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MANAGING THE AIRPORT-PROXIMATE AREAS

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Purpose: Identifying the main gaps in local planning in the context of sustainable development and addressing spatial conflicts in airport-proximate areas, using the examples of areas surrounding airports in Gdańsk and Kraków are objectives of the research.
Design/methodology/approach: The research is based on analyzing Polish and foreign literature, documents, reports, and other information and data obtained directly during the research process. A quantitative-qualitative analysis was conducted based on Local Development Plans (LDPs) adopted between 1995 and 2022 in the airport-proximate areas covered by the resolution establishing restricted use areas (RUAs) around Lech Wałęsa Airport in Gdańsk and Kraków-Balice Airport. The quantitative analysis included the number of plans and functions for these areas, while the qualitative analysis focused on potential conflicts between land functions and airport activities.
Findings: The complexity of planning policy and its legal and institutional environment, dependence on conditions of various nature (e.g., historical, political, economic, and social), and the interdependence of interests among different entities create decision-making conditions that ultimately hinder the implementation of the primary spatial development goals associated with ensuring sustainable development. The gaps in local planning concern the generation of spatial conflicts, especially between aviation-related functions and residential functions.
Research limitations: The analysis did not include the size of the areas covered by LDPs. The analysis was conducted based on the number of LDPs and their functions; the original versions of plans were examined.
Practical/social implications: Research implications include among others determining the potential for spatial conflicts in airport-proximate areas due to regulations adopted in local plans; identifying possible solutions to improve the effectiveness (in line with sustainable development principles and spatial conflict prevention) of interventions by local authorities using LDPs.
Originality/value: This study is directed towards stakeholders in local development. The issue of assessing the effectiveness of planning interventions in areas around airports in this scope has so far not been analyzed using a quantitative-qualitative analysis of LDPs.

Keywords: local development, spatial management, land-use planning, airports.

Category of the paper: research paper.

1. Introduction

In the era of globalization, the significance of aviation transport is paramount. Besides their obvious transportation function, airports also have a substantial impact on the quality of life in cities, the urban tissue, and local (spatial) planning implications (Freestone, Baker, 2011).

With the increased number of passengers served and cargo transported, passenger terminals are enriched with various services for travelers and additional commercial activities. Additional functions are also developed around airports (Freestone, 2009), such as business centers, commercial and service facilities, bus stops, railway stations, car rental services, industrial parks, and logistics and freight-related buildings (Stangel, 2013). Therefore, it can be concluded that the location and development of airports significantly influence the surrounding areas (Gierczak-Korzeniowska, 2016).

The literature describes various development models of areas in the proximity of airports-based on the shape and direction of developments in the airport-proximate zones. These models include Airport City, Aeropolis, Airport Corridor, Airport Regio, and Aeria, among others (see Roeseler, 1971; Conway, 1980; Schaafsma, 2010; Kasarda, 2001; Schlaack, 2010). Furthermore, it is noted that the distinction between the airport and its surrounding territory is blurred and becomes a unified urban landscape (Figure 1).

Graphic Example	Concepts' Features	Planning and Developing
Airport Region (70s)		
	* An embryonic Aerotropolis from the 70's * A public planners view * Development of residential and industrial areas around the airport * Connected to host city and to main industrial and logistical sites by roads (highways and conventional roads) and conventional rail	* Top-down planning * Public authorities view * Public developers
Airport City		
	* Limited to the airport perimeter * Large supply of various services: commerce; public services; leisure and business spaces	* Privately and public developed and managed by airport authorities
Airport Corridor		
	* Developed on a corridor between the airport and the host city * Greater and more varied involvement of public on the infrastructure planning * Connected to host city and region by highways (express or not) and railway (express/high speed or not)	* Public-privately planned * Intervention of various stakeholders in cooperation: airport authorities; private developers; local and regional public institutions;
Aerotropolis		
	* Extrapolation of the Airport City to the surroundings of its perimeters * Replication of Airport City services, industrial, residential, thematic and logistical spaces * Features similar to Airport Corridor	* Unplanned to national and regional planed * Mix of developers: private; public; private and public
Airea		
	* A fragmented and dispersed developed area around the airport in a polycentric and metropolitan way * Features similar to Airport Corridor and Aerotropolis	* Regional and local planning * Private and public developers * Mix between private/public and small/large components

Airport; **A** - Airport City; Concept's area; Host city

Figure 1. Development models of airport-proximate areas –- concepts, features, and characteristics. Source: (Correia, de Abreu e Silva, 2015).

The factors these models have in common are the airport location as a central element of intercity transport, the support of mixed and non-aviation development, and the importance of planning in ensuring the effective allocation of regional resources and infrastructure development (Freestone, Baker, 2011). Therefore, airport development planning must be combined with a more comprehensive process of local planning of airport-proximate areas and to create a vision of their development as a whole and in line with sustainable development.

2. Local planning around airports in conditions of sustainable development

The space around the airport requires special attention, not only because it combines numerous functions that may generate conflicts in space but also because the development of these areas must be planned many years in advance. However, it is indicated that at their creation stage, airports were planned as self-existing institutions without a functional background, therefore the need to "reserve" land for the future development of airport-related services was often not addressed. Nowadays, airports are not just places from which people can embark on a trip; they have become business centers with a rich offer of accompanying services (Puzdrakiewicz, Pokora, 2019). The importance of these areas increases as transport links are expanding. Due to the above, the airport-proximate areas enjoy a growing interest from local authorities and investors (Puzdrakiewicz, Pokora, 2019; Gierczak-Korzeniowska, 2016). This results in a dynamic urbanization process in the areas of civil airports (Kunicka-Kowalska, Kowalski, 2014).

It should be emphasized that the airport's operation affects the environment, causing numerous external effects, both positive – such as job creation (Brueckner, 2003), development of infrastructure and construction – and negative, e.g., noise and pollution emissions. Therefore, it can be assumed that the airport's existence should in some way limit the permitted functions of the airport-proximate areas, e.g., the residential function related to the increase in the number of inhabitants of the airport-proximate areas, or influence the location of health care services. The progress of urbanization should thus be controlled through effective space management, considering the specificity of urban, suburban, and rural areas (Chi, 2012).

The purpose-bound interpretation of effectiveness relates to assessing the effects of action in relation to the adopted effects (Zieleniewski, 1969). Local planning is defined as systematic activities aimed at the effective use of space, reconciling the interests of its various users, and achieving social and economic goals. An important aspect of local planning is the use and protection of the natural and built environment so that it is possible to meet the needs of current and future generations (Ministry of Development and Technology, 2023). Therefore, local planning is effective and efficient if it complies with the principles of sustainable development and prevents spatial conflicts. In other words, local planning involves actions that meet the

community's economic, social, and ecological needs. Sustainable development is the factor that can both stimulate and distimulate the investment process. Public authorities, especially in large cities, are responsible for this challenging task, one of the main problems of which is changing the function of a given area and addressing the needs of various stakeholders (Hołuj, 2018) while maintaining the above-mentioned principles of sustainable development and stimulating local economic development. Local development plans (LDPs) are the tools used for this purpose. In the context of airport-proximate areas, they aim to organize space so that, on the one hand, the future infrastructure and development do not interfere with the nature of air operations (Kunicka-Kowalska, Kowalski, 2014). On the other hand, the airport's operation should have the least possible impact on residents' comfort and quality of life. In this context, there is a constant contradiction between expectations of greater mobility and decreasing tolerance for the negative effects of transport and its related consequences (Pawłowska, 2015).

