



Feasibility Analysis Regarding the Manner of Development of the Former Edmund Szyk Stadium Area in Poznań

Zbigniew Walczak

*Institute of Construction and Geoengineering,
Poznan University of Life Sciences, Poland
<https://orcid.org/0000-0003-3999-7250>*

Magdalena Topolińska

*Institute of Construction and Geoengineering,
Poznan University of Life Sciences, Poland*

*Natalia Walczak**

*Department of Hydraulic and Sanitary Engineering,
Poznan University of Life Sciences, Poland
<https://orcid.org/0000-0003-0344-585X>*

Ireneusz Laks

*Institute of Construction and Geoengineering,
Poznan University of Life Sciences, Poland
<https://orcid.org/0000-0003-4078-9600>*

Anna Szymczak-Graczyk

*Institute of Construction and Geoengineering,
Poznan University of Life Sciences, Poland
<https://orcid.org/0000-0002-1187-9087>*

*corresponding author's e-mail: natalia.walczak@up.poznan.pl

Abstract: The paper presents a feasibility analysis of changes in the manner of development a former sports facility, Edmund Szyk Stadium in Poznań. The terrain and adjacent areas were inventoried, including the assessment of inter-area relationships. Based on the inventory and authors' surveys, three developmental variants were selected for further analysis. Particular attention was paid to the purpose of the area in the local zoning plan (local spatial development plan) and the preferences of its local community. A multi-criteria analysis carried out with three different methods – AHP, MAUT and PROMETHEE II indicated the second variant as optimal. Additionally, the authors performed a sensitivity analysis of the AHP method to determine the weight of adopted criteria. This allowed for observing what impact these changes had on the final result. The sensitivity analysis was performed only for 3 main groups of criteria. The implementation of activities planned in the concept will allow for optimal land development, improvement in functionality as well as improvement in visual and landscape characteristics of the city.

Keywords: multi-criteria analysis, AHP, MAUT, PROMETHEE II, sports facility, spatial development, sensitivity analysis, revitalization



1. Introduction

Revitalization of Polish cities is currently one of the most urgent issues related to the continuous degradation of urban substance (Parysek 2015, 2017, Tofiluk et al. 2019). The matter was pointed out by legislators when they introduced the Act on Revitalization of October 9, 2015 (Journal of Laws of 2015, item 1777). Revitalization is a process that aims to stop the degradation of urban areas, counteract violent crisis incidents by making local residents involved in, strengthen pro-environmental activities, and protect the current national heritage by taking into account all principles of sustainable development (Boryczka 2016). Therefore, it is a direct response to the progressive social, spatial and economic degradation of urban space (Domański & Gwosdz 2010). A properly carried out revitalization process should take into account not only social, economic and technical aspects (Urbańska-Galewska et al. 2013) but also formal and legal (Ostręga & Uberman 2005) as well as environmental perspectives (Przewoźniak 2005). Sometimes, it is quite problematic, particularly in the context of reconciling conflicting requirements or expectations regarding revitalization. In such a situation, a decision problem may arise, which can be tried to be solved by using one of numerous methods of multi-criteria decision support.

Post-industrial facilities are often revitalized, and with great success. The following implementations can serve as an example here: Manufaktura in Łódź, Stary Browar in Poznań, Graffica in Rzeszów – all have been recently revitalized and serve as shopping centres (Budner & Pawlicka 2013, Dąbrowski 2012, Frey & Kozicki 2009, Świerczewska-Pietras 2009, Tölle 2007, Twardzik 2015). Revitalization of post-industrial facilities may be intended for use as modern apartments i.e. "Tkalnia 14" in Zielona Góra – the object built in 1864 and originally used as a weaving mill (Turek 2013) or as cultural/ touristic facilities (museums), i.e. the Museum of Artistic Foundry (Muzeum Odlewnictwa Artystycznego) on the premises of Steelworks and Foundry in Gliwice (Nitkiewicz-Jankowska 2006).

