

INFRASTRUCTURE PROJECTS AND TRANSPORT EXCLUSION – CASE STUDY OF THE POMORSKA KOLEJ METROPOLITALNA

Mariusz CHMIELEWSKI^{1*}, Joanna PIOCH², Renata PŁOSKA³

¹ University of Gdansk, Department of Business Economics; mariusz.chmielewski@ug.edu.pl,
ORCID: 0000-0002-0775-621X

² Sopot University of Applied Sciences, Department of Economics and Finance; joanna.pioch@ssw-sopot.pl,
ORCID: 0000-0002-7895-1696

³ University of Gdansk, Department of Business Economics; renata.ploska@ug.edu.pl,
ORCID: 0000-0002-1716-4496

* Correspondence author

Purpose: The purpose of this paper is to analyse the effects of the Pomorska Kolej Metropolitalna infrastructure project from the perspective of transport exclusion of the Gdańsk-Gdynia-Sopot Metropolitan Area residents. The reason for undertaking the topic is the importance of this project for many different groups of stakeholders and the possibility of analysing some of the already visible effects of its implementation.

Design/methodology/approach: The theoretical part describes the phenomenon of transport exclusion as well as the specifics and importance of infrastructure and infrastructure projects. The research part is based on a case study: an analysis and evaluation of selected effects of the presented project. The subject matter covers a regional transport investment – the Pomorska Kolej Metropolitalna. The study used statistical data analysis and the descriptive method.

Findings: The analysis of selected parameters concerning various aspects of the infrastructure project's effects showed that the Pomorska Kolej Metropolitalna improves the residents' quality of life by reducing the phenomenon of transport exclusion. Increased transport accessibility affects both residents of the region's capital city and other towns in the analysed area.

Research limitations/implications: The main limitation of the study is that the project is still in the implementation phase. As a result, not all of its effects are discernible and quantifiable. Therefore, the study takes into account only selected elements describing the effects of the Pomorska Kolej Metropolitalna, mainly in the context of the problem of transport exclusion.

Practical implications: The findings of the study may be used by the entities responsible for the implementation of public investments as an argument for choosing transport projects as a tool to improve the quality of life in the region.

Originality/value: The value of the study is to indicate that the benefits of infrastructure investments are linked not only to measurable: financial and material results, but also to other aspects relating to the quality of life of the society and reducing the problem of transport exclusion. The paper raises the issue of benefits for the local community, providing arguments for decision makers responsible for spending public funds earmarked for regional development.

Keywords: infrastructure projects, transport exclusion, Pomorska Kolej Metropolitalna.

Category of the paper: Conceptual Paper. Case study.

1. Introduction

The quality of life of residents of particular regions – an extremely important issue, in the light of the strongly promoted concept of sustainable development – depends on many factors, including the availability of various goods and services. One of the conditions for this availability is the ability to reach the place where these goods and services can be found. This means, therefore, that an important factor affecting the residents' lives is an adequate transport infrastructure and the availability of public transportation. If there are deficiencies or limitations in this area, we can observe the phenomenon of transport (communication) exclusion affecting various social groups. One of the key elements of fighting against transport exclusion are investments in the development of transport infrastructure and public transport services.

The aim of this paper is to analyse the effects of the Pomorska Kolej Metropolitalna (PKM) infrastructure project from the perspective of transport exclusion of the Gdańsk-Gdynia-Sopot Metropolitan Area residents. The research is based on a case study, in which selected elements were analysed, such as: the number of passengers using the PKM services, the scale of adjusting the PKM railway infrastructure to the requirements of people with special needs, the service potential of the metropolitan area's capital city, to which access was improved or gained, and the number of people living in the metropolitan area along the route of the PKM.

For the purposes of the study, the problem of transport exclusion was identified, and the specifics of public infrastructure and infrastructure projects were presented. The PKM project was also presented and parameters to assess its impact on the level of transport exclusion were selected. The study adopted a research hypothesis that the implementation of the infrastructure project will contribute to reducing the phenomenon of transport exclusion in the region. The following research methods were used: case study, statistical data analysis, and the descriptive method.

2. Transport exclusion

One of the phenomena affecting the possibility of integration and development of the region is the so-called transport exclusion. This topic appears both in scientific publications and expert studies, including those prepared by NGOs, as well as in official documents concerning policies and strategies for regional development worldwide (See e.g. Binder, Matern, 2020; Currie, 2011; Hine, Mitchell, 2003; Levitas et al., 2007; Perez-Barbosa, Zhang, 2017).

Transport exclusion¹ refers to situations in which individuals experience a lack of, or limitation of the possibility to use transport, which in turn restricts their mobility and access to goods, services, and opportunities to build and maintain social relationships (Kamruzzaman et al., 2016). Transport exclusion should be considered a form of social exclusion, preventing full participation and activity in social life (Błażewski, 2019; Jaroš, 2017; Koliński, 2021). Moreover, it contributes to the emergence of other forms of social exclusion. Its consequence may be impeded access to healthcare organisations and the medical services they provide, or to educational facilities and services. Lack of access to means of transport may limit the possibility to contact public administration organisations and handle official matters, as well as use shopping facilities. Finally, it can significantly hinder, and in extreme cases even prevent employment or change of employment (Zmuda-Trzebiatowski, 2016). The negative effects for the individual are therefore evident. The broader effects must also be mentioned: transport exclusion of entire areas or social groups may, especially in the long run, generate such undesirable phenomena as: unemployment, poverty, or, as a result of health deterioration, reduced capacity to work in the community affected by this type of exclusion. The intensification of migration processes, as part of which people leave their place of residence and move to places that provide better living conditions, including better transport accessibility, should also be mentioned (Kaczorowski, 2019).