Tools for reducing aircraft noise are not only local plans understood as the final document constituting local law, but also the entire process of adopting local plans, which enables co-deciding on how the space is developed, is also important, as effective management depends on cooperation between the market, public authorities, and social organizations (Frąckiewicz-Wronka, 2023). Moreover, an action is considered effective if it brings results that are not only effective ("doing the right things") but are efficient as well ("doing the things right") (Buklaha, 2012).

Other tools for reducing aircraft noise include acoustic modernization, restrictions and prohibitions, and restricted use areas (RUAs). The RUA is one of the methods of reducing aircraft noise, as indicated by the International Civil Aviation Association (ICAO, 2008). This is a geographically separated protection zone for areas exposed to excessive noise occurring many kilometers from the border of the entity responsible for the emission. In the RUA area, maintaining permissible environmental noise levels within the area to which the airport management company has legal title is impossible despite using available technical, technological, and organizational solutions.

The implementation of planning procedures, the integration of various levels of development policy and the tools it uses with separate policies, including environmental policy, enable the identification of gaps and problems in this process. The complexity of planning policy and its legal and institutional environment, dependence on different conditions (e.g., historical, political, economic, social), and the interdependence of the interests of various entities create prerequisites for making decisions that may ultimately hinder achieving original local development goals related to ensuring sustainable development and minimizing the risk of conflicts in space.

The literature on the subject identifies many problems that appear in planning processes conducted by Polish municipalities. One of them is the low integration of various aspects of development planning, particularly socio-economic planning, local planning and planning for nature and landscape protection (Drzazga, 2015). Other important issues include the lack of local plans in urbanized and urbanizing areas, failure to ensure proper development and infrastructure of buildings, drastically overestimated size of areas in LDPs intended for housing development and a high number of administrative decisions allowing construction without local plans (Kowalewski et al., 2020). These problems can also be observed in planning of airport-proximate area (Wojewnik-Filipkowska, Koszarek-Cyra, 2022).

One of the challenges in managing the airport-proximate areas is the multi-scalar nature of airport-related problems. Three vectors of problems can be identified: vertical (different levels, often from national to local), horizontal (different interests in the same sphere) and sectoral (public and private stakes) (Cidell, 2004; Galvin, 2010). Additionally, the negative effects of local planning are most often observed when a change occurs in an area owned by many users (Hołuj, 2018). This article focuses on selected problems (gaps) in local planning related in particular to the above-mentioned horizontal and sectoral layout. This study is part of the research trend on assessing the effectiveness of planning interventions in the housing market (see Habdas, Konowalczuk, 2018). It also continues and expands on earlier authors' research and is part of the research project "SOWA 2023"[1].

The study analyzed LDPs in terms of their validity, the frequency of the occurrence of the residential function – one that conflicts with the intensification of air traffic – the source of nuisance and the reasons for the reduction of the quality of life of residents living in areas adjacent to the airport. In this way, the possibility of spatial conflicts in the airport-proximate areas was examined and possible solutions were indicated to improve the effectiveness of interventions of local authorities using local development plans. Comparative research was carried out for the airport-proximate areas of the Kraków-Balice airport and Lech Wałęsa airport in Gdańsk.

3. Methods

A quantitative-qualitative analysis was conducted based on LDPs adopted between 1995 and 2022 in the airport-proximate areas covered by the resolution establishing RUA around Lech Wałęsa Airport in Gdańsk (Uchwała Nr 203/XVIII/16 Sejmiku Województwa Pomorskiego, 2016) and Kraków-Balice Airport (Uchwała NR XVIII/247/20 Sejmiku Województwa Małopolskiego, 2020). The quantitative analysis included the number of plans

[1] https://ie.uek.krakow.pl/kenipi/2023/03/08/projekt-sowa-2023/.

and functions for these areas, while the qualitative analysis focused on potential conflicts between land functions and airport activities.

Spatial conflict is a complex conflict encompassing both spatial aspects and natural, economic, cultural, social, psychological, legal, organizational, and technical dimensions. In the context of the current research, conflict refers to the inconsistency in the intended use of adjacent areas, which is associated with negative external effects in the form of noise and odor emissions (Ułańska, 2012). This conflict relates to transport and technical infrastructure, investment pressure, and adverse effects on the natural environment (Puk, 2011). The compatibility or incompatibility of the intended land use and the possibility of conflicts associated with it was determined based on the analysis and synthesis of the literature, according to which conflicts most commonly occur between industry and residential, recreational, agricultural, and forestry functions, as well as between transport and residential and recreational functions (Grochowska, 2017; Dmochowska-Dudek, 2011). An analysis of the frequency of a particular land function in the examined LDPs was conducted to identify potential conflicts. Since different plans may use varying terminology for specific functions, the presentation of results was simplified, and the following symbols were applied:

- MN: residential areas.
- MNU: residential and service building areas.
- U: service areas.
- UP: production and service areas.
- R: agricultural areas.
- P: industry areas.
- Z: green areas.
- WS: inland waters.
- KD: road areas.
- KK: railway areas.
- KL: airport areas.
- T: technical infrastructure areas.
- I: other areas.

The research for the airport-proximity area in Gdańsk was conducted in 2020 and for the Kraków-Balice area in 2022. In both cases, the analysis included all the valid plans for the selected areas during the research. The plans for airport-proximity areas in Gdańsk were developed from 1995 to 2020, whereas for Kraków the documentation concerned the years from 2004 to 2022. To facilitate comparison, data for the years related to both areas were compared which include LDPs from 2004 to 2020.

The spatial scope of the analysis was determined based on the RUA. In the case of Gdańsk, the analysis covered the LDPs for the following districts and areas within Gdańsk: Matarnia, Kokoszki (including districts of Housing Kokoszki and Industrial Kokoszki), Brętowo, Jasień, Piecki Migowo, Zabornia (a part of Ujeścisko-Łostowice), as well as villages in the municipality of Żukowo: Miszewko, Rębiechowo, Banino, and Czaple, and the village of Tokary in the municipality of Przodkowo. In the case of Kraków, the spatial scope of the analysis included the following districts and areas: District IV Prądnik Biały, District VI Bronowice, District VII Zwierzyniec, as well as villages in the municipality of Zbierzów: Aleksandrowice and Balice, and villages in the municipality of Liszki: Mników and Morawica.