Sports facilities are built or revitalized often when major sporting events are to be organised in a not so distant future e.g. National Stadium in Warsaw or the Stadion Energa Gdańsk (Kamrowska-Załużska & Kostrzewska 2014, Sobiera 2012). New facilities are often located in former brownfields or heavily degraded urban areas. Such investments are undoubtedly a major stimulus towards a socio-economic recovery, an improvement in spatial order, and also have a positive impact on improving the image of a given city and the local identity of its residents (Taraszkiwicz 2018, Taraszkiwicz & Nyka 2017, Tomanek 2015, Wojtowicz-Jankowska 2010). The higher rank of an organised event, the more the revitalization activities contribute to better spatial order (Kostrzewska 2016). Undoubtedly, it is problematic how to use these facilities after the event itself (Berbeka 2013, Kamrowska-Załużska & Kostrzewska 2014). Large sports facilities, constructed or modernised on the occasion of major sporting events,

do not play a leading role when the events end. Indeed, an isolated facility will not be an attraction in itself. It must have an appropriate subsidiary premises thanks to which it could be recognized, in addition to its original purpose, as a tourist attraction. However, it requires additional investments, e.g. construction of a sports museum, etc. Therefore, such decisions should be preceded by a comprehensive analysis.

A separate issue is the modernisation and revitalisation of sports facilities that have ceased to perform their original functions, with insufficient functionalities, when there is a lack of adequate complementary infrastructure or they have simply fallen into ruin. Former sports facilities, erected during the communist era and enjoying great interest at that time, often require or have required major modernisation and revitalisation. If it has been carried out, sports facilities can be further used successfully (Masierak & Torzewski 2018, Pędraszewska-Sołtys & Dzioban 2018). Sometimes, however, they are abandoned, forgotten, neglected and fall into ruin. An example here would be Edmund Szyk Stadium (Polish: Stadion im. Edmunda Szyca) in Poznań, a multi-purpose stadium opened in 1929, which until 1995 served as the stadium of Warta Poznań Sports Club. The article is an attempt to assess the revitalisation potential of the former sports complex and possible indication of directions of changes in the development of the facility and its adjacent areas.

2. Facility

The history of former Lech stadium's grounds named after Edmund Szyk dates back to as early as the first half of the 20th century and is associated with the "Comprehensive National Exhibition" (Powszechna Wystawa Krajowa) in Poznań in 1929. The facility found its location in the close proximity to the city centre, unfortunately in wetlands, where the Warta riverbed once existed, and then there was a backwater area (Fig. 1).

During World War II, the premises of the stadium became a Jewish labour camp and a place of execution. Considering this tragedy, near the stadium there was erected a monument dedicated to the memory of the victims of this crime.

The stadium was successfully rebuilt after 10 years of functioning in the urban space, in 1957. It brought the times of prosperity for the facility and turned it into one of the most important sports centres in Poland. The stadium's first degrading factor was the change of Lech's club location to the facility at Bułgarska Street in 1980. However, the main factor that led to the stadium's total collapse was the withdrawal of the main sponsor in 1989. The difficult financial situation forced the management to sell the plot, and the terrain of the stadium was intended for housing development.

The city authorities, after many years of discussions and efforts, managed to achieve success in this matter. They bought the facility with adjacent

areas of approx. 6,5 ha. Ipso facto, the area was given a chance to renew its character and commence works related to its revitalisation.

Currently, the stadium is devastated. A detailed inventory showed large amount of glass and litter on its premises (Fig. 2).