The problem of transport exclusion can affect different groups, but those particularly vulnerable include people on lower incomes, people with disabilities, and the elderly. They can also include children, adolescents, and single parents. In the context of countries like the United Kingdom, groups such as women and certain ethnic, usually minority, groups are also mentioned (Mackett, Thoreau, 2015; Zmuda-Trzebiatowski, 2016).

The problem of transport exclusion affects various countries and regions around the world. Therefore, the issue appears, among others, in the context of the global strategy for sustainable development, expressed in the form of the so-called Sustainable Development Goals². The problem of transport accessibility is particularly relevant to two of them: Goal 10 – „Reduced inequalities” and Goal 11 – „Sustainable cities and communities”. The first of these goals postulates the reduction of inequalities both between countries and within individual countries. Reducing problems related to transport accessibility can be treated as part of the implementation of Target 10.2, under which activities are to be undertaken to empower and promote the social, economic and political inclusion of all people. In turn, under Goal 11,

¹The literature on the subject also uses the term: communication exclusion (see: Smolarski, Raczyk, 2017).

²The list of 17 Sustainable Development Goals includes 1: No poverty; 2: Zero hunger; 3: Good health and well-being; 4: Quality education; 5: Gender equality; 6: Clean water and sanitation; 7: Affordable and clean energy; 8: Decent work and economic growth; 9: Industry, innovation and infrastructure; 10: Reduced inequalities; 11: Sustainable cities and communities; 12: Responsible consumption and production; 13: Climate action; 14: Life below water; 15: Life on land; 16: Peace, justice and strong institutions; 17: Partnerships for the goals (The 17 Goals, 2021).

Target 11.2 was defined, which explicitly mentions providing access to safe, affordable, and sustainable transport systems for all (The 17 Goals, 2021).

In Poland, the problem of transport exclusion intensified in the 1990s, during the period of socio-economic transformation (Kaczorowski, 2019). Over the following decades, the problem grew in many places. According to the data of the Jagiellonian Club, in Poland, nearly 13.8 million people live in municipalities where there is no local transport organised by the local authorities (Dulak, Jakubowski, 2018).

The sources of transport exclusion can be very diverse. These include the too high, for some people, cost of using infrastructure and means of transport, lack of information on the availability of transport services, and psychological barriers such as fear or resistance to using public transport (e.g. by the elderly or people with disabilities), and lack of transport accessibility in some regions (Mackett, Thoreau, 2015). In the case of the last two sources of transport exclusion, investments related to the development of transport infrastructure are a way to overcome this problem.

3. Infrastructure and infrastructure projects as a way of improving the quality of life of the local community

The development of infrastructure is connected with the implementation of infrastructure projects. The definitions of infrastructure are derived from the Latin words: *infra* and *structura*, which mean „the basis of a certain system or construction, a foundation” (Ratajczak, 1999, p. 11). Many different approaches to defining infrastructure are presented in the literature (Chmielewski et al., 2019).

The most common definitions characterise infrastructure as a basic public good, of strategic importance for the economy and society, whose purpose is to improve the quality of life and conduct business in its vicinity (Kozłowski, 2012). The process of human creation of permanently located linear and point public utility facilities constituting the foundations of socio-economic life, taking into account functions such as transport, communication, water management or energy supply, is one of the most frequently used concepts for defining infrastructure (Piskozub, 1998). Other definitions focus on the economic purpose of building infrastructure (Grzywacz, 1982). The definition proposed in recent years indicates that the most important aspects of infrastructure are that it enables the movement of media, persons, and things, is made available free of charge or for a reduced fee, and is the responsibility of the public authorities who are obliged to create and keep it in good condition (Brzozowska, 2009, p. 12).

The variety of definitions is due to the broad scope of the concept in question. This is shown in the figure below indicating the scope of the concept of infrastructure, in which tangible and intangible, formal and informal elements appear, as well as those that may be created as a result of human activity and those which arise without it. A distinction between investments in “hard” economic infrastructure, and “soft” infrastructure related to the socio-cultural aspect appears here (Miś, 2021).