4. Development of the Gdańsk and Kraków Airport – Case Studies (Materials)

Gdańsk Airport was opened in 1974 on a 240-hectare site. Since 1993, the airport has operated as a commercial company owned by the following entities: the City of Gdańsk (33.63% share), the Pomeranian Voivodeship (32.85% share), Polish Airports State Enterprise (Polskie Porty Lotnicze S.A.) (29.09%), the City of Gdynia (2.23%), and the City of Sopot (2.19%). The airport is located approximately 10 km from the city centers of Gdańsk and Sopot and about 23 km from the center of Gdynia in a straight line. The Tri-City bypass road and national highways intersect in the vicinity of the airport. The Pomeranian Metropolitan Railway was built in 2015. It is directly connected to Terminal T2. The airport is well-connected through bus lines to the surrounding towns and villages. The airport's catchment area includes northern Poland, with approximately 2.5 million people living within a 100 km radius of the airport. The airport's infrastructure allows 41-44 takeoff and landing operations per hour. The runway has 7 taxiways and the apron on the departure side can accommodate approximately 38 Code C aircraft. The airport has two passenger terminals. Terminal T1 (almost 10,000 square meters of usable space) was put into operation in 1997. The construction of Terminal 2 (currently 54,000 square meters of usable space) began in 2010, and it was expanded in 2014-2015. From 2019 to 2022, a new Western pier was added to the Terminal 2. Gdańsk Airport is the only one in Poland with passenger bridges suitable for turboprop aircraft such as Bombardier Q400. Currently, it offers approximately 70 regular connections to destinations in Poland and Europe (Gdańsk Lech Walesa Airport, 2023).

Kraków-Balice Civil Airport was established on the grounds of a military airport in 1964, covering an area of 10 hectares. The total area of the airport includes 310 hectares, with 27.5 hectares under the management of the company "Międzynarodowy Port Lotniczy im. Jana Pawła II Kraków-Balice sp. z o.o." The overall area does not include the military area. The shareholders of the company are as follows: Polish Airports State Enterprise (Polskie Porty Lotnicze S.A.) (76.19%), the Małopolskie Voivodeship (22.73%), the City of Kraków (1.04%), and the Municipality of Zabierzów (0.04%). The airport is 11 km west of Kraków and is directly adjacent to the A4 motorway and the S7 expressway. The airport is well-connected by means of rail and bus lines to Kraków and surrounding areas. The service area of Kraków-Balice Airport covers southeastern Poland. Approximately 7.9 million people reside within 100 km from the airport, including the vicinity of Katowice Airport (68 km away). The airport is equipped with two terminals. The current apron at Kraków-Balice Airport can accommodate 23 Code C aircraft. New investments include the expansion of the aircraft parking apron on the Western part of the airport, creating an additional 15 Code C parking spaces (the investment progress as of December 31, 2022, is 70%). Moreover, a new cargo terminal is planned, including office and warehouse space with a total usable area of 5.6 thousand square meters. It is expected to be completed in the fourth quarter of 2024 (Kraków Airport im. Jana Pawła II, 2023).

Based on the contour lines of noise emissions for both the airport-proximity areas in Kraków and in Gdańsk, the RUA was defined and divided into zones A, B, and C (Kraków) as well as zones A and B (Gdańsk) (Table 1, Figure 2, Figure 3). Specific usage restrictions and development constraints were assigned to each zone, depending on the noise intensity resulting from aviation operations, flight approach and departure routes during the day and at night, and air traffic forecasts (Table 1, Figure 1, Figure 2).

Table 1.
RUAs in the vicinity of Lech Wałęsa Airport near Gdańsk and Balice Airport near Kraków

Zone	Kraków-Balice Airport	Gdańsk Airport
A	the boundary is determined from the outside by the maximum range of the night noise isoline: 50 dB or the day-evening-night noise isoline: 60 dB, from the inside by the airport boundary	limited from the outside by the envelope of the isoline of 50 dB at night and 60 dB during the day and from the inside – the boundary of the airport area
B	the boundary is determined from the outside by the day-evening-night noise isoline: 55 dB, from the inside by the maximum range of the night-evening-night noise isoline: 50 dB, from the inside the maximum range of the night-evening-night noise isoline: 60 dB or the airport boundary	limited from the outside by the boundary of the limited use area (45 dB isoline envelope at night, required for areas with higher standards acoustic) and from the inside – the envelope of the isoline of 50 dB at night (required for residential areas)
C	the boundary is marked by night noise isolines of 45 dB, from the inside the maximum range of day-evening-night noise isolines: 55 dB	no zone C

Source: Uchwała Nr 203/XVIII/16 Sejmiku Województwa Pomorskiego, 2016; Uchwała NR XVIII/247/20 Sejmiku Województwa Małopolskiego, 2020.

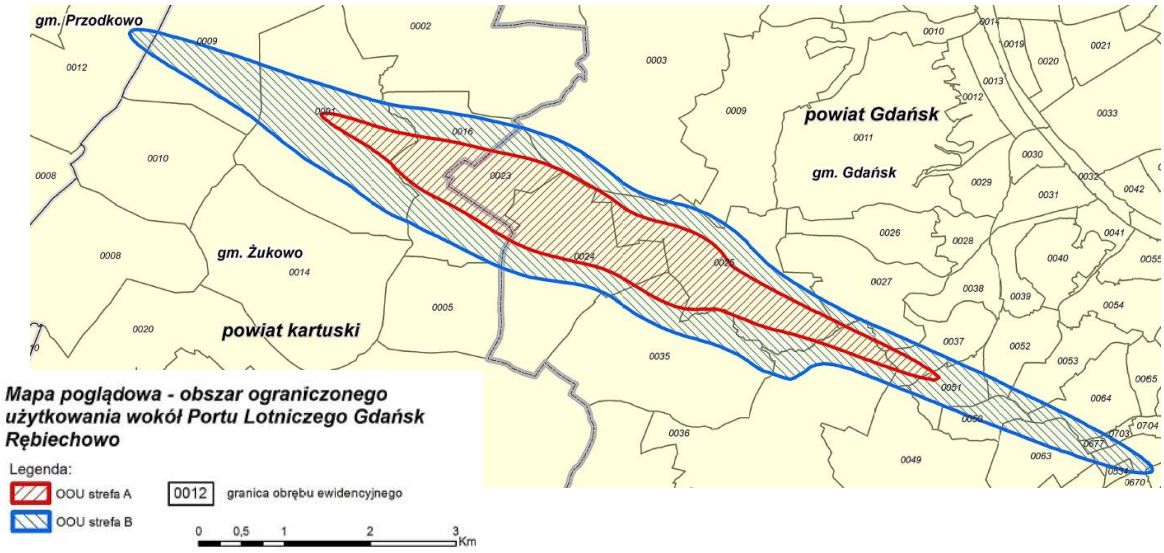


Figure 1. Restricted Use Area (RUA) around Lech Wałęsa Airport serving Gdańsk.
Source: Appendix No. 4 (Uchwała Nr 203/XVIII/16 Sejmiku Województwa Pomorskiego, 2016).

