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IMPACT OF AIRPORT INFRASTRUCTURE DEVELOPMENT IN GDAŃSK: EX-POST ANALYSIS

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Purpose: The purpose of this paper is to assess the effectiveness and long-term impact of infrastructure investments implemented at Gdańsk Lech Wałęsa Airport between 2010 and 2015. The study evaluates whether the planned operational capacity was achieved and explores the socio-economic and environmental effects on the surrounding region.
Design/methodology/approach: An ex-post evaluation approach was applied, combining quantitative and qualitative data analysis. Airport performance indicators such as passenger traffic, runway operations, and financial stability were examined alongside spatial and demographic data from neighbouring areas. The research is grounded in regional growth theory and sustainable infrastructure frameworks and incorporates elements of cost-benefit assessment.
Findings: The findings confirm that the main objectives of the investment were fulfilled. The airport exceeded the 5-million-passenger threshold in 2019, validating the expansion strategy. Technical enhancements (e.g., ILS CAT IIIb, increased hourly operations) and improved connectivity supported job creation, land value growth, and urban development. However, challenges such as transport congestion, spatial conflicts, and environmental pressures highlight the need for integrated spatial and infrastructure planning.
Research limitations/implications: The research is limited to pre-pandemic data and does not fully capture the long-term outcomes of newer investments. Future studies should examine post-COVID trends, climate resilience, and regional integration within EU transport policy.
Practical implications: The paper provides evidence-based insights for policy-makers and infrastructure managers, showing how airport development can support regional strategies and attract complementary investment. It underscores the need for aligning technical capacity with spatial policy and public service infrastructure.
Social implications: The investment improved accessibility and quality of life in the Tri-City region. However, it also exposed tensions in local planning and land-use policy. The study suggests that future infrastructure projects should ensure stronger public participation and environmental safeguards.
Originality/value: This paper offers a comprehensive ex-post evaluation of a major EU co-financed airport project in Central Europe. It demonstrates the catalytic role of airport infrastructure in regional transformation and contributes empirical evidence relevant to development planning and policy implementation.

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Keywords: airport infrastructure; regional development; sustainable transport, infrastructure, investment,
Category of the paper: research paper.

1. Introduction

The subject of subsequent editions of the World Bank's reports on the development of the world always concerns important determinants of this development. The report published in 1994 noted and emphasized the importance of infrastructure for the development of world regions and economies. The report shows that changes in the infrastructure have a positive effect on global economic growth, and an increase in infrastructure by 1% is compared to a GDP growth of 1%, and the mere expansion of the road network leads to an increase in GDP by 0.8% (World Development Report, 1994). This means that the condition of the economy may be positively stimulated by the implementation of infrastructure investments. Infrastructure investments are not only a stimulus, but also a factor conditioning the development of regions. There is a strong positive correlation between the level of socio-economic development of a region or a country and the degree of demand for infrastructure and the resulting services (Ratajczak, 2000, p. 86).

The article concerns investments in the development of the infrastructure of Gdańsk Lech Walesa Airport implemented in 2010-2015. The ex-post analysis aims to identify the effects in terms of benefits and costs for the airport and its surroundings. The study makes a research assumption that the investments made in 2010-2015 formed the basis for further development of the port and its surroundings. The study uses elements of cost-benefit analysis related to the identification of investment effects, in order to draw conclusions on the effectiveness of the undertaken investment activities.

Gdańsk Lech Wałęsa Airport was selected as the subject of this study due to: (1) its inclusion in the TEN-T network, (2) the highest traffic growth among regional airports in Poland during the analyzed period, (3) its significant economic and tourism-related importance for the Pomeranian region, and (4) the availability of financial and operational data.

The article presents a review of research on the impact of infrastructure development on the economic development of regions and the impact of infrastructure investments by airports on their development and on changes in their surroundings. The paper presents the effects of the implemented development investment in Gdańsk Lech Walesa Airport identified by the authors in the form of distinguishing the costs and benefits resulting from it for the port and its surroundings. Conclusions were presented at the final section of the paper.