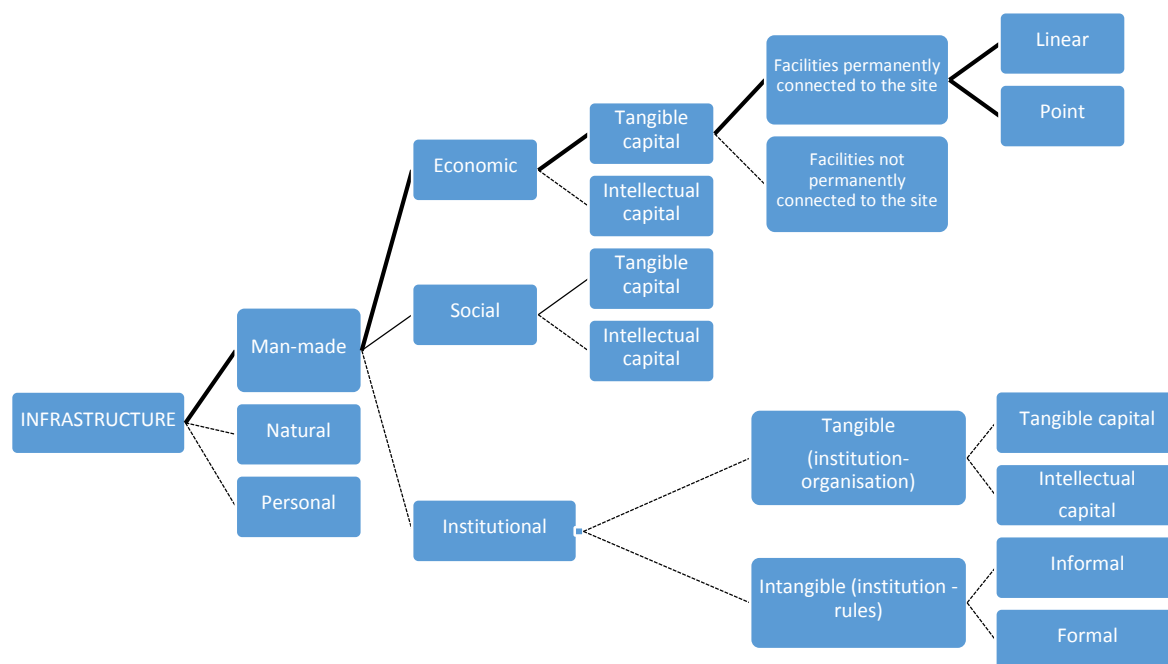


Figure 1. Scope of infrastructure. Adapted from: Ratajczyk M. (1999). *Infrastruktura w gospodarce rynkowej*, Wydawnictwo Akademii Ekonomicznej w Poznaniu, Poznań, p. 22.

Many renowned economists pointed to different aspects of its impact. A. Smith emphasised the duty of the state to create and maintain public utilities such as roads. J. Schumpeter stressed the importance of infrastructure in strengthening entrepreneurial innovation. Nowadays the importance of infrastructure as a direct and indirect factor in economic growth and development is emphasised (Ratajczyk, 1999).

In the theory of literature, infrastructure plays an important role in the analyses of its significance for the stabilisation of growth and economic development. The definitions presented above indicate that it is described as one of the elements of the socio-economic system that conditions the economic development of a given region.

The strong ties between infrastructure and economic development are indicated by the authors of numerous studies. The role of EU funds in increasing the possibilities of creating infrastructure by the local governments and local authorities, which intensifies broadly understood development, is emphasised. EU funds are used to improve indicators used to assess the socio-economic level of regional development. Despite indicating such links, it should be remembered that cohesion policy does not guarantee the reduction of disproportions, although it does increase the possibilities of the local governments and local authorities to effectively use resources and improve the quality of life (see e.g. Gricer et al., 2021; Węgrzyn, 2014).

Infrastructure projects are a tool used in infrastructure creation processes. A project is defined as a temporary venture that is carried out in order to produce a unique product or service. This definition is based on two characteristics of projects: temporariness and intentionality. Among the various characteristics attributed to infrastructure projects are (Nicholas, Stein 2012):

- interdisciplinarity,
- use of a variety of resources,
- the presence of a large group of stakeholders,
- uncertainty,
- the existence of a target group.

It should be noted that there is a great deal of variety between different infrastructure projects, but that each of them requires significant financial resources for their implementation at the beginning and later for their maintenance.

4. Pomorska Kolej Metropolitalna – case study and research on selected parameters

The Pomorska Kolej Metropolitalna (PKM) is an infrastructure project that had been planned since the beginning of the 21st century. However, the first plans to rebuild the railway line connecting Gdańsk with Kashubia, which was built at the beginning of the 20th century and destroyed in 1945 (the so-called Gdańsk Wrzeszcz – Kokoszek – Kashubia line) appeared already in the 1960s and 1970s (Jurasz, 2020). The main problem with their implementation was the lack of funding for such a large infrastructure project. In 2005, the first studies on the reconstruction of the railway line, which was to become an alternative to car connections between Gdańsk and Kashubia, were prepared (PKM, 2021). The studies carried out at that time pointed out that the implementation of this infrastructure project would bring many benefits to the region, such as a reduction in car traffic in Gdańsk and, as a consequence, an increase in the availability of parking spaces in the city. Less car traffic will in turn reduce CO₂ and greenhouse gas emissions, reduce travel time by rail from Kashubia to the voivodeship's capital, which will mean a reduction in the transport exclusion of residents of municipalities located near Gdańsk. Attention was also drawn to facilitated access to Kashubian towns for the residents of Gdańsk, which affects the development of tourism in these places.

In the following years (2007-2009), a project feasibility study was prepared and the Marshal's Office of the Pomeranian Voivodeship established the Pomorska Kolej Metropolitalna SA company, which was to carry out the planned infrastructure project (PKM, 2021). In 2012, the Pomorska Kolej Metropolitalna infrastructure project received funding from

the European Union at a level of approximately PLN 663 million, which accounted for around 85% of the value of the entire planned investment (PKM, 2021).

The implementation of the project in its first phase was related to the revitalisation of the Kokoszki railway line – there were two project phases: the preparatory phase (the value of this phase amounted to approximately PLN 6.4 million) and the implementation phase (the value of this phase amounted to PLN 656.5 million) (PKM, 2021). The second phase of the infrastructure project started in 2013 when demolition and construction works along the route of the new railway line began. The completion of construction works under the infrastructure project related to the revitalisation of the Kokoszki railway line took place in August 2015 after more than 2.5 years of construction works.

As part of wider implementation of this infrastructure project, further expansion of the project scope is planned. Under this phase of the project, 19.5 km of railway line were constructed, with more than 40 engineering structures (viaducts, footbridges, culverts, and underpasses) and 8 stations built.

At the moment (October 2021), the next phase of the project related to the electrification of the already constructed railway line is being implemented, new stations on the existing railway line are being created, and the PKM SA company serving the newly established railway line is also developing the infrastructure that will enable the use of electricity from renewable energy sources in order to make a greater contribution to reducing environmental pollution. The electrification of the railway line will make it possible to use larger train sets for transport, which will contribute to a significant increase in the passenger capacity.