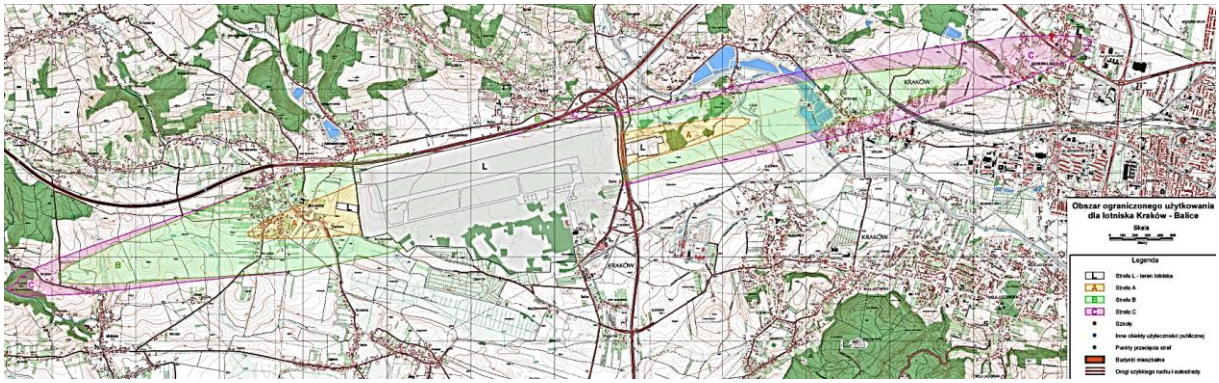


Figure 2. Restricted Use Area (RUA) for Kraków-Balice Airport.
Source: Appendix No. 1 (Uchwała Nr XXXII/470/09 Sejmiku Województwa Małopolskiego, 2009).

The restrictions and development rules for these zones involve prohibition or limitation on residential functions, the location of recreational areas, and the construction of buildings with permanent, extended, or round-the-clock occupancy (especially hospitals, nursing homes, schools, dormitories). The resolution also specifies technical requirements for buildings located within the RUA.

5. Results and discussion

At both of the analyzed airports, air transport for recreational travel, business travel, and cargo shipments grew dynamically during the analyzed period. The year 2020 was exceptional due to the COVID-19 pandemic. Neither of the analyzed airports reached pre-pandemic levels in 2022 (Figure 3).

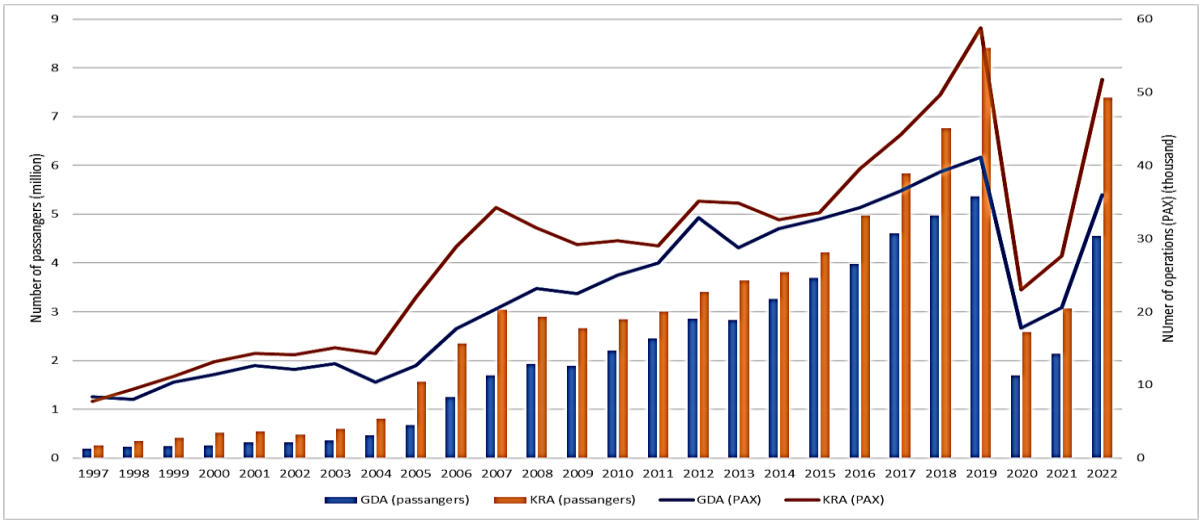
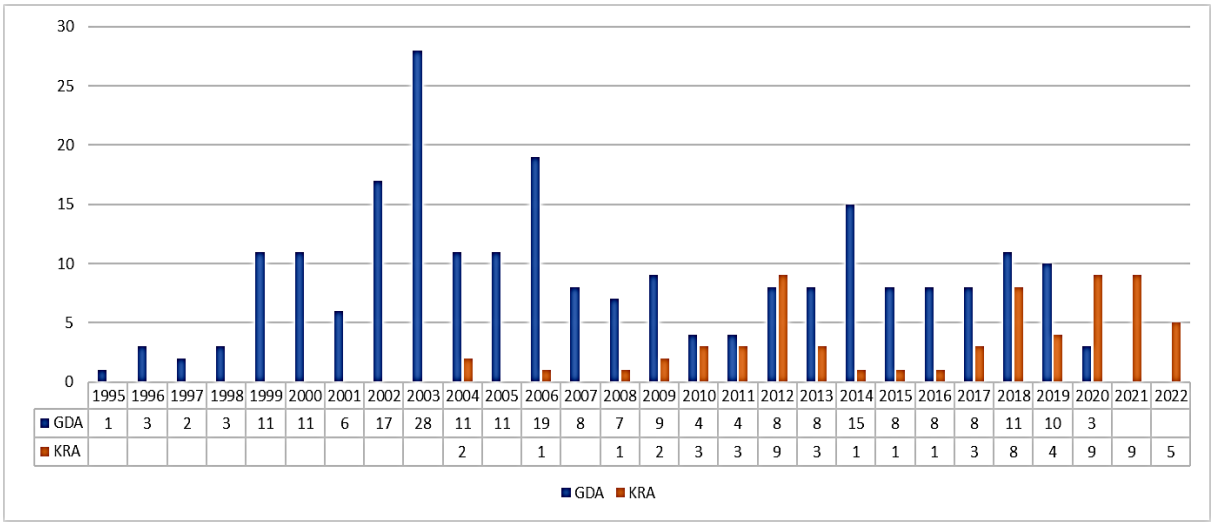


Figure 3. The number of passengers served, operations conducted in domestic and international traffic (regular and charter), and the number of PAX operations in the years 1999-2022 at Gdańsk Airport (GDA) and Kraków Airport (KRA).

Source: Own analysis based on (Civil Aviation Authority, 2023).

Since 2010, Gdańsk Airport has been serving over 2 million passengers annually, while Kraków Airport has been doing so since 2006. From 1997 to 2022, the number of passengers at Gdańsk Airport increased by over 23 times, while at Kraków Airport, 28 times. During the same period, operations increased by factors of 4 and 6, respectively.

The development of airports has stimulated the development of airport proximity areas, which relates to local development policy. In the airport vicinity in Gdańsk, 234 LDPs were adopted from 1996 to 2022, while in Kraków, 65 LDPs were adopted from 2004 to 2022 (Figure 4).



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GDA	1	3	2	3	11	11	6	17	28	11	11	19	8	7	9	4	4	8	8	15	8	8	8	11	10	3		
KRA										2		1		1	2	3	3	9	3	1	1	1	3	8	4	9	9	5

Figure 4. The number of local plans established in the airport-proximate areas near Gdańsk (GDA) (1995–2020) and Kraków (KRA) (2004-2022).

Source: own study based on planning documents of the surveyed communes (as of January 1, 2012 – Gdańsk; January 1, 2023 – Kraków).