2. Theoretical background and literature context

Paul Rosenstein-Rodan, co-founder of the development economics, in his research focused on the economic growth of middle- and underdeveloped countries. As the creator of the concept of „big push", he believed that after exceeding a certain threshold of development, the economies of the poorer regions are able to still develop on their own. To exceed this threshold, external economic aid is needed, including, among others, support for the implementation of infrastructure investments and industrialization of regions (Rosenstein-Rodan, 1959, pp. 360-369; Rosenstein-Rodan, 1976). For Poland, which joined the community of European Union Member States in 2004, European funds aimed at the development of Poland's infrastructure have been the effect of the „big push".

Infrastructure investments are recognized by many economists as a factor of growth and development of the region, therefore they also appear in numerous other theories, concepts and economic models, such as: Harrod-Domar model, Solow growth theory, Romer's, Barro and Sala-i-Martin's, Lucas's endogenous growth theories, Aschauer's theory of endogenous development, as well as Biehl's concept of endogenous regional development (Barro, Sala-i-Martin, 2003; Romer, 1986, pp. 1002-1037; Solow, 1956, pp. 65-94; Lucas, 1988, pp. 3-42; Dunford, 2009, pp. 192-201). Polish researchers also emphasize the importance of infrastructure investments in the development of enterprises and regions (Parysek, 2001; Ratajczak, 2000). Infrastructure is considered by some to be one of the key and, at the same time, the most effective factors determining development due to its functions and unique features (Dolata, 2015, p. 46).

In the literature, infrastructure investments are considered in terms of sustainable development, how the goal of sustainability is used in a case of transport infrastructure investment, because this kind of investment raises serious questions about the sustainability of all the three areas mentioned: economy, ecology, and democracy. This kind of investment exceeds the local and regional levels by many times, not least when it comes to its environmental consequences and its economic benefits (Lidskog, Soneryd, 2000, p. 1465).

Investments made by airports are discussed in the literature in terms of their effects on the region. At the beginning of the second half of the twentieth century, this problem was addressed, among others, by William. F. Ogburn (1946, pp. 373-379) by studying the interactions of the development of air transport and spatial structures and by Joachim H. Schultze (1959, pp. 1-202) studying the impact of air transport and its infrastructure on the development of urban agglomerations.

Researchers also draw attention to the aspect of financing sources of infrastructure investments, including airport investments (Forsyth, 2018, p. 259; Wojewnik-Filipkowska, 2008, p. 160). Due to the high capital intensity of airport infrastructure investments, the along period of the investment process and the high risk, such investments often cannot be

implemented solely with the use of private investors' capital, but require external support or other solutions[1].

3. Research methodology

The subject of the research is an investment financed partially from the European Union funds. There are guidelines that you need to pay special attention to when developing a need for a transport investment. These include, among others, demographic changes; socio-economic changes, including GDP level in analysed area, income and the level of unemployment; industrial and logistic structure and developments: location of concentrated industrial activities, natural resources, main transport hubs (ports and airports), logistics structure, spatial changes, traffic volume, etc. (UE Guide, 2014, p. 81). The guide presents the costs and benefits of a planned investment. On the other hand, this article identifies the costs and benefits of the implemented airport investment.

The study was conducted in two areas. First, the effects of the implemented investment for the airport were identified. It was examined whether a sustained effect of the possibility of handling more passengers per year was achieved and whether the number of flight operations per hour increased. Moreover, the financial statements of Gdańsk Lech Walesa Airport were analysed and it was assessed whether the investment had an impact on its financial condition.

The second research area was the effects of the development of the airport in Gdańsk, noticeable in its close vicinity and in the region. Positive and negative effects in the socio-economic environment and for the natural environment (Atkinson et al., 2006) have been identified. These are elements belonging to the method referred to in the literature as cost-benefit analysis (Quinet, 2007).

The article is based on a variety of publicly accessible sources, including financial data retrieved from the ORBIS database, official websites of Gdańsk Lech Wałęsa Airport and the City of Gdańsk, as well as selected documents obtained directly from the airport administration and the Pomeranian Voivodeship Office in Gdańsk.

[1] The financing of such projects may vary, they may be funds obtained from prepayments. They are very often used by airports to fund major investments, such as runways and terminals. It involves the airport charging airlines higher prices as soon as, and sometimes before, the project's construction commences, often well before it becomes operational (Forsyth, 2018, p. 259). This form of financing is available for the higher rank airports. Those of lesser rank use traditional forms of financing and combine equity capital with borrowed capital. Public funds are also used, and in the case of member states - the EU funds.