4.1. Passenger transport data analysis

Passenger transport estimates for the entire infrastructure project show a very dynamic increase in the number of passengers served. In 2016, the first full year of operation of the new railway line, 2 million passengers were served. In the following year of 2017, 3 million passengers were served, and in 2018 there was another increase of more than a million passengers to over 4 million people. In the record year of 2019, the number of passengers who used the new railway line was almost 4.5 million (PKM, 2021). Analysing the number of passengers carried on the three key routes from the point of view of the infrastructure project in question, we can see a continuous dynamic increase in the number of passengers until the record year of 2019.

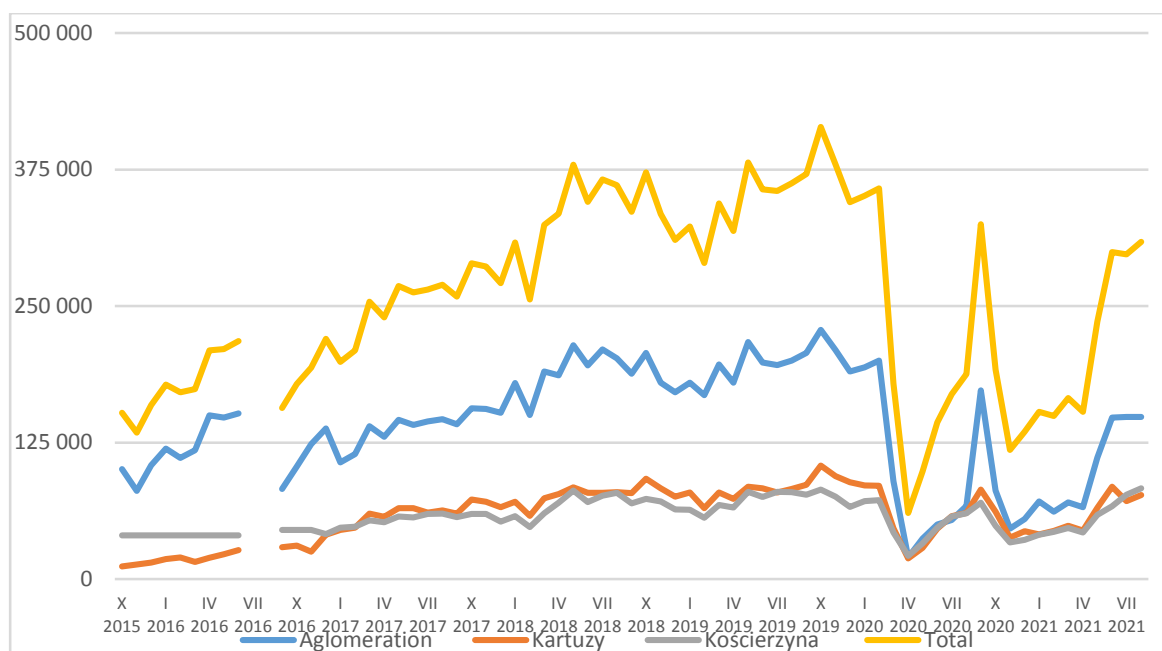


Figure 2. Monthly number of passengers carried on the three key routes of the Pomorska Kolej Metropolitalna from September 2015 to October 2021. Adapted from: Author's own work based on data from PKM SA (PKM, 2021).

In July 2016, heavy rainfall caused damage to the railway line that took two months to repair. Therefore, for two months of that year passengers could not be transported. The presented data shows that the highest number of passengers was carried on the agglomeration route (in October 2021 it was 200,000 passengers, which accounted for 53% of all passengers on the three analysed routes) and both regional routes (Kartuzy and Kościerzyna) generate a total number of passengers comparable to the agglomeration route (in October 2021 it was a total of 176,100 passengers, which accounted for 47% of all passengers on the three analysed routes) – while the number of passengers on both regional routes was at a similar level at the end of the analysed period (in October 2021 99.4 thousand passengers were carried on the Kartuzy route, and 76.4 thousand passengers were carried on the Kościerzyna route). The COVID-19 pandemic had a significant impact on the number of passengers at the end of the analysed period (October 2021). Its outbreak at the beginning of 2020 caused a sharp decrease in the number of passengers - in March 2020 the total number of passengers carried on the three analysed routes fell from 357,000 (February 2020) by almost 50% (to 179,000), and in April there was a further decrease to 60,000 passengers – compared to February 2020, this was a decline of 85% (April 2020 was the month with the lowest number of passengers in the entire analysed period since the inception of the Pomorska Kolej Metropolitalna). In October 2021 the number of passengers using the three routes of the Pomorska Kolej Metropolitalna almost returned to the level of 2019 (414,000 passengers were carried in October 2019, and in October 2021 – 380,000 passengers).

The analysis of data in individual years from the launch of the Pomorska Kolej Metropolitalna is presented in Table 1.

Table 1.

The number of passengers and the dynamics of their changes by PKM on three key routes in 2015-2021

Routes	2015*	2016**	2017	2018	2019	2020	2021***
Aglomeration	285 800	1 245 100	1 676 500	2 274 700	2 371 400	1 067 600	1 213 500
Kartuzy	40 300	248 900	733 000	932 500	1 000 600	655 900	668 400
Kościerzyna	120 000	416 300	663 700	821 300	869 300	594 400	604 800
Total	446 100	1 910 300	3 073 200	4 028 500	4 241 300	2 317 900	2 486 700

Routes	Dynamics 2020/2017	Dynamics 2019/2017
Aglomeration	63,68%	141,45%
Kartuzy	89,48%	136,51%
Kościerzyna	89,56%	130,98%
Total	75,42%	138,01%

* Data for the period X-XII 2015.

** Data for 2016, excluding VII and VIII due to the shutdown of the railways due to the flood.

*** Data for the period I-X 2021.

Source: own study based on data from PKM SA.

