrading efforts. The fact of the population potential of the villages living along the lines was not without significance. In addition, it was observed that the greatest chances for longer rail service were those lines where reactivation was comprehensive. This automatically translated into higher transport parameters (higher route speed, reduced travel time, lower failure rate of railroad infrastructure elements). It is worth noting that the reactivation mainly covered single-track, non-electrified lines. Spatially, they were located primarily in the southern part of the province, that is, in the area where railroad decommissioning activities were carried out on the largest scale in 1990–2006.

Referring to the last research question about plans for the coming years, it should be noted that the local government is not stopping in its efforts to reactivate railroad lines. While it restored 20 railroad lines with a total length of 360 kilometers in 2009–2024, it plans to reactivate 10 more lines with a length of about 200 kilometers in the coming years of 2025–2028. The layout of the rail network should not be expected to be restored to its pre-war state. It should be considered optimal to restore the network to a state 80% resembling the original one (the most extensive in all history) – and this is the plan for reactivation activities until 2028. One should be aware that not all disused lines have the potential for reactivation. Hence, local governments should reasonably (e.g., based on in-depth economic analyses) plan the process of rebuilding railroad lines, so as not to eventually fall into the so-called ‘reactivation trap’ (i.e., the principle that we reactivate everything). The network should not be expected to be reactivated to the state of 1990, much less 1945 (2,688 km). The implementation of the transportation system should be based on bus transportation or newly built lines/railroads (possibly) adapted to the current routes.

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