4. Results & discussion

The study covered the area where the Gdańsk Airport is located. Gdańsk and neighbouring Gdynia are strategically important hubs belonging to the Trans-European Transport Network (TEN-T). Land, sea and air routes cross here. Currently, work is underway on two transport corridors crossing Poland: the Baltic-Adriatic Corridor and the North Sea - Baltic Corridor, both of which the port cities are part of. In a study the aim of which was to classify the main Polish cities, taking into account: factors of the size of an urban area (population, number of apartments, budget revenues, number of entities), factors of economic development and wealth of the urban area (budget revenues, number of entities, factors of inhabitants' wealth (unemployment rate, average salary), Gdańsk and Gdynia have been permanently classified into the wealthier cities' group (Kokot, 2021, p. 84). This paper analyses whether the effects of the development of an airport concern only the airport itself or are reflected in the development of the region.

The subject of the analysis are the effects resulting from the implementation of development investments in Gdańsk Lech Walesa Airport in 2010-2015. For this reason, the research period covers the years before and after the implementation of these investments.

Gdańsk Lech Walesa Airport started operating in 1974. After the political transformation in Poland, since 1993, the Gdańsk Airport has been operating as a commercial law company, the shareholders of which are local government units and State-owned company "Airports" (now Polish Airports State Company) (Table 1).

Table 1.
Current shareholders of Gdańsk Lech Walesa Airport

Shareholders	Shares (%)
Municipality of Gdańsk	37,33
Pomeranian Voivodeship	31,02
Polish Airports State Company	27,47
Municipality of Gdynia	2.11
Municipality of Sopot	2.07

Source: own elaboration based on information from the website https://www.airport.Gdańsk.pl/, 02.2025.

The condition of the infrastructure at the airport in Gdańsk in the 1990s was not sufficient. In 1997, the building of the Passenger Terminal 1 (T1) was put into use. In the following years, it was expanded, but it did not bring the desired results. The main limitations of the Gdańsk airport were the infrastructure elements on the airside and landside (Figure 1). These included in particular:

- no taxiway; the busy runway limited the port's capacity,
- insufficient apron space for airplanes,
- insufficient space for passenger service.

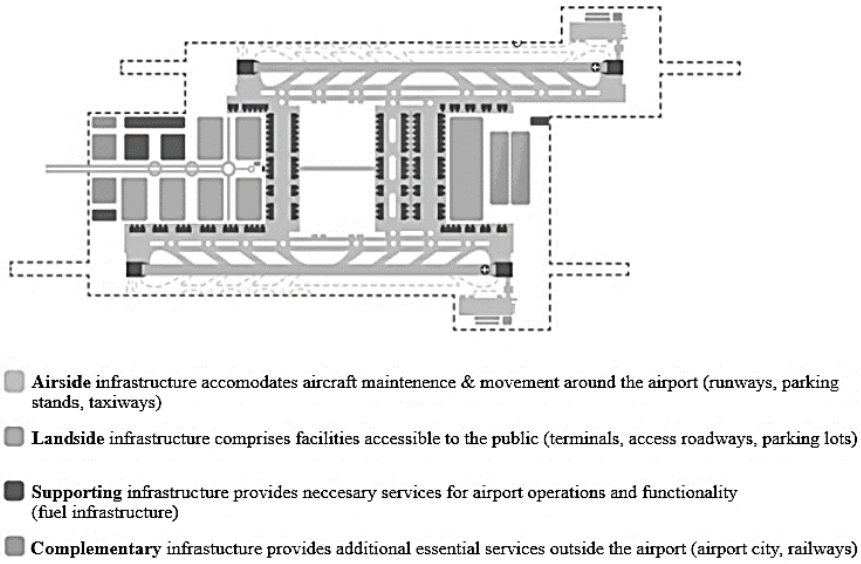

Figure 1. Typical airport infrastructure elements.

Source: Own elaboration based on information from the website https://www.cpk.pl/pl/dla-mieszkancow/program-lotniskowy/infrastruktura-lotniskowa: 15.12.2024.