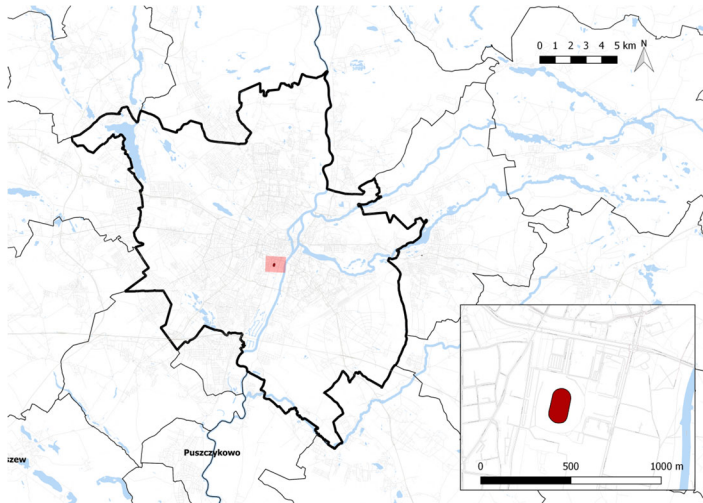


Fig. 1. Location of the stadium Edmund Szyca against the background of the city of Poznań



Fig. 2. Current stadium status

3. Analysis

The authors made a feasibility analysis of the manner the object could be developed using multi-criteria analysis tools (MCDM) i.e. Analytic Hierarchy Process – AHP (Saaty 2008), Multi-Attribute Utility Theory – MAUT (Wallenius et al. 2008) and Preference Ranking Organization METHOD for Enrichment of Evaluations – PROMETHEE II (Vincke & Brans 1985).

Five main criteria were identified: social – G1, environmental – G2, functional – G3, spatial – G4 and economic – G5. Sub-criteria were assigned to each of the designated groups, which allowed for a more detailed analysis of the significance of individual criteria with reference to selected variants. In total, 19 sub-criteria were defined (Table 1). In order to additionally verify the created ranking of variants, the results obtained with the AHP method were compared with the results from the MAUT and PROMETHEE II methods. Table 1 also compares the adopted values of individual expert assessments based on own experience, the area inventory, the analyses of MPZP and SUiKZP and the expectations of the local community (surveys). The weights of individual criteria (Table 1) were determined by the AHP method using a pair-wise comparison matrix.

The decision problem can be illustrated with a simple graph showing the adopted hierarchical structure (Fig. 3).

Three land development variants were proposed for consideration:

V1 – sports, cultural and artistic facility / sports and entertainment hall,

V2 – recreation area / park with small architecture elements,

V3 – recreation and service facility / restaurants.

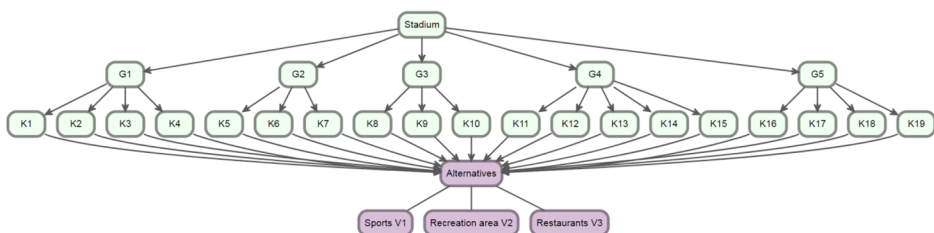


Fig. 3. Hierarchical structure of the problem of optimising development concerning Edmund Szycc stadium

Table 1. Assessments of analysed variants for changes in the manner of area development developed

Criterium		Scale of assessment	Weight	Variant		
				V1	V2	V3
Social G1						
K1	Target reach	1-3	0.079	3	2	2
K2	Local community preferences	%	0.152	33.3	58.8	7.8
K3	Number of job openings	1-3	0.04	3	1	2
K4	Aesthetics and spatial order	1-3	0.023	2	3	2
Environmental G2						
K5	Improvement in urban greenery	0-2	0.068	0	2	1
K6	Improvement in biodiversity	0-2	0.061	0	2	1
K7	Environmental nuisance (noise, heavy traffic)	1-3	0.011	3	1	2
Functional G3						
K8	Increased attractiveness with regard to tourists and new investors	0-2	0.083	2	2	1
K9	Transport accessibility	0-2	0.011	2	1	1
K10	Number of social or media events organised annually	0-2	0.047	2	1	0
Spatial G4						
K11	Development with regard to specific functions – paved areas [ha]	ha	0.034	4	0.8	3
K12	Distance from the nearest facility with similar functionality	km	0.03	3.2	0.65	1.5
K13	Integration with existing infrastructure	1-3	0.068	3	3	1
K14	Fitting in existing landform	1-3	0.072	3	1	0.5
K15	Adaptation of land development to applicable spatial development documentation	0-3	0.145	3	3	1
Economic G5						
K16	Estimated investment cost	1-3	0.013	3	2	1
K17	Estimated investment gains	0-2	0.032	1	0	2
K18	Securing of financing sources	1-3	0.009	2	2	1
K19	Operating costs	1-3	0.017	3	2	1