In Gdańsk, of the whole of the surveyed area during the mentioned period (1995-2020), the highest number of LDPs was adopted in 2003. This can be associated with the implementation of a new law on local development planning. Article 87.1 of this law stipulated that LDPs adopted before January 1, 1995, would lose their validity. Creating a spatial vision, closely linked to the relatively regular adoption of LDPs for Gdańsk's districts, can be considered an ongoing and consistently executed process since 2002 (except for 2011), as new plans were adopted every year. In contrast, in the Żukowo municipality, such plans were only developed for the village of Banino in recent years. New LDPs for the villages of Czaple and Rębiechowo have not been created since 2007 (Czaple) and 2010 (Rębiechowo). It can be inferred that this is an action aimed at avoiding conflicts, at least in the short term.

During the consistent analysis period from 2004 to 2020, an average of nearly 9 LDPs were adopted annually for the surveyed area in Gdańsk, while in Kraków it was slightly over 3 plans per year. In Gdańsk (for urban areas), a total of 139 plans were published, while in rural areas, there were 13 plans. The highest number of plans was published in Gdańsk in 2006 (19 plans) and 2014 (15 plans). Kokoszki district had the highest number of plans (41), followed by Jasień (32) and Brętowo (28). Kokoszki is the westernmost district of Gdańsk with a mixed residential and industrial character, bordering Jasień to the east. Jasień is one of the best-situated districts in Gdańsk, characterized by multi-family housing with large-scale retail facilities in its Western part. It also borders agricultural fields, allotment gardens, and recreational areas. Brętowo, also located in the Western part of the city, near the Oliwa Forests and Strzyża Creek, consists mainly of residential areas with heterogeneous architecture, including both prefabricated apartment buildings and single-family houses.

Regarding the airport-proximity areas in Kraków during the study period, 65 LDPs were in force. They were adopted for the analyzed area between 2004 and 2022. A noticeable difference was observed in the number of plans adopted for urban areas (58) compared to rural areas (7). Similar to the case of Gdańsk, this suggests that the city's involvement in the planning process is greater than that of the surrounding municipalities. The highest number of LDPs was adopted for District IV of Kraków – Prądnik Biały (the most populous district in Kraków; 25 plans) and District VII Zwierzyniec (20). The lowest number of plans were adopted for the villages of Aleksandrowice (1) and Balice (1). Due to their natural attractiveness, both villages are part of the Tenczyński Landscape Park. In the 1970s, a small residential estate was built on the eastern outskirts of Aleksandrowice. A4 motorway runs south of the village, and beyond it lies the airport, located within the village of Balice.

While analyzing the documents, it was also observed that LDPs prepared for the Kraków airport proximate zones cover large land areas. In contrast, Gdańsk often involves small areas, in extreme cases a few plots or a single street. This may indicate that planning in Kraków and surrounding municipalities is based on a broader land development vision and is carried out more thoughtfully than in Gdańsk. In Gdańsk, changes or the adoption of new plans seemed more ad hoc and appeared to be a way to address current issues rather than being part of

comprehensive spatial management. When analyzing the timing of plan adoption in Kraków, most documents were created in 2012, 2020, and 2021. The last two years, characterized by high activity, indicate that planning processes around the Kraków airport are carried out very actively, and the plans are regularly updated. This also confirms that, unlike Gdańsk, where plans from the 1990s were still in effect at the time of the study, the oldest plans around Balice Airport date back to 2004, with the vast majority being adopted after 2010. Due to the fact that local planning can lead to spatial conflicts, the frequency of land functions specified in the LDPs applicable for the respective areas was analyzed (Tables 5 and 6).

Table 5.
Number of plans in which a specific function occurred – Gdańsk (plans from 1996-2020)

Area	MN	MNU	U	UP	R	P	Z	WS	KD	KK	KL	T	I
Banino	8	6	3	0	2	1	5	3	7	0	0	1	0
Brętowo	21	14	20	4	1	0	24	1	23	4	0	4	3
Czaple	0	1	0	2	1	0	0	0	2	0	0	1	0
Jasień Szadółki	30	27	35	15	0	1	28	0	32	5	0	14	1
Klukowo Rębiechowo	11	9	16	9	0	1	11	1	17	4	0	9	0
Kokoszki Mieszkaniowe	28	31	33	18	0	0	18	0	34	1	0	12	2
Kokoszki Przemysłowe	2	2	5	12	1	0	10	0	12	0	3	5	0
Matarnia-Złota Karczma	5	4	8	7	0	0	7	0	7	1	3	2	0
Miszewko	7	9	2	4	0	0	5	0	11	1	0	2	0
Piecki Migowo	16	15	15	3	1	1	14	1	17	0	0	5	4
Rębiechowo	14	6	1	0	1	0	3	0	12	0	0	2	0
Tokary	0	1	1	1	1	0	1	1	1	0	0	0	0
Zabornia	4	4	5	0	0	0	3	0	4	0	0	2	0
Total frequency	**146**	**129**	**144**	**75**	**8**	**4**	**129**	**7**	**179**	**16**	**6**	**59**	**10**
% in the number of plans	**62.4**	**55.1**	**62**	**32**	**3.42**	**1.71**	**55**	**2.99**	**76.5**	**6.84**	**2.6**	**25.2**	**4.27**

Source: own study based on planning documents of the analyzed municipalities (as of January 1, 2021).

In the areas around airports in Gdańsk, the most common functions, aside from roads, included in the LDPs related to housing – 146 plans included a housing function, and 129 areas had mixed residential and service functions. It is important to note that these are often not areas of "old housing," but rather newly emerging neighborhoods. For example, in the village of Rębiechowo, the land directly adjacent to the airport was de-agriculturalized for residential use, resulting in building residential housing in the analyzed area. At the same time, very few areas were designated for industrial or agricultural use. Considering the potential for conflicts in space, it can be concluded that the high number of areas designated for residential purposes in the airport vicinity, coupled with the lack of industrial and agricultural areas less affected by airport operations, may be considered an error in local planning.

A similar analysis was conducted for the airport-proximate areas in Kraków (Table 6).

Table 6.
Number of plans in which the particular function occurred – Kraków (plans from 2004-2022)

Area	MN	MNU	U	UP	R	P	Z	WS	KD	KK	KL	T	I
Aleksandrowice	1	1	1	0	1	0	1	0	1	0	0	1	0
Balice	1	1	1	0	1	0	1	1	1	1	0	1	0
Dzielnica IV Prądnik Biały	19	19	18	1	7	0	22	9	25	1	0	14	0
Dzielnica VI Bronowice	12	9	11	0	6	0	12	6	13	7	0	8	0
Dzielnica VII Zwierzyniec	18	13	17	1	8	0	18	7	19	1	0	11	1
Mników	2	1	2	3	2	1	3	2	3	0	0	0	0
Morawica	1	1	1	2	1	0	2	2	2	0	2	0	0
Total frequency	**54**	**45**	**51**	**7**	**26**	**1**	**59**	**27**	**64**	**10**	**2**	**35**	**1**
% in the number of plans	**83.1**	**69.2**	**78**	**11**	**40**	**1.54**	**91**	**41.5**	**98.5**	**15.4**	**3.1**	**53.8**	**1.54**

Source: own study based on planning documents of the analyzed municipalities (as of January 1, 2023).