As a result of the „big push", Gdańsk Lech Walesa Airport became the beneficiary of the EU funds. It was included in the TEN-T program and received funds for a needs analysis, and then obtained EU funds under the project "Studies on the long-term adjustment of the International Gdańsk Lech Walesa Airport, a TEN-T node in the North Poland, for air transport needs "- 2008-PL-92005-S. Additionally, the largest development of airport infrastructure took place before the UEFA European Football Championship in 2012 in Poland and Ukraine. These events led to the development of aviation infrastructure in Gdańsk and in other cities where football matches were held (Macioszek, 2021, p. 137). As part of the project, the objective was to increase the capacity of flight operations initially from 15 per hour to 45, then the expectations were reduced to 30 flight operations per hour; and to provide an airside and landside infrastructure capable of handling 5 million passengers a year (Table 2). The identification of investment needs was based on the location of Gdańsk Lech Walesa Airport, which plays an important role in the transport of business and tourist customers. It is also an important backup airport for Warsaw Chopin Airport.

Table 2.
Selected improvements of Gdańsk Lech Walesa Airport in 2005 and the prospects for 2012 from the perspective of year 2005

Subject of improvement	2005	2012
Runway dimensions	2800 m x 45 m	2800 m x 45 m
Runway capacity	15 operations/h	45 operations/h
Usable area	7260 m^2	50 424 m^2
Commerical area	1200 m^2	7500 m^2
Cubature	38 500 m^3	350 768 m^3
Passenger capacity	3 000 000	5 000 000

Source: Own elaboration based on documents from Gdańsk Lech Walesa Airport and data from "Studies on the long-term adjustment of the International Gdańsk Lech Walesa Airport, a TEN-T node in the North Poland, for air transport needs" - 2008-PL-92005-S.

The first of the planned development phases of Gdańsk Airport was implemented in 2010-2015 and included the following elements of the airport infrastructure:

- airport electric power system modernization,
- rainwater drainage system,
- noise monitoring system,
- taxiway,
- technical and patrolling road,
- technical base for airport equipment,
- apron,
- de-icing apron,
- new passenger terminal T2,
- office building for Customs Office and Border Patrol,
- others.

The effects of the investments of the airport are directed to increasing the efficiency of its operations. However, the components of the airport do not include only the elements listed in Figure 1. The literature also identifies intangible components of an airport, which include, among others, an external factor - environment (Urfer, Weinert, 2011, p. 112).

5. Effects for the airport

When analyzing the activities of airports, in the literature on the subject of the aviation sector, they are more and more often recognized as enterprises. This is because airports from the links of air transport infrastructure began to be perceived as economic entities, with the purpose of generating value for stakeholders. However, the airport management is obliged to ensure the airport is fully operational in compliance with the legal requirements, under the public service obligation, in accordance with the aviation law act.

The airport generates revenues from its basic activity, consisting in servicing air traffic (passenger and cargo) and on economic activity in the segments facilitating the efficient functioning of this traffic, as well as other complementary ones. The additional revenues generated in connection with servicing the passenger traffic are: shops, gastronomy, etc.

Table 3 presents the port's financial results achieved during and after the implementation of the development investment in 2010-2015. It covers the years 2014-2023, data from the earlier period are not publicly available.

Table 3.
Financial data of the Gdańsk Lech Walesa Airport in 2014-2023 (th EUR)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Exchange rate: PLN/EUR	0,2349	0,2355	0,2270	0,2395	0,2323	0,2344	0,2168	0,2175	0,2130	0,2300
Total assets	130 096	151 303	147 168	152 642	149 624	154 390	137 365	179 159	189 174	197 952
Operating revenue (Turnover)	31 974	33 888	34 150	40 682	45 745	49 813	25 070	25 426	41 917	60 204
Sales	28 443	30 413	31 084	36 054	41 769	46 483	18 209	21 958	39 820	56 103
Operating profit (loss) (EBIT)	8 681	7 427	7 583	8 840	3 191	14 638	556	-117	7 817	13 361
Profit (loss) for the period (Net income)	6 678	5 716	5 491	6 886	-2 640	11 262	-4	-530	4 524	9 711
Costs of employees	4 025	4 257	4 069	4 954	5 379	5 927	4 820	4 946	5 590	7 256
Depreciation & Amortization	7 326	7 839	8 802	9 879	9 552	9 679	8 869	7 649	9 014	11 480
Cash flow (Net Income before D&A)	14 003	13 555	14 293	16 764	6 913	20 941	8 864	7 120	13 538	21 190

*Local GAAP - ang. Generally Accepted Accounting Principles.