The analysis of transport on the three main routes of PKM shows a steady increase in the number of passengers, from the launch of the project until the appearance of the external factor, which was the COVID-19 pandemic. This external factor caused a sharp drop in passenger numbers in 2020. The dynamics of the increase in the number of passengers - by analyzing the years in which there were no external factors (such as: flood and COVID-19 pandemic), having a direct impact on the number of passengers (changes in 2017/2019) - on three key routes there is a noticeable dynamic (over 30% over 3 years) growth in the number of passengers. It means that in the analyzed directions of transport in each of the analyzed years, the growth dynamics was on average over 15% year to year. The agglomeration route showed the highest growth dynamics.

4.2. Functionality analysis of project facilities

It should be noted that the entire infrastructure created as part of the project was prepared with a view to limiting the exclusion of disabled people – all stations built as part of the project are prepared to serve people with various types of disabilities. At the implementation stage of individual facilities built within the framework of the Pomorska Kolej Metropolitalna project, appropriate infrastructure was provided for groups of people who may be subject to potential exclusion.

The platform infrastructure (rail passenger stations) built in 2015 complies with the Technical Specifications for Interoperability that ensure access to train cars for people with disabilities. Meeting these requirements is possible thanks to additional equipment that facilitates movement for people with, among others, hearing impairment (each station has a voice information system for passengers, and information is also provided in English) and visual impairment (at each station, information systems and facilities are adapted to the blind and visually impaired people). All stations have also been equipped with devices facilitating

access for people with motor disabilities – each station has been equipped with lifts taking people directly to the platform. The Pomorska Kolej Metropolitalna SA company, which implemented the infrastructure project, currently manages the railway line built as part of the project, as well as eight separate passenger facilities, i.e. railway stations. Each railway station has been equipped with two platforms, lifts to the platforms, shelters, paths to the station, electronic machines for automated ticket sales and traveller information systems, with special attention paid to people with disabilities. In addition, a Park&Drive car park with over 360 parking spaces was built at five stations - the largest car park in the first phase, with 140 parking spaces, was built outside the Gdańsk Matarnia station. As interest in parking spaces increases, expansion of these car parks is planned. Railway stations constructed as part of the project have become transport hubs connected with other means of public transport (buses, trams). In addition to live PKM train running status, there is also information on other means of public transport. Railway diagnostics, as well as management of the entire line and information systems are carried out using the Traffic Control Centre built as part of the project and located in Gdańsk Matarnia. There are 95-99 train journeys per day, with the highest frequency in the morning when people head to work in the centre of Gdańsk and in the afternoon when they go home from work in the centre of Gdańsk. At present, as a result of the construction work carried out as part of the railway electrification which will be completed in mid-2022, the frequency of journeys has slightly decreased. The capacity of the railway line will be higher due to the use of larger train sets.

4.3. Analysis of the potential of benefits located in Gdańsk for the region's residents

One of the problems faced by the residents of the more remote districts of Gdańsk and the municipalities constituting the Gdańsk-Gdynia-Sopot Metropolitan Area (contrary to its name, it includes not only the Tricity area, but a total of 59 municipalities, towns and counties with more than 1.6 million residents) was poor transport connections to the region's and voivodeship's capital, Gdańsk. The development of the metropolitan railway facilitated, and in some cases actually enabled access to the rich offer of goods and services within the city. It should be noted that Gdańsk is the largest centre of the Gdańsk-Gdynia-Sopot Metropolitan Area, with a population of over 470,000, which accounts for around 20% of the entire Pomeranian Voivodeship population. In Gdańsk, there are almost 270 outpatient clinics, over 160 pharmacies, and 14 general hospitals. Gdańsk is an important academic and educational centre. In 2020, there were 13 higher education institutions with over 67,000 students. At the same time, the city had 48 day nurseries and 52 children's clubs, 309 kindergarten institutions, 107 primary schools, 70 secondary schools, and 26 post-secondary schools. Gdańsk also plays an important role as a cultural centre, which is evidenced by the existence, according to the figures for the end of 2020, of 30 public libraries, 27 museums and museum branches, 7 theatres and music institutions, and 11 art galleries. Sport is also developing in the city – there are over 120 sports clubs, while the available sports infrastructure includes the Ergo

Arena sports and entertainment hall and the Polsat Plus Arena Gdańsk football stadium. There are over 83 thousand business entities in Gdańsk, which accounts for over 1/4 of all business entities in the Pomeranian Voivodeship. The registered unemployment rate at the end of 2020 was 3.5%, while at the same time the unemployment rate in the Pomeranian Voivodeship reached 5.9% (CSO & Gdańsk Main Town Hall, 2021). One should not forget that Gdańsk is also the seat of the voivodeship authorities, other public and local administration institutions, and the judiciary. Finally, the voivodeship's capital has a rich and varied retail offer, including, among others, large shopping centres.

It is worth noting that the creation of connections between the districts of Gdańsk and the municipalities lying along the railway line and the central part of Gdańsk has also increased the availability of services and goods offered by Gdynia and Sopot which co-create the Tricity area. Gdynia alone has over 42.6 thousand registered businesses, with an unemployment rate (at the end of 2020) of 3.4% (Public Information Bulletin of the Gdynia City Hall, 2021). With regard to medical services, there are three large public hospital facilities in Gdynia. As far as cultural services are concerned, it is worth mentioning the two large theatres operating in Gdynia, as well as the Gdynia Film Centre.

4.4. Analysis of the number of people living in the PKM accessibility area

Four routes were created as part of the infrastructure project: one agglomeration route (Gdańsk Wrzeszcz – Gdańsk Osowa – Gdynia Główna) and three regional routes (Gdańsk Główny – Kartuszy, Kościerzyna – Gdańsk Osowa – Gdynia Główna, and Kościerzyna – Gdańsk Wrzeszcz – Gdynia Główna).