Variant 1 (V1 – Hall) is based on the existing land use with current landform. The key assumption is the introduction of current land development plans in the concept of constructing a sports and entertainment hall. The variant assumes that building development will constitute 26% of the area, 57% of the area will be left biologically active, whereas 17% of the area will be designated for pedestrian access/ entry, internal roads and access roads.

Variant 2 (V2 – Park) is based on the existing land use with necessary surface levelling and demolition of stadium remains. Part of the high and low vegetation found in the area will be used to develop green space in the park. The variant assumes no building development, 90% of the area will be left biologically active, whereas pedestrian access/ entry, internal roads and access roads will constitute 10% of the area.

Variant 3 (V3 – Service) is based on the assumption that the former stadium premises will feature a recreation and service facility, including restaurants and residential buildings with service outlets. The variant assumes that building development will constitute 26% of the area, 54% of the area will be left biologically active, while pedestrian access/ entry, internal roads and access roads will constitute 20% of the area.

The results of analyses obtained with AHP, MAUT and PROMETHEE II are summarised in Table 2.

Table 2. Summary of results obtained with 3 considered methods

Variant	AHP		MAUT		Promethee II	
	index	rank	index	rank	index	rank
W1	0.347	II	0.665	II	0.148	II
W2	0.419	I	0.713	I	0.278	I
W3	0.233	III	0.180	III	-0.427	III

Additionally, the authors carried out a basic analysis of model sensitivity to parameter changes. The sensitivity analysis consisted in changing the weights of selected main criteria. There were chosen the following options:

- the first analysis for the economic criterion G5 – 44% (7,1%),
- the second analysis for the environmental criterion G2 – 50%, (14%),
- the third analysis for the functional criterion G3 – 49%, (14,1%).

The weights of individual criteria before modification are shown in parentheses. The analysis consisted in appropriate modification of a pair-wise comparison matrix of main criteria, as a result of which the weight values are not in full tens. The sensitivity analysis was performed only for the AHP method. Changes in the weights of criteria resulted in a change in the ranking obtained. Emphasis on economic issues (G5) provided a new solution with Variant

3 (V3 – residential/ service) indicated as optimal. Respectively, due to increase in the weight of G2 (environmental criterion), Variant 2 (V2, Fig. 4) took first place in the ranking, similarly to the baseline study. In the case of emphasis on functional solutions (G3), Variant 1 (V1) proved to be the most advantageous.

The sensitivity analysis indicated that the final ranking depends on stakeholder's preferences and the appropriate objective development of a pairwise comparison matrix implemented by experts. A sensitivity analysis should be carried out for each multi-criteria simulation/ analysis. It enables, among others, a more complete understanding of a given problem, and thus reduce the risk of ill-chosen subjective preferences.

4. Summary

The presented analyses indicated the second variant (Park) as an optimal solution. The project particularly responds to the needs and expectations of residents, supported by authors' surveys and other inquiries (already in 2012 in a deliberative survey, residents postulated to create a park in this area). 76% of participants in public consultations also opted for this solution)¹. The project includes bicycle routes (existing and planned in the vicinity) and suggests new ones. Another important aspect included in the project is the idea of the "Southern Green Wedge in Poznań" (Południowy klin zieleni) located in the designed area. The city park in place of the former stadium will ensure a continuation of urban green zones and will be a link between Izabela and Jarogniew Drwęski Park and John Paul II park.