Source: Own elaboration based on ORBIS Database, https://ekrs.ms.gov.pl and information from Gdańsk Airport.

When analyzing the financial condition of the Gdańsk Airport company in the period after the implementation of the investment project in question, a positive trend in the development of the Gdańsk port can be observed. Revenues from sales are characterized by an upward trend in the subsequent years of the analysis, operating costs also increased. The financial analysis showed that data such as profit on operating activity and net profit doubled in value. These are good financial results that prove the positive impact of the implemented investments. In 2018, Gdańsk Airport recorded a loss of PLN 11 million for the first time, resulting from an unfavorable Court of Appeal in Gdańsk decision regarding the failure to provide service and warranty care by the construction consortium. Gdańsk Airport had to create provisions for a total value of PLN 42 million related to the court dispute. For the purposes of the profitability analysis, measured with indicators such as ROE, ROA and (Table 4), costs generated by legal disputes were excluded to correctly illustrate the company's condition.

Table 4.
Profitability ratios of the Gdańsk Lech Walesa Airport in 2014-2023

Profitability ratios (%)	2014	2015	2016	2017	2018	2019	2020 (pandemic year)	2021	2022	2023
ROE using Net income	10.64	8.33	7.66	8.35	-3.41	12.61	-0.01	-0.64	5.22	9.39
ROA using Net income	5,13	3.78	3.73	4.51	-1.76	7.30	0.00	-0.30	2.39	4.91
Cash flow/Operating revenue	43.8	40.00	41.85	41.21	15.11	42.04	35.36	28.00	32.30	35.20

Source: own elaboration based on ORBIS Database.

An analysis of Gdańsk Airport's financial indicators for the years 2014-2023 reveals fluctuations in operational efficiency and profitability in response to both strategic developments (infrastructure expansion) and crisis events (the COVID-19 pandemic). Between 2014 and 2017, the Cash Flow to Operating Revenue ratio remained stable at a high level

(approximately 40%), indicating the airport's strong ability to generate cash from its core operations. Concurrently, ROA and ROE values ranged between 3.7-5.1% and 7.7-10.6%, respectively, reflecting moderate yet consistent profitability. In 2018, all key indicators deteriorated significantly. The Cash Flow to Operating Revenue ratio fell to 15.1%, while both ROA and ROE turned negative (ROA: -1.76%, ROE: -3.41%). This downturn was likely driven by increased investment expenditures related to infrastructure expansion, combined with declining operational efficiency. The year 2019 marked a notable recovery. All indicators reached their highest values in the analyzed period (ROE: 12.61%, ROA: 7.30%, Cash Flow to Operating Revenue: 42.04%), suggesting effective utilization of prior investments and a favorable market environment. The period from 2020 to 2021, directly affected by the COVID-19 pandemic, saw a dramatic financial downturn. Profitability dropped to near-zero or negative levels, and cash generation capability weakened (down to 28.0% in 2021). This decline reflected reduced passenger traffic and sustained operational costs under restricted airport operations. Starting in 2022, a gradual recovery became evident. Improvements in ROA (reaching 4.91% in 2023) and ROE (9.39%), along with an upward trend in the Cash Flow to Operating Revenue ratio (35.20%), confirm that the airport has begun to stabilize and regain financial efficiency.

In addition to analyzing financial indicators, passenger traffic trends are a key measure of the investment's effectiveness. To better understand the scale of passenger traffic growth at Gdańsk Lech Wałęsa Airport, it is useful to compare its performance with other major regional airports in Poland. Figure 2 presents passenger traffic volumes for the period 1999-2023 across six key airports: Warsaw Chopin, Kraków, Gdańsk, Katowice, Wrocław, and Poznań. Between 2010 and 2019, Gdańsk Airport recorded a substantial increase in passenger numbers—from 2.2 million to 5.4 million—exceeding its target capacity set during the investment planning phase.