In the metropolitan area of the PKM, the districts of Gdańsk and Gdynia, which previously had no rail access, gained a good connection to the city centre, e.g. Osowa, and the travel time by rail from selected districts to the centre of Gdańsk was significantly reduced. This is shown in table 2.

Table 2.

Number of residents of Gdańsk and Gdynia districts in the area covered by the metropolitan PKM line and the dynamics of its changes in the years 2015 and 2020

City	Name of district	Population (people with registered residence)		Dynamics in %
		as at 31.12.2020	as at 31.12.2015	Year 2020 to 2015 (in 5 years)
Gdańsk	Brętowo	7 551	7 602	-0,67%
	Jasień	20 972	13 640	53,75%
	Kokoszki	9 888	8 898	11,13%
	Matarnia	5 996	5 867	2,20%
	Osowa	16 121	14 933	7,96%
	Piecki- Migowo	27 527	25 515	7,89%
	Strzyża	5 299	5 507	-3,78%
	Wrzeszcz Dolny	22 350	24 107	-7,29%
	Wrzeszcz Górny	21 568	23 596	-8,59%
	Razem	137 272	129 665	5,87%

Cont. table 2.

Gdynia	Karwiny	10 016	10 605	-5,55%
	Mały Kack	9 718	8 716	11,50%
	Wielki Kack	11 233	11 002	2,10%
	Witomino	16 748	18 312	-8,54%
	Wzgórze Św. Maksymiliana	10 668	11 639	-8,34%
	Śródmieście	11 555	12 757	-9,42%
	Razem	69 938	73 031	-4,24%

Statistical data from the City of Gdynia website, <https://bip.um.gdynia.pl/dane-podstawowe,1762/dzielnice,364788>, 30.11.2021.

Analysis of the data in Table 1 shows that in 2020, the number of residents who could use the metropolitan route created as a result of the investments made to date was more than 207,000 in Gdańsk and Gdynia combined - it means an increase of more than 13,000 from 193,980 people in 2015. Between 2015 and 2020, the number of residents living in the districts of Gdańsk and Gdynia located in the vicinity of the metropolitan route increased by 7,607 people in Gdańsk and decreased by 3,093 people in Gdynia, with a simultaneous increase in the total number of residents in both cities. Of course, it is not possible to make a simple inference that the increase in the number of residents of a given district depends solely on transport accessibility, but the observed changes may indicate potential links between these phenomena.

The planned development of the PKM to cover the southern districts in the next 10 years may result in increasing the number of Gdańsk residents who can potentially benefit from the railway transport by more than 105,000, as shown in table 3.

Table 3.

Number of residents of the southern districts of Gdańsk covered by the new PKM line and the dynamics of its changes in the years 2015 and 2020

Name of Gdańsk district (development of the PKM on the route Wrzeszcz - southern districts)	Population (people with registered residence)		Dynamics in %
	as at 31.12.2020	as at 31.12.2015	Year 2020 to 2015 (in 5 years)
Śródmieście	24 536	28 000	-12,37%
Chełm	31 764	32 553	-2,42%
Orunia Górna-Gdańsk Południe	20 786	17 476	18,94%
Ujescisko-Lostowice	28 254	22 785	24,00%
Razem	105 340	100 814	4,49%

Statistical data from the Gdańsk Information Centre website, https://gcigdansk.sharepoint.com/:x:/s/UMG-OtwarteDane3.0/EfB5_LEQvYNGrsuchHPOxYJ4ByHt-W1gQ2kqJLRxv-lhW2Q?e=XomyLI, 30.11.2021.

Based on the data in table 3, it can be concluded that there is a real need to build an additional railway line allowing to reduce transport exclusion of a part of the population, especially of those who use public transport. Long-term effects also include a reduction in the number of motor vehicles, cleaner air, and an improvement in the quality of life of agglomeration residents.

Apart from the line serving the districts of Tricity, the PKM offers transport on routes connecting Tricity with Kartuzy and Kościerzyna. Residents of municipalities and towns located along these routes may also benefit from greater accessibility to healthcare, cultural, and educational facilities located in the metropolitan area. Table 4 presents data on the population living in municipalities on the route to Kartuzy.

Table 4.

Population of Kartuzy County and the dynamics of its changes in the years 2015 and 2019

Kartuzy County (8 municipalities)	Population		Dynamics in %
	as at 31.12.2019	as at 31.12.2015	Year 2019 to 2015 (in 4 years)
Chmielno	7 805	7 426	5,10%
Przodkowo	9 663	8 824	9,51%
Sierakowice	20 054	19 106	4,96%
Somonino	10 814	10 304	4,95%
Stężycza	10 664	10 131	5,26%
Sulęczyno	5 547	5 386	2,99%
Kartuzy	34 013	33 400	1,84%
Żukowo	40 837	34 348	18,89%
Razem	139 397	128 925	8,12%

Statistical data from: <https://stat.gov.pl/obszary-tematyczne/ludnosc/ludnosc/powierzchnia-i-ludnosc-w-przekroju-terytorialnym-w-2020-roku,7,17.html> (access: 30.11.2021); <https://stat.gov.pl/obszary-tematyczne/ludnosc/ludnosc/ludnosc-stan-i-struktura-ludnosc-i-oraz-ruch-naturalny-w-przekroju-terytorialnym-stan-w-dniu-31-grudnia-2015-roku,6,19.html>, 30.11.2021.

In all municipalities situated along the Gdańsk – Kartuzy PKM route, an increase in population has been noted. It primarily concerns Żukowo, where there are two PKM stations. This municipality located in the middle of the analysed route has significantly benefited from increased transport accessibility. The number of residents of Żukowo increased by about 6.5 thousand people over the period of 4 years.