In the areas surrounding Krakow Airport, residential functions were frequently included in the plans (83% of all plans), as well as mixed residential and service functions (almost 70%). Somewhat surprising is the relatively low designation of areas for industrial or mixed-use purposes in these plans, which is considered one of the best ways to utilize space around airports in the literature. At the same time, many plans included green and agricultural areas. Considering both the potential for spatial conflicts and environmental benefits (e.g., noise reduction), such land use planning around the airport is beneficial.

To compare the planning processes for airports in Gdańsk and Krakow, data for overlapping study periods (i.e., 2004-2020) were analysed. The frequency of designating a specific land use function in the plans was compared. Since the total number of plans in both areas differed, the analysis used the percentage share of the frequency of designating a specific function to the total number of plans in a given area (Figure 5).

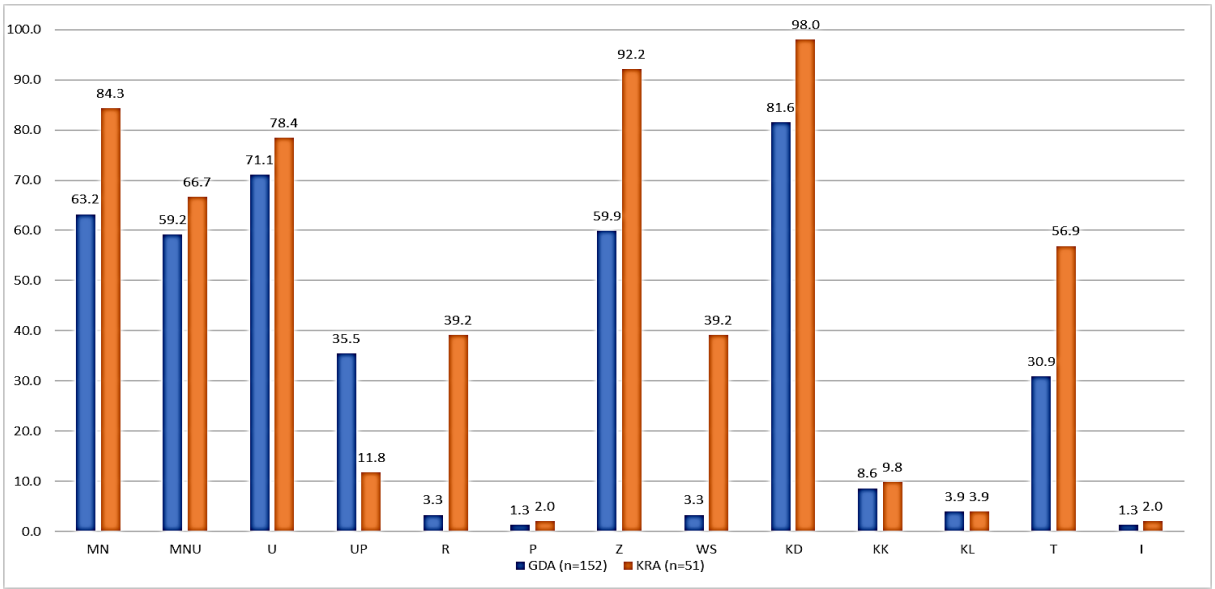


Figure 5. Comparison of the frequency of functions in the plans established for Gdańsk (GDA) and Kraków (KRA) in 2004-2020.

Source: own study based on planning documents of the surveyed communes.

By comparing the provisions of planning documents in both areas, it is possible to indicate the approach of the authorities of the areas studied to determine the functions of airport-proximate areas. In the case of the Krakow airport, the authorities more often decided on agricultural functions of the areas, and green areas were also planned more often. Municipal authorities managing the areas around the airport in Gdańsk more often decided to allocate the areas for service and industrial functions. In the airports in Gdańsk and Kraków, too many areas were assigned a residential function. Such local planning will cause urban sprawl and is perceived in the literature as a negative phenomenon, which can be observed in Gdańsk (Figure 6).

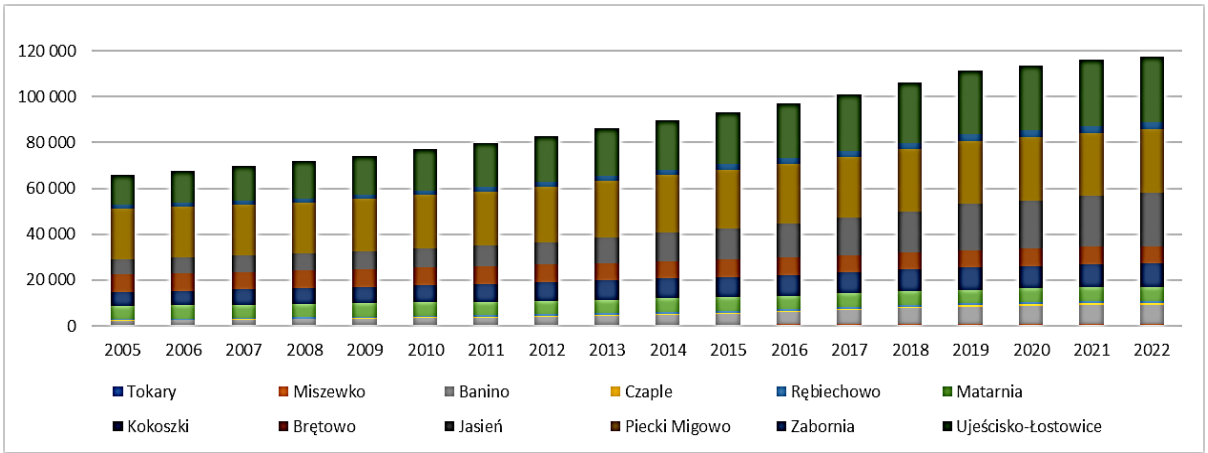


Figure 6. Number of inhabitants in selected areas around Gdańsk airport (2005-2022).

Source: Gdańsk in numbers, https://www.Gdańsk.pl/Gdańskwliczbach/mieszkancy,a,108046, 2023.09.08.

The leading areas in terms of population growth in 2005-2022 are Banino (363%), Czaple (245%) and Jasień (232%). The only population decrease was noted in Brętowo (-1%). In Krakow, the phenomenon of population growth in the analyzed area is not observed (Figure 7).