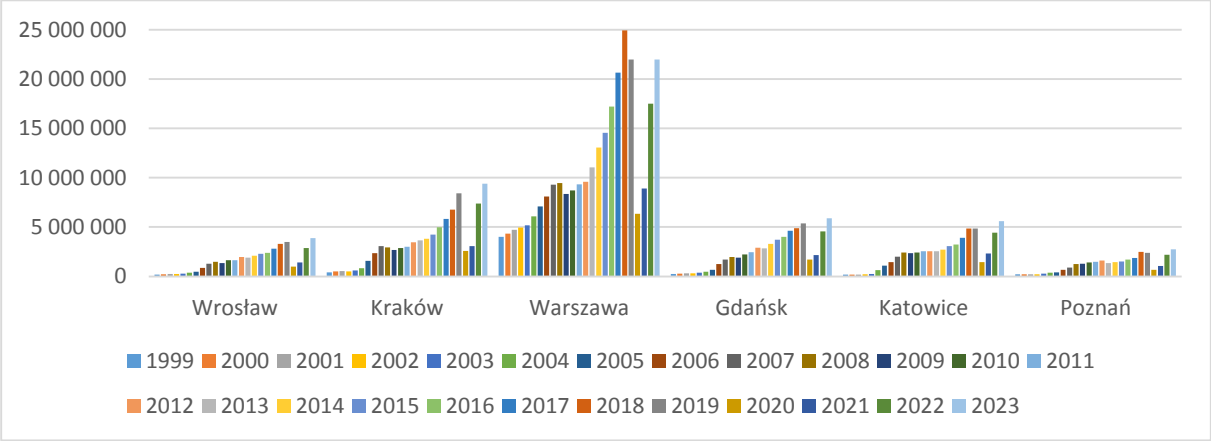

Figure 2. Passenger traffic at selected Polish airports in the period 1999-2023.

Source: authors' own elaboration based on official airport statistics by GUS, Bank Danych Lokalnych.

This upward trend is consistent with national patterns, but the scale of increase in Gdańsk outpaced several other regional hubs during the same period. The observed growth aligns closely with the completion of the infrastructure investment phase (2010-2015), which expanded the airport's operational capacity and improved service quality. As seen in Figure 2, only Kraków and Warsaw recorded higher absolute passenger volumes in 2023, but the relative growth rate in Gdańsk during the analyzed period remains among the most dynamic. These comparative data confirm that the infrastructure expansion not only enabled increased traffic handling capabilities but also met growing regional demand for air transport services. By 2024, the airport had served nearly 6.7 million passengers, reflecting continued post-pandemic recovery and demand growth (Table 5). According to projections by the airport authorities, Gdańsk Lech Wałęsa Airport is expected to handle up to 9.5 million passengers annually by 2035.

Table 5.
Operations data in 2010-2024 in Gdańsk Lech Walesa Airport

Year	Passenger service capacity	Annual runway capacity (operations/hour)	Cargo (metric tons)
2010	2 231 610	31 276 (3,6)	4 487
2011	2 463 222	34 364 (3,9)	4 944
2012	2 906 091	40 044 (4,6)	4 851
2013	2 844 308	35 908 (4,1)	4 943
2014	3 288 251	40 047 (4,6)	5 658
2015	3 706 180	40 261 (4,6)	5 162
2016	4 004 081	41 079 (4,7)	4 864
2017	4 611 714	43 422 (5,0)	5 549
2018	4 980 647	46 482 (5,3)	6 213
2019	5 376 120	48 882 (5,6)	6 887
2020 (pandemic year)	1 711 281	11 586 (1,3)	7 028
2021	2 155 470	29 298 (3,3)	9 171
2022	4 576 705	43 987 (5,0)	10 189
2023	5 907 280	49 502 (5,7)	11 483
2024	6 714 149	56 839 (6,5)	11 681

Note: "Operations/hour" indicates the average number of aircraft operations per hour calculated over the operating hours of the airport.

Source: own elaboration based on data obtained from Gdańsk Lech Walesa Airport.