Table 5 provides information on the number of residents in the municipalities of the Kościerzyna County which is affected by the extension of the Gdańsk – Kościerzyna PKM line.

Table 5.

Population of Kościerzyna County and the dynamics of its changes in the years 2015 and 2019

Kościerzyna County (8 municipalities)	Population		Dynamics in %
	as at 31.12.2019	as at 31.12.2015	Year 2019 to 2015 (in 4 years)
Kościerzyna	23 742,00	23 744,00	-0,01%
Dziemiany	4 410,00	4 284,00	2,94%
Karsin	6 239,00	6 255,00	-0,26%
Kościerzyna	16 091,00	15 550,00	3,48%
Liniewo	4 597,00	4 642,00	-0,97%
Lipusz	3 744,00	3 660,00	2,30%
Nowa Karczma	7 049,00	6 825,00	3,28%
Stara Kiszewa	6 816,00	6 664,00	2,28%
Razem	72 688,00	71 624,00	1,49%

Statistical data from: <https://stat.gov.pl/obszary-tematyczne/ludnosc/ludnosc/powierzchnia-i-ludnosc-w-przekroju-terytorialnym-w-2020-roku,7,17.html> (access: 30.11.2021); <https://stat.gov.pl/obszary-tematyczne/ludnosc/ludnosc/ludnosc-stan-i-struktura-ludnosc-i-oraz-ruch-naturalny-w-przekroju-terytorialnym-stan-w-dniu-31-grudnia-2015-roku,6,19.html>, 30.11.2021.

No evident increase in the number of residents was observed in these municipalities, although the possibility of commuting to Tricity increased the availability of services to agglomeration residents. This is also evidenced by data on the number of serviced passengers on this route, indicating an almost doubling of this number in the analysed period of 5 years.

The greatest benefits from the agglomeration line were achieved by the residents of the new housing estates built near the railway, as well as the residents of housing estates that previously had difficult access to regular rail transport (Gdańsk Osowa). On the regional routes, the greatest benefits were achieved by those using the Gdańsk – Kartuzy route, and to a lesser extent, Gdańsk – Kościerzyna.

At the same time, it should be noted that the new rail line has significantly improved access to Poland's third largest airport, Gdańsk Airport, which served over 5 million passengers in the record-breaking year of 2019, with a significant number of them benefitting from a convenient and fast connection to the city centre using the Pomorska Kolej Metropolitalna line (Airport, 2021).

Conclusions

The quality of life in a given region depends on many factors. One of them is good accessibility of each town, so that the residents can easily and affordably reach places where they can use services and goods to satisfy their needs. The lack of adequate transport infrastructure and public transport services most often leads to transport exclusion, which is part of a wider phenomenon, namely the social exclusion of entire social groups.

One of the key tasks of the local authorities is to counteract transport exclusion, mainly through the development and maintenance of transport infrastructure and the organisation of a system for the provision of transport services. An example of this type of activity is the Pomorska Kolej Metropolitalna project described in the paper. Having analysed the selected and identifiable at this stage effects of the investment related to limiting the phenomenon of transport exclusion, it was found that:

- the number of PKM passengers between 2016 and 2019 increased from 2 million per year to 4.5 million; 2020 saw a sharp decrease in the number of passengers due to the COVID-19 pandemic, but by 2021 there was already a clear return to the level of passenger transport in the years preceding the pandemic,
- the introduced facilities, especially for people with special needs, increased transport accessibility for groups particularly affected by transport exclusion,
- better transport links between the metropolitan area and Gdańsk means access to the labour market and a wide range of administrative, educational, medical, and cultural services for its residents, among others,

- the development of the Pomorska Kolej Metropolitalna made it possible to extend transport services to a total of over 420,000 out of 1.6 million residents of the Gdańsk-Gdynia-Sopot Metropolitan Area – previously, these people had fewer, and in some cases very limited, opportunities to reach the region's capital,
- in the next few years, along with the further development of the PKM, they will be joined by another 100,000 people living in the southern districts of Gdańsk.

The analysis shows a high level of acceptance for the presented project by the residents of the metropolitan area. It can, therefore, also be assumed that in the future, the project will continue to develop and the number of people using the created infrastructure will increase. The PKM project also generates additional opportunities for the growth of the urban area by including areas hitherto inaccessible due to transport exclusion. At the same time attention should be paid to the fact that the local governments have limited financial resources for the implementation of infrastructure projects and should select those projects which generate significant benefits to the development of the region. In the context of the performed analysis, it appears that the project under study meets the requirements in this respect. The analysis carried out confirmed the hypothesis on the impact of the infrastructure project in question on reducing transport exclusion in the region where the project operates.

References

1. Binder, J., Matern, A. (2020). Mobility and social exclusion in peripheral regions. *European Planning Studies, Vol. 28, Iss. 6*, pp. 1049-1067. DOI: 10.1080/09654313.2019.1689926.
2. BIP Urzędu Miasta Gdynia (2021). Retrieved from: <https://bip.um.gdynia.pl/dane-podstawowe,1762/edukacja,364815>, 06.12.2021.
3. Błazewski, M. (2019). Prawne uwarunkowania ograniczenia wykluczenia transportowego. In: J. Blicharz, T. Kocowski, M. Paplicki (Eds.), *Spółdzielnie socjalne oraz organizacje pozarządowe wsparciem dla zagrożonych wykluczeniem* (pp. 11-20). Wrocław: Wydział Prawa, Administracji i Ekonomii Uniwersytetu Wrocławskiego.
4. Brzozowska, K. (2009). *Finansowanie inwestycji infrastrukturalnych przez kapitał prywatny na zasadzie project finance*. Warszawa: CeDeWu.
5. Chmielewski, M., Pioch, J., Sadkowska, J. (2019). Analiza korzyści i kosztów społecznych w realizacji regionalnych projektów infrastrukturalnych. In: K. Leszczewska, Z. Patora-Wysocka (Eds.), *Subsydiarność – aspekty ekonomiczne i społeczne* (pp. 103-120). Łódź: Społeczna Akademia Nauk.
6. Currie, G. (2011). *New Perspectives and Methods in Transport and Social Exclusion Research*. Emerald Publishing.