The concept will open prospects for recreation in this area, improve urban aesthetics, affect residents' well-being and the overall microclimate of the city. It will have a positive impact on biodiversity and provide a continuity in two important respects: recreation and ecology.

On the site of the former stadium, the city authorities alternatively have proposed to build a Music Centre, which will include the new headquarters of the Poznań Philharmonic. However, this concept has been objected to by local socially engaged activists. The Committee of Civic Dialogue at the Faculty of Environmental Development and Protection presented its stand on the matter. "Referring to the statements of local politicians, the president of Poznań and the marshal of the voivodship regarding the plans for cubature development of Edmund Szyca stadium with philharmonic facilities that completely ignore the will of residents, NGOs of naturalists and social activists [...] stand that if the philharmonic building is recognized as necessary, its construction should not take place at the expense of an extraordinary enclave of greenery in the very centre of the city."

¹ <https://tenpoznan.pl/poznan-filharmonia-zamiast-stadionu-szyca-co-z-parkiem/>
(date of access 11.03.2021)

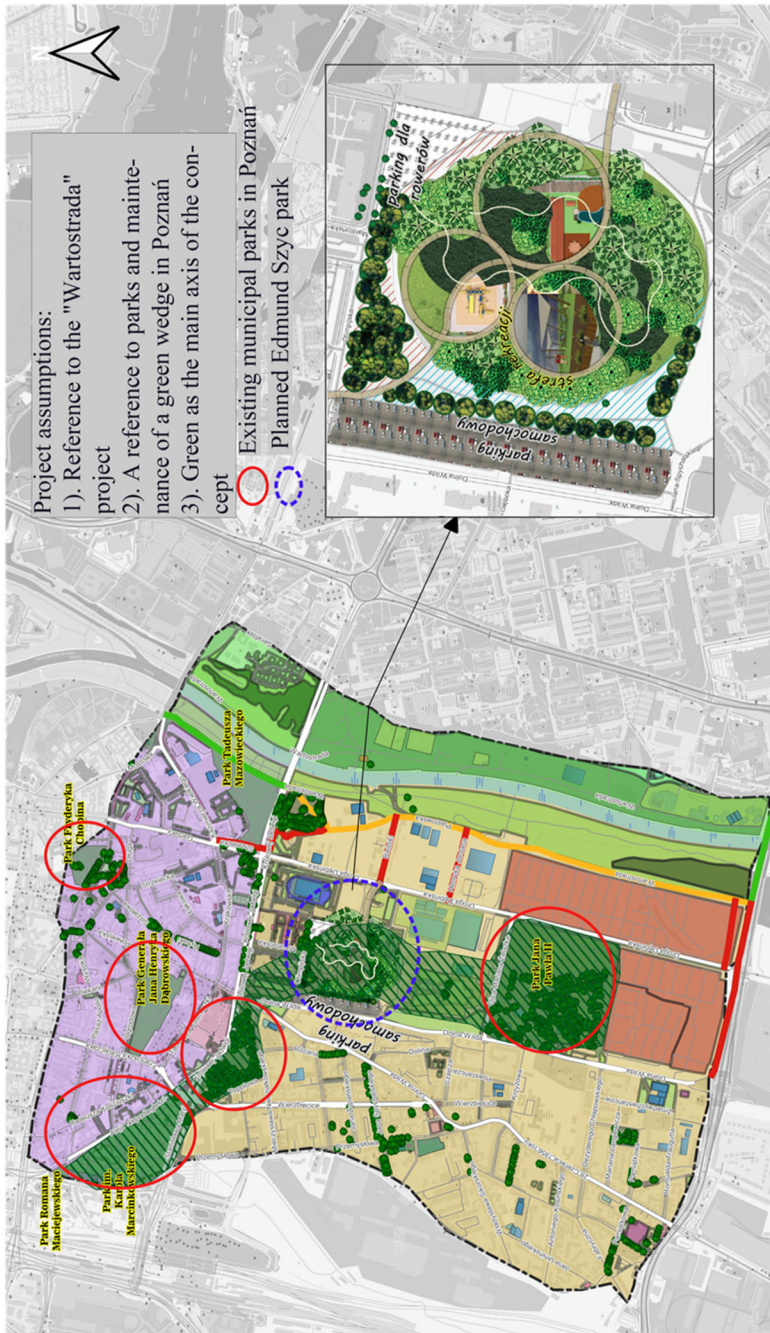


Fig. 4. Visualization of the concept

The initiative to create an enclave of greenery in this area has been also supported, among others, by the Association of "Prawo do Miasta", the Coalition of "Za Zielęń Poznań", the Club of Naturalists.

It has not been decided whether the Poznań Philharmonic will be erected on the grounds of the former stadium. The city authorities carried out preliminary analyses, which showed that the area of today's marketplace in the district of Dolna Wilda could be a better location for this purpose².

Therefore, there is still a chance to use the stadium's greenery to create a park expected by residents.

References

- Berbeka, J. (2013). The Evolution of Forms and the Role of Sports City Tourism. *Studia Ekonomiczne*, 147, 9-20 (in Polish).