Between 2010 and 2024, the airport recorded a steady increase in passenger, operational, and cargo capacity, with the exception of a sharp decline in 2020 due to the COVID-19 pandemic. The number of passengers served rose from 2.2 million in 2010 to over 6.7 million in 2024 an almost threefold increase. Simultaneously, annual runway capacity increased from 31,000 to nearly 57,000 operations, while cargo volumes grew from 4,500 to more than 11,600 metric tons. Data from 2022 to 2024 reflect a strong recovery and continued growth potential for the airport. The condition of the airport infrastructure on the side of airside after modernization, as declared by the airport, allows for the handling of 30 air operations within an hour. So far, the largest number of air operations took place in 2024. At that time, 56 839 air operations were handled. The average number of operations per hour is thus close

to 6.5 (assuming that the number of hours per year is around 8760). This is an average result, which is not adequate to the maximum capacity of handling air operations at the airport in Gdańsk. Increased air traffic is observed in the morning hours, while at night it is kept to a minimum. For the above reasons, the detailed capacity analysis in this aspect cannot be determined on the basis of the data obtained.

6. Effects for the region

Key environmental issues and airport development challenges are increasingly analyzed through the lens of sustainable development, due to their impact on the quality of life of nearby residents, the spatial and economic dynamics of surrounding areas, and the condition of the environment (GAO, 2000). As confirmed by Rucińska and Ruciński (2017) as well as Koszarek-Cyra and Wojewnik-Filipkowska (2023), airport operations generate both benefits and costs, and the overall impact depends on how these effects are distributed.

Recent theoretical and practical approaches emphasize that airports have evolved into regional growth engines. According to Appold and Kasarda (2013), modern airports function as multifunctional "airport cities"—hubs of commerce, logistics, and urban expansion that attract investment and employment far beyond their terminals. In line with this model, Gdańsk Lech Wałęsa Airport has had a profound effect on its surroundings, particularly following major infrastructure investments implemented after 2010.

Positive impacts include:

- satisfying social and economic transportation needs,
- improved regional accessibility, especially after the launch of the Pomeranian Metropolitan Railway (2015),
- increased societal mobility and tourism development,
- attraction of low-cost carriers and expanded frequency of international connections,
- increased business and leisure air traffic,
- job creation – by 2023, nearly 7000 people were employed directly or indirectly in airport-related activities (Koszarek-Cyra, Wojewnik-Filipkowska, 2023). Projections indicate that this number may further increase due to ongoing expansion. International research confirms a strong correlation between proximity to an airport and local job density[2],

[2] Research conducted in the United States by Appold and Kasarda found that 3.1 million jobs (2.82 percent of employment in the US) were within 2.5 miles of the border fence of the 25 busiest passenger airports in 2009. More than 7.5 million jobs (6.78 percent of US employment) were within 5 miles of the same airports, while 19.0 million jobs (17.17 percent of the total) were within 10 miles (Appold, Kasarda, 2013, p. 1247).

- accelerated suburban expansion and land-use transformation – residential areas such as Banino, Kokoszki and Jasień experienced substantial growth, with population increases of 363%, 245% and 232% respectively between 2005 and 2022 (Koszarek-Cyra, Wojewnik-Filipkowska, 2023),
- increased land value – particularly in areas previously classified as agricultural, now being converted for residential or industrial purposes (Rucińska, Ruciński, 2017).

Such developments are consistent with broader theoretical frameworks on infrastructure-driven growth. Romer (1986) and Lucas (1988) demonstrated that increasing returns from infrastructure investments stimulate long-term economic expansion. Barro and Sala-i-Martin (2004) emphasized the role of regional capital accumulation and transport connectivity in reducing disparities. Similarly, Dolata (2015) and Ratajczak (2000) pointed to transport infrastructure as a key factor in sustainable spatial development.

However, rapid airport-driven development brings challenges:

- insufficient road and public transport infrastructure, leading to congestion during peak hours,
- reduction of biologically active areas due to urban sprawl,
- increased noise and air pollution related to air traffic,
- potential water contamination from de-icing and apron runoff,
- spatial planning conflicts – over 60% of local development plans (LDPs) in the airport's vicinity allocate land for residential use, while only 1.7% designate industrial functions, resulting in functional incompatibilities (Koszarek-Cyra, Wojewnik-Filipkowska, 2023).