7. Dulak, M., Jakubowski, B. (2018). *Publiczny transport zbiorowy w Polsce. Studium upadku*. Retrieved from <https://klubjagiellonski.pl/2018/04/17/publiczny-transport-zbiorowy-w-polsce-studium-upadku/>, 01.12.2021.
8. Gricer, D., Jóźwiak, I.J., Switana, J. (2021). European Union Funds in Infrastructure Development of Polish Rail Transportation between 2014-2020. *Silesian University of Technology Scientific Papers. Organization and Management Series, No. 153*, pp.143-154.
9. Grzywacz, W. (1982). *Infrastruktura transportu*. Warszawa: Wydawnictwa Komunikacji i Łączności.
10. GUS & Urząd Miasta w Gdańsku (2021). Informator o sytuacji społeczno-gospodarczej Gdańska za rok 2020. Retrieved from: <https://download.cloudgdansk.pl/gdansk-pl/d/202111179087/informator-za-2020.pdf>, 06.12.2021.
11. Hine, J., Mitchell, F. (2003). *Transport Disadvantage and Social Exclusion: Exclusionary Mechanisms in Transport in Urban Scotland*. Routledge. <https://doi.org/10.4324/9781315235677>.
12. Jaroš, V. (2017). Social and transport exclusion. *Geographia Polonica, Vol. 90, Iss. 3*, pp. 247-263. <https://doi.org/10.7163/GPol.0099>.
13. Kaczorowski, J. (2019). Wykluczeni. O likwidacji transportu zbiorowego na wsi i w małych miastach. *Przegląd Planisty, Iss. 4*, pp. 11-14.
14. Kamruzzaman, M., Yigitcanlar, T., Yang, J., Mohamed, M.A. (2016). Measures of Transport-Related Social Exclusion: A Critical Review of the Literature. *Sustainability, Vol. 8, Iss. 7(696)*. <https://doi.org/10.3390/su8070696>.
15. Koliński, K. (2021). Wykluczenie transportowe uczniów szkół ponadpodstawowych powiatu wągrowieckiego. *Studia Regionalne i Lokalne, Iss. 3(85)*. doi: 10.7366/1509499538505.
16. Kozłowski, W. (2014), Ocena inwestycji infrastrukturalnych w aspekcie zrównoważonego rozwoju. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, No. 365*. Wrocław: Uniwersytet Ekonomiczny we Wrocławiu.
17. Levitas, R., Pantazis, C., Fahmy, E., Gordon, D., Lloyd, E., Patsios, D. (2007). *The multidimensional analysis of social exclusion*. Department of Sociology and School for Social Policy Townsend Centre for the International Study of Poverty; Bristol: Bristol Institute for Public Affairs, University of Bristol.
18. Mackett, R.L., Thoreau, R. (2015). Transport, social exclusion and health. *Journal of Transport and Health, Vol. 2, Iss. 4*, pp. 610-617. doi: 10.1016/j.jth.2015.07.006.
19. Nicholas J.M., Steyn, H. (2012), *Zarządzanie projektami*. Warszawa: Wolters Kluwer Polska.
20. Perez-Barbosa, D., Zhang, J. (2017). Transport-Based Social Exclusion in Rural Japan: A Case Study on Schooling Trips of High School Students. *Social Inclusion, Vol. 5, Iss. 4*, pp. 235-250. <https://doi.org/10.17645/si.v5i4.1079>.

21. Piskozub, A. (1998). Funkcje przemieszczania jako cecha wspólna infrastruktury. *Problemy Ekonomiki Transportu, No. 2.*
22. Ratajczak, M. (2020). Infrastruktura a wzrost i rozwój gospodarczy. *Ruch Prawniczy, Gospodarczy i Socjologiczny, Vol. LXII, Iss. 4*, Retrieved from: http://repozytorium.amu.edu.pl:8080/bitstream/10593/5247/1/05_marek_ratajczak_infrastuktura%20a%20wzrost%20i%20rozwoj%20gospodarczy_83-102.pdf, 20.11.2021.
23. Smolarski, M., Raczyk, A. (2017). Przestrzenne zróżnicowanie wykluczenia komunikacyjnego w transporcie kolejowym na przykładzie województwa dolnośląskiego. *Studia Miejskie, Vol. 27*, pp. 9-24. doi: 10.25167/sm2017.027.01.
24. *The 17 Goals*. Available online: <https://sdgs.un.org/goals>, 02.12.2021.
25. Węgrzyn, J. (2014). *Znaczenie partnerstwa publiczno-prywatnego w realizacji projektów infrastrukturalnych w gminach województwa małopolskiego*. Rozprawa doktorska. Kraków: Uniwersytet Ekonomiczny w Krakowie. Retrieved from: https://bazybg.uek.krakow.pl/cyfrowa_pliki/doktoraty_full/1200003027/Djvu/1200003027.pdf, 28.11.2021.
26. Zmuda-Trzebiatowski, P. (2016). Dostępność transportowa, a partycypacja w aktywnościach, ubóstwo oraz zagrożenie wykluczeniem społecznym. *Autobusy: technika, eksploatacja, systemy transportowe, Vol. 17, Iss. 12*, pp. 754-759.