- Boryczka, E. (2016). Revitalization of cities, W; Z. Przygodzki (red.), *ECOMIASTO # MANAGEMENT Sustainable, intelligent and participatory development of the city*, Łódź: Wydawnictwo Uniwersytetu Łódzkiego. DOI: 10.18778/7969-721-2.08 (in Polish).
- Budner, W., Pawlicka, K. (2013). The assessment of the innovative architecture of Poznań and the growth of attractiveness of the city. *Acta Scientiarum Polonorum, Administrati Locorum* (12)2, 5-20 (in Polish).
- Dąbrowski, A. (2012). Revitalization of post-industrial facilities on the example of "Manufaktura" – former Izrael Poznański's Works in Łódź, W: B. Filipiak, (red.) *Space in new economic reality*, WSB Poznań, 25-35 (in Polish).
- Domański, B., Gwosdz, K. (2010). A look at the problems of urban regeneration in Poland, W: Z. Ziobrowski, W. Jarczewski (red.), *Revitalization of Polish cities – diagnosis*, Kraków: Instytut Rozwoju Miast (in Polish).
- Frey, J., Kozicki, J. (2009). Manufaktura in Łódź, factory that has been given a second chance. *Zeszyty Naukowe. Budownictwo / Politechnika Łódzka* (59), 73-85 (in Polish).
- Kamrowska-Zaluska, D., Kostrzewska, M. (2014). Mega-events as catalysts for urban regeneration. *Problemy Rozwoju Miast*, 2, 57-70 (in Polish).
- Kostrzewska, M. (2016). Urban regeneration through the sporting events and initiatives. *Przestrzeń Ekonomia Społeczeństwo*, 9, 51-65 (in Polish).
- Masierek, E., Torzewski, R. (2018). Development of the sport and recreation complex in Poddebice – customers perspective. *Space-Society-Economy*, 25, 37-59. DOI: 10.18778/1733-3180.25.03 (in Polish).
- Nitkiewicz-Jankowska, A. (2006). Industrial tourism as a visiting-card of Uppersilesian Industry District (Górnoslaski Okręg Przemysłowy). *Prace Naukowe Instytutu Górnictwa Politechniki Wrocławskiej* (117), 251-256 (in Polish).

² Source: UMP Poznań:

https://www.propertydesign.pl/architektura/104/gdzie_powstanie_poznanska_filharmonia_na_terenie_bylego_stadionu_czy_targowiska,28518.html
(date of access 11.03.2021)