To monitor and mitigate the environmental impact of its operations, Gdańsk Airport has implemented a noise monitoring and measurement system related to aviation activity, as well as periodic assessments of rainwater discharged into drainage ditches. These tests have not revealed any significant environmental risks. Nevertheless, even in the absence of clear harm, it is reasonable to assume that some environmental impact is inherent to airport operations. As Lidskog and Soneryd (2000) emphasize, compliance with environmental norms alone is not enough-major infrastructure projects must also be socially inclusive, addressing public concerns and ensuring meaningful engagement of affected communities.

Despite these challenges, cost-benefit analyses indicate that the advantages of airport operations generally outweigh their costs-provided effective mitigation measures are implemented. Pearce, Atkinson and Mourato (2006) stress that environmental externalities should be systematically accounted for in such assessments, and the European Commission (2014) highlights the importance of monetizing both environmental and social impacts when appraising large infrastructure investments.

Ultimately, the case of Gdańsk Lech Wałęsa Airport reflects a broader trend observed across Europe and globally: airports play a growing role in regional development, but this growth must be accompanied by thoughtful spatial planning, environmental stewardship, and open dialogue with the public.

7. Conclusion

The ex-post analysis confirms that the infrastructure investment at Gdańsk Lech Wałęsa Airport was successful and met its strategic objectives. The target capacity of handling over 5 million passengers annually was reached in 2019, just a few years after the commissioning of the new T2 terminal. Although the COVID-19 pandemic temporarily disrupted air traffic, the airport has since returned to a growth trajectory, supported by positive financial, operational, and socio-economic indicators.

The investment not only enhanced the airport's technical performance - achieving ILS Category IIIb capability and increasing hourly runway capacity - but also generated significant regional impacts. These include job creation, increased land and property values, suburban expansion, and the stimulation of commercial activity, including the ongoing Airport City development. The stable financial condition of the airport enables the continuation of new investment projects, such as the construction of the western pier.

Importantly, the investment fulfilled expectations not only of the airport operator but also of public stakeholders. It improved the mobility of residents in the Tri-City and surrounding areas and aligned with the long-term development strategy of the Pomeranian Voivodeship. The project also contributed to the liberalization and competitiveness of the Polish aviation sector, increasing the range and frequency of international connections for both business and leisure travellers.

From a public policy perspective, the project exemplifies the effective use of EU and national funds to support long-term regional growth. It demonstrates how transport infrastructure can simultaneously fulfill economic and social utility goals. Moreover, the evaluation provides practical insights into the management of large-scale infrastructure projects and the effective allocation of public resources. In the context of Poland's relatively young and rapidly changing aviation sector, such experience supports institutional learning and strategic planning for future investments.

Moreover, the findings confirm the catalytic role of airport infrastructure in regional economic transformation, as anticipated in endogenous growth theories (e.g., Romer, Lucas). At the same time, they underscore the importance of integrated spatial and environmental governance in mitigating externalities from such projects. Methodologically, the study demonstrates the relevance of ex-post evaluation in assessing large-scale infrastructure outcomes, which may be useful for similar regional case studies.

Nonetheless, the study acknowledges limitations related to the observation period, which ended with the onset of the COVID-19 pandemic. Air operations were nearly frozen during some periods, and some regional investments were delayed. These disruptions should be taken into account in further impact assessments.

Future research should explore the long-term effects of subsequent development stages, including aspects of social equity, climate resilience, and regional integration within the trans-European transport network.

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Footnotes

[1] The financing of such projects may vary, they may be funds obtained from prepayments. They are very often used by airports to fund major investments, such as runways and terminals. It involves the airport charging airlines higher prices as soon as, and sometimes before, the project's construction commences, often well before it becomes operational (Forsyth, 2018, 259). This form of financing is available for the higher rank airports. Those of lesser rank use traditional forms of financing and combine equity capital with borrowed capital. Public funds are also used, and in the case of member states - the EU funds.

[2] Research conducted in the United States by Appold and Kasarda found that 3.1 million jobs (2.82 percent of employment in the US) were within 2.5 miles of the border fence of the 25 busiest passenger airports in 2009. More than 7.5 million jobs (6.78 percent of US employment) were within 5 miles of the same airports, while 19.0 million jobs (17.17 percent of the total) were within 10 miles (Appold, Kasarda, 2013, p. 1247).