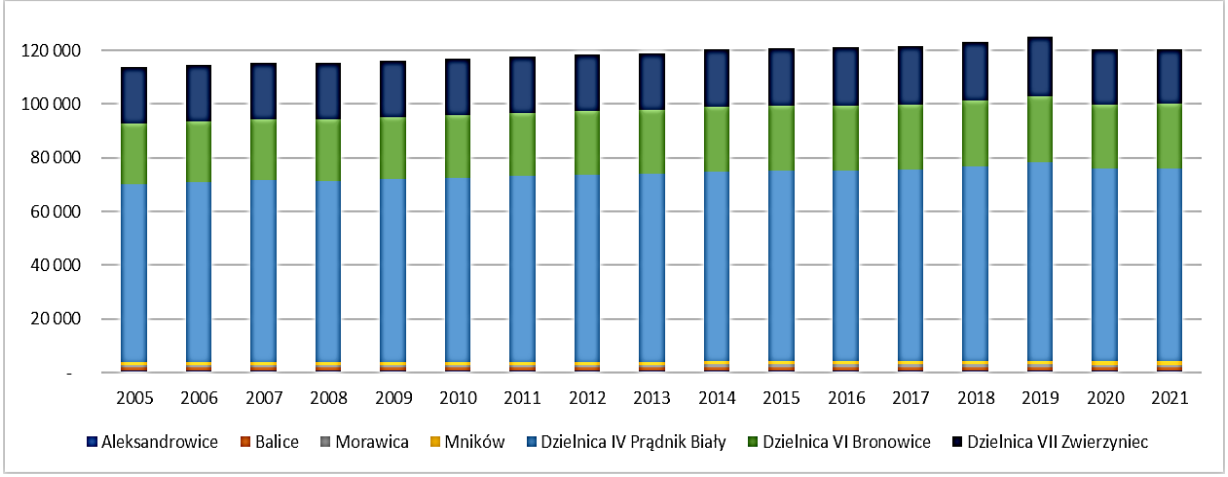


Figure 7. Number of inhabitants in selected airport-proximate areas in Krakow (2005–2021)

Source: own study based on information from municipalities, Hybrid demographic forecast for Krakow and 18 auxiliary districts for 2020-2050 https://www.arcgis.com/apps/dashboards/06f7496273614c588f97560cdcef0010, 2023.09.07.

6. Summary

The specific development of airport-proximate areas, which should be a tool or, in a sense, an indirect goal of development (while the primary goal is to improve the quality of life), appears in this context as a result of the actions taken. Airport-proximate areas should be planned and designed at the initial investment stage to fit into the framework of an appropriate model in the future. However, in practice, airports are built as independent investments without considering the neighborhood as their functional part, which constitutes a gap in local planning. The development of airports attracts investors. As a result, commercial and residential buildings are developing; emerging investments change the space around airports, and the airport itself becomes, at the same time, the cause and effect of development. In the context of the local development of the airport and its neighborhood in Gdańsk, the Airport City model has been only recently identified as the target development model in the airport development investment plans. This indicates acceptance of the status quo or the trend of functionally diversified development, where residential functions are also performed in addition to industrial and commercial functions (with certain restrictions set by the RUA). A similar situation can be described at the Kraków-Balice airport. Its development is claimed to refer to the Airport City model, implemented by global hubs, central and regional ports worldwide (Wróbel, 2020). However, it is not certain whether the model will achieve spatial order (Bajwoluk, 2022).

As mentioned above, one of the effects of the gaps in the form of a lack of integrated and long-term planning might be spatial conflicts, especially between aviation-related functions and residential functions and/or industrial functions, naturally located in airport-proximate areas and residential functions. Thus, it can be concluded that the intervention of public authorities using the LDP in Gdańsk is not effective since the purpose of local planning is to counteract the problem of uneven local development of the city, promote rational planning of public services and infrastructure, prevent conflicts related to the implementation of investments, sustainable development, and the maintenance of spatial order. In the case of Gdańsk, this cannot be confirmed. However, it can be claimed that local planning, which is supposed to be a tool for resolving spatial conflicts, is their source. This is the second gap in local planning. Although in both analyzed cases, the city's activity in the planning process is greater than that of neighboring municipalities, it seems that in Kraków, local planning that invalidates plans from the 1990s and which covers larger areas and includes green and agricultural areas, indicates a more thought-out development vision, which does not mean that local planning, in this case, is effective.

Thus, the identified gaps in local planning based on the conducted research include a lack of a defined development vision and acceptance of the status quo; lack of planning activity; lack of updating local plans; planning for single plots and small areas; a small number of plans

allocating areas to industrial and industrial-services functions; excessive assignment of residential functions to areas; and a shortage of green and agricultural areas.

Possible actions improving the effectiveness of interventions in the form of LDPs are widely described in the literature, but, as it turns out, they exist in theory only. In particular, proper local planning, preventing spatial chaos, consistent with sustainable development and preventing conflicts, consists in formulating and implementing a development vision through the adoption of local plans and their updates, resisting the pressure of property owners to transform agricultural land into residential land, especially in the vicinity of burdensome investments, with the active participation and cooperation in the local planning process of interested parties.

The limitation of the conducted research is that the analysis is based on the number of LDPs and the frequency of given land functions, without detailed consideration of the size of the areas covered by the plans. However, the analysis allows to conclude that local plans for the airport-proximate areas in Gdańsk are characterized by significant fragmentation compared to those for the airport-proximate areas in Kraków. The heterogeneous area identification in documents and on websites (provinces, districts, and units) posed a technical limitation in the research and made it difficult to assign LDPs to the studied areas, particularly in the case of Gdańsk.

Finally, it is necessary to indicate, that on July 7, 2023, the Sejm passed the Act amending the Act on local planning and development and certain other acts, which will enter into force on September 24, 2023. The amendment introduces several changes, including the introduction of a new planning tool – the general plan of the municipality, which will be adopted obligatorily for the entire municipality (excluding closed areas), as an act of local law. All municipalities in Poland must establish such a plan by 2026. A new form of local plan has also been introduced – the integrated investment plan, as a tool that gives municipalities greater opportunities in locating investments, taking into account social participation and the principles of local order (Ministry of Development and Technology, 2023).

The further direction of airport-proximate areas management research relates to addressing the area of LDPs and comparative studies of other civil airports in Poland and selected foreign airports to verify the experience of foreign airports in this area, taking into account legal orders and local planning systems that differ from the Polish one. In the future, the analysis will also focus on the new general plans of airport-proximate municipalities in the field of planning further development of the studied areas.

References

1. Bajwoluk, T. (2021). The functio-spatial structure of airport surroundings: the case of Kraków Airport. *Budownictwo i Architektura, 20(4),* pp. 47-62.
2. Brueckner, J.K. (2003). Airline traffic and urban economic development. *Urban Studies, 40(8),* pp. 1455-1469.
3. Bukłaha, E. (2012). Sukces, skuteczność i efektywność w zarządzaniu projektami. *Studia i prace Kolegium Zarządzania i Finansów, vol. 113,* pp. 24-35.
4. Chi, G. (2012). The impacts of transport accessibility on population change across rural, suburban and urban areas: a case study of Wisconsin at sub-county levels. *Urban studies, 49(12),* pp. 2711-2731.
5. Cidell, J. (2004). *Scales of Airport Expansion: Globalization, Regionalization, and Local Land Use. Report No. CTS 04-01*. Center for Transportation Studies: University of Minnesota.
6. Conway, M. (1980). *The Airport City: Development Concepts*. Atlanta: Conway Publications.
7. Correia, M., de Abreu e Silva, J. (2015). *Review of Airport Concepts and Their Applicability to the New Lisbon Airport Process.* Revista Portuguesa de Estudos Regionais, pp. 47-58.
8. Dmochowska-Dudek, K. (2011). Obiekty NIMBY jako przykład konfliktowych inwestycji na terenach mieszkaniowych – teoretyczny zarys problemu. *Space – Society –Economy, 10,* pp. 29-56.
9. Drzazga, D. (2015). Współczesne wyzwania stojące przed planowaniem przestrzennym w świetle paradygmatu zrównoważonego rozwoju. *Acta Universitatis Lodziensis. Folia Oeconomica, 2,* pp. 177-193.
10. Frączkiewicz-Wronka, A. (2023). Zarządzanie publiczne: istota, definicje, rozwój modeli i uwarunkowania podejmowania decyzji. In: A. Frączkiewicz-Wronka, M. Ćwiklicki (ed.), Zarządzanie publiczne. *Perspektywa teorii i praktyki*. Wydawnictwo Uniwersytetu Ekonomicznego w Katowicach, pp. 9-37.
11. Freestone, R., Baker, D. (2011). Spatial Planning Models of Airport-Driven Urban Development. *Journal of Planning Literature, 26(3),* pp. 263-279.
12. Freestone, R. (2009). Planning, Sustainability and Airport-Led Urban Development. *International Planning*, pp. 161-176.
13. Galvin, V. (2010). Coordinating Spatial Development in Airport Regions: Embeddedness and Experimentation at Paris Orlyand Amsterdam Schiphol. *Aerlines, 48,* pp. 1-5.
14. Gdansk Lech Walesa Airport, https://www.airport.gdansk.pl/, 2023.09.06.
15. Gierczak-Korzeniowska, B. (2016). Airport City Rzeszów-Jasionka – nowa przestrzeń miejska o globalnym charakterze. In: *Problemy logistyki i zrównoważonego rozwoju*. Bydgoszcz: Wydawnictwo Uczelniane Wyższej Szkoły Gospodarki, pp. 196-206.