- Ostreġa, A., Uberman, R. (2005). Legal aspects of post-mining sites revitalisation. *Górnictwo i geoinżynieria*, 29, 115-127 (in Polish).
- Parysek, J. J. (2015). Urban renewal in Poland: yesterday, today, and perhaps tomorrow. *Studia Miejskie*, 17, 9-25 (in Polish).
- Parysek, Jerzy J. (2017). Urban revitalization in Poland: problems, dilemmas, challenges and hopes. *Studia Regionalia*, 50, 103-121. DOI: 10.12657/studreg-50-0
- Pędraszewska-Sołtys, B., Dzioban, K. (2018). Sports facilities in Warsaw in the 1950s and today. *Rozprawy Naukowe Akademii Wychowania Fizycznego we Wrocławiu*, 60, 90-102 (in Polish).
- Przewoźniak, M. (2005). Theoretical aspects of ecological revitalization of cities: towards the methodology of integrated urban-ecological revitalization. *Urbanistyki i Studiów Krajobrazowych*, 1, 25-34 (in Polish).
- Saaty, T. L. (2008). Decision making with the analytic hierarchy process. *International journal of services sciences*, 1(1), 83-98. DOI: 10.1504/IJSSci.2008.01759
- Sobiera, A. (2012). Sports and communication infrastructure for Euro 2012. *Nowoczesne Budownictwo Inżynieryjne*, 3, 82-89 (in Polish).
- Świerczewska-Pietras, K. (2009). Closed revitalization as an example of post-industrial area management in Łódź. *Studies of the Industrial Geography Commission of the Polish Geographical Society*, 12, 173-182.
- Taraszkiewicz, K. (2018). The Impact of Large Sport Facilities on Revitalization of Urban Space on the Example of Energa Arena Stadium in Gdańsk. *Studia Komitetu Przestrzennego Zagospodarowania Kraju PAN*, 192, 339-349 (in Polish).
- Taraszkiewicz, K., Nyka, L. (2017). Role of Sports Facilities in the Process of Revitalization of Brownfields. *IOP Conference Series: Materials Science and Engineering*, 245, DOI: 10.1088/1757-899X/245/4/042063.
- Tofiluk, A. M., Knyziak, P., Krentowski J. (2019). Revitalization of twentieth-century prefabricated housing estates as interdisciplinary issue. *IOP Conf. Series: Materials Science and Engineering*, 471. DOI: 10.1088/1757-899X/471/11/112096
- Tölle, A. (2007). The revitalisation process of the city – by the example of Poznań. *Studia regionalne i lokalne*, 2(28), 46-58 (in Polish).
- Tomanek, M. (2015). Restoration of sports facilities and its influence on the regeneration of a city on the example of the National Stadium in Warsaw. *Zarządzanie Publiczne*, 29(1), 75-82. DOI: 10.4467/20843968ZP.15.007.3437 (in Polish).
- Turek, A. (2013). Revitalisation of postindustrial areas for residential purposes. *Problemy Rozwoju Miast*, 1, 71-86 (in Polish).
- Twardzik, M. (2015). *A shopping center as a local city revitalization project (on the example of Galeria Katowicka)*. Prace Naukowe/Uniwersytet Ekonomiczny w Katowicach, 87-101 (in Polish).
- Urbańska-Galewska, E., Wiśniewski, R., Apollo, M. (2013). Social, economic and technical aspects of revitalization, on the example of the Letnica borough of Gdansk. *Problemy Rozwoju Miast*, 2, 29-39 (in Polish).
- Vincke, J. P., Brans, Ph (1985). A preference ranking organization method. The PROMETHEE method for MCDM. *Management Science*, 31(6), 647-656. DOI: 10.1287/mnsc.31.6.647

- Wallenius, J., Dyer, J. S., Fishburn, P. C., Steuer, R. E., Zionts, S., Deb, K. (2008). Multiple criteria decision making, multiattribute utility theory. Recent accomplishments and what lies ahead. *Management Science*, 54(7), 1336-1349. DOI: 10.1287/mnsc.1070.0838
- Wojtowicz-Jankowska, D. (2010). *What can happen when a stadium opens in the city? – an example of changes in Gdańsk-Letnica*. Materiały Międzynarodowej Konferencji Naukowej Wydziału Architektury Politechniki Śląskiej: Między Miastem a Nie-Miastem, Odnowa Krajobrazu Miejskiego, Gliwice 09-10 Grudnia 2010, 461-470 (in Polish).