16. Grochowska, A. (2017). Niezgodność form przeznaczenia terenów w planowaniu przestrzennym – metoda identyfikacji potencjalnych konfliktów przestrzenno-funkcjonalnych. *Acta Universitatis Lodziensis. Folia Geographica Socio-Oeconomica, 28,* pp. 131-149.
17. Habdas, M., Konowalczuk, J. (2018). Cele i warunki skutecznej interwencji państwa w obszarach ograniczonego użytkowania portów lotniczych. *World of Real Estate Journal/Świat Nieruchomości, 105(3),* pp. 5-16.
18. Hołuj, A. (2018). Ekonomiczne i ekologiczne efekty zewnętrzne w planowaniu przestrzennym. *Acta Universitatis Lodziensis. Folia Oeconomica, 4(336),* pp. 137-155.
19. Hybrydowa prognoza demograficzna dla Krakowa i 18 pomocniczych dzielnic na lata 2020-2050, https://www.arcgis.com/apps/dashboards/06f7496273614c588f97560cdcef0010, 2023.09.07.
20. ICA (2008). *Guidance on the Balanced Approach to Aircraft*. International Civil Aviation Organisation. Doc 9829 AN/451.
21. Kasarda, J. (2001). From Airport City to Aerotropolis. *Airport World*, pp. 42-45.
22. Kowalewski, A., Markowski, T., Śleszyński, P. (2020). *Kryzys polskiej przestrzeni. Źródła, skutki i kierunki działań naprawczych.* Warszawa: Polska Akademia Nauk, Komitet Przestrzennego Zagospodarowania Kraju.
23. Kraków Airport im. Jana Pawła II, https://www.krakowairport.pl/, 2023.09.06.
24. Kunicka-Kowalska, Z., Kowalski, P. (2014). Analiza konfliktu przestrzeni powietrznej lotnisk i procesu urbanizacji. *Przegląd Komunikacyjny, 11,* pp. 26-29.
25. Ministerstwo Rozwoju i Technologii, https://www.gov.pl/web/rozwoj-technologia/planowanie-przestrzenne, 2023.09.07.
26. Puk, M. (2011). Kolizje przestrzenne i konflikty społeczne - gra o przestrzeń - rozwój zrównoważony a równoważenie rozwoju. *Studia Komitetu Przestrzennego Zagospodarowania Kraju PAN, 142,* pp. 188-195.
27. Puzdrakiewicz, K., Pokora, K.A. (2019). Przekształcenia zagospodarowania przestrzennego strefy okołolotniskowej portu lotniczego w Gdańsku. In: Gdańsk jako przedmiot badań geografii społeczno-ekonomicznej i gospodarki przestrzennej. *Regiony Nadmorskie, nr 28.* Pelplin: Wydawnictwo Bernardinum, pp. 107-128.
28. Roeseler, W.G. (1971). Airport Development Districts: The Kansas City Experience. *Urban Lawyer*, p. 254.
29. Schaafsma, M. (2010). From Airport City to Airport Corridor: Airport and City, Sustainability and Economy. In: *Airports in Cities and Regions: Research and Practise*. Karlsruhe: KIT Scientific Publishing, pp. 173-180.
30. Schlaack, J. (2010). Defining the Airea: Evaluating Urban Output and Forms of Interaction Between Airport and Region. In: *Airports in Cities and Regions: Research and Practise*. Karlsruhe: KIT Scientific Publishing, pp. 113-122.

31. Stangel, M. (2013). Rozwój strefy okołolotniskowej a port lotniczy. Efekt synergii. *Przegląd Komunikacyjny*, pp. 8-15.
32. Uchwała Nr 203/XVIII/16 Sejmiku Województwa Pomorskiego z dnia 29 lutego 2016 r. w sprawie utworzenia obszaru ograniczonego użytkowania wokół Portu Lotniczego im. Lecha Wałęsy w Gdańsku.
33. Uchwała NR XVIII/247/20 Sejmiku Województwa Małopolskiego z dnia 24 lutego 2020 roku w sprawie zmiany Uchwały Nr XXXIV/494/09 Sejmiku Województwa Małopolskiego z dnia 3 lipca 2009 r. w sprawie Programu ochrony środowiska przed hałasem dla województwa małopolskiego, Dz.U. Województwa Małopolskiego. Kraków: 10 marca 2020, Poz. 2018.
34. Uchwała Nr XXXII/470/09 Sejmiku Województwa Małopolskiego z dnia 25 maja 2009 r. w sprawie utworzenia obszaru ograniczonego użytkowania dla lotniska Kraków – Balice, zarządzanego przez Międzynarodowy Port Lotniczy im. Jana Pawła II Kraków – Balice Sp. z o.o.
35. Ułańska, J., Borowska-Stefańska, M. (2012). Użytkowanie ziemi i polityka przestrzenna w Łódzkim Obszarze. *Studia Komitetu Przestrzennego Zagospodarowania Kraju PAN, 147,* pp. 13-43.
36. Urząd Lotnictwa Cywilnego, https://www.ulc.gov.pl/pl/statystyki-analizy/statystyki-i-analizy-rynku-transportu-lotniczego/3724-statystyki-wg-portow-lotniczych, 2023.09.06.
37. Wojewnik-Filipkowska, A., Koszarek-Cyra, A. (2022). Planowanie przestrzenne jako czynnik rozwoju lotniska oraz sąsiedztwa. In: B. Marona, M. Głuszak (ed.), *Współczesne wyzwania gospodarowania nieruchomościami* (pp. 95-129). Difin.
38. Wróbel, P. (2019). Kraków Airport – studium przypadku. Przekształcenia architektoniczno-urbanistyczne. *Builder, 270(1),* pp. 36-39.
39. Zieleniewski, J. (1969). *Organizacja i zarzadzanie.* PWN.