

FUNCTIONAL-ENVIRONMENTAL EVALUATION OF POCKET PARKS IN URBANIZED AREAS - THE CASE STUDY OF GLIWICE

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A b s t r a c t

The article presents the role and importance of creating new green areas in the areas of urban agglomerations. Particular attention was paid to the processes of creating new green areas in post-industrial areas and urban wastelands and their restoration for cities. The issue of the formation of pocket parks is raised and the results of the detailed research carried out by the authors in 2020 are briefly discussed. The article presents a comparative analysis of several selected examples of pocket parks, describes the role they play in cities. The purpose of the research was to determine what elements of pocket parks play an important role for the microclimate of cities and their communities. An example of the creation of a new pocket park in the city center of Gliwice, Poland is presented. The conclusions of the research and the evaluation of the experiment carried out by the authors can be useful for the creation of urban policies, planning of green areas in cities and the creation of utility-functional programs for new green areas.

Keywords: pocket park, landscape architecture, revitalization of urban spaces, green spaces in cities

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1. INRODUCTION

Greenery and its role in cities and brownfields have been assigned a significant role for years, and depending on the time and place, various complementary functions have been attributed to them. These most mentioned and described functions according to Zachariasz A. oscillate around the concepts of ecological and biological; com-positional, structural, and aesthetic; social, health, mental and educational; cultural; economic; fire prevention [29].

The evolution of changes in the approach to greenery can be traced in publications, among others: James Wines [27] Fabiano Lemes de Oliveira [17], and contemporary approaches, with emphasis on relevance to climate change and sustainable development in: Thomas Elmqvist [et al] [8], Elisabeth M. Hamin Infield, Yaser Abunnasr and Robert L. Ryan [11], Rocio Montaña Novoa [20], Marcus Zepf [30], *Greening Cities: Forms and Functions*, [24].

In view of the meanings and variability of approaches to the creation of green areas in urban areas, the authors, taking advantage of the opportunity to carry out an experiment in agreement with a municipal company, studied contemporary processes of creating pocket parks. The basis of the research was an agreement with PWIK Ltd., in whose ownership was a small green area, assuming that the area would be made available to the local community. The cooperation envisaged conducting research, defining the timetable for implementation and the scope of adaptation of urban wasteland for recreational purposes. The results were to guarantee the success of the implementation, and widely disseminated were to promote a model of cooperation between different communities dealing with green spaces.

The article includes the results of the research, which was realized and published earlier, as well as a description of the process of creating the pocket park, which took place after the analysis and design stage, and an evaluation of the realized park is also presented.

Research has shown that the idea and concept of pocket parks was born in the mid-20th century in North American cities. The idea was born out of the need to satisfy the residents of heavily urbanized cities' contact with green spaces and has been growing rapidly ever since, often taking the form of urban programs, as in London, Copenhagen, and Vienna. On the one hand, the limited access to such areas, and on the other hand, the lack of opportunities for larger greenery schemes has had a significant impact on their development. New York is a city full of pocket parks, with one of the oldest and most popular realizations being Paley Park, created in Manhattan in 1967 [3].

The importance of pocket parks for the local natural environment and local communities is confirmed by the multitude of similar developments that have been created recently. However, the already established American parks have been the subject of studies on their use for family recreation and the promotion of

moderate or vigorous physical activity [5]. In their conclusions, the study authors indicated that pocket parks are perceived as attractive and safe and can increase physical activity by encouraging families with children to walk. Importantly, they indicated that those using the park came to it from about 400 meters (0.25 miles). Despite the importance of distance to the concept itself, it was noted that their popularity in highly urbanized areas is due, among other things, to the fact that they provide a substitute for an escape from the hustle and bustle of the city [7]. Their declarative size in no way limits their importance. In fact, their size makes it easier to locate them near large numbers of residents. Examples of this include Copenhagen and Los Angeles, which prioritize the realization of small urban natural areas, thus creating opportunities for residents to interact with nature as part of their daily lives, which is a key element of their functioning [22]. The city of Gliwice aspires to join this group of cities that care about the urban environment. The article presents the process of creating a new pocket park, describes possible implementation options, and evaluates the park after its implementation. The conclusions of the study can be useful in shaping urban development strategies, implementation plans for other pocket parks, with a particular focus on high-intensity urban areas in post-industrial cities.

2. RESEARCH METHOD

The paper adopts the following methods of research: a literature review and including a case study with a search for research results from other researchers, an individual case study with a multi-variant concept for implementing changes in the park, and an implementation evaluation. In the introduction, reference is made to the theory and contemporary research on pocket parks, prevention of heat island formation, the role of urban parks and pocket parks in creating selected environmental aspects for the microclimate of cities.

The important part, from the point of view of the next stage, the urban-architectural competition, was the study of selected realizations of pocket parks. The author's qualitative evaluation of the selected realizations was abandoned, while the focus was on the compositional typology carried out in graphic form and synthetic description.

The characteristic programmatic and spatial elements of pocket parks were also selected and summarized quantitatively and qualitatively in the form of a table.

In addition, considering the ambiguity of the concept of "pocket park" and the need to define it precisely, as well as its functions, equipment and important components, the case study undertaken was treated as an empirical study, which with the assumptions [28]:

1. explores a contemporary phenomenon (so-called case) in the context of reality, especially when:
2. the boundaries between the phenomenon and the context are not completely obvious.

The diagram showing the research method has been presented below (Fig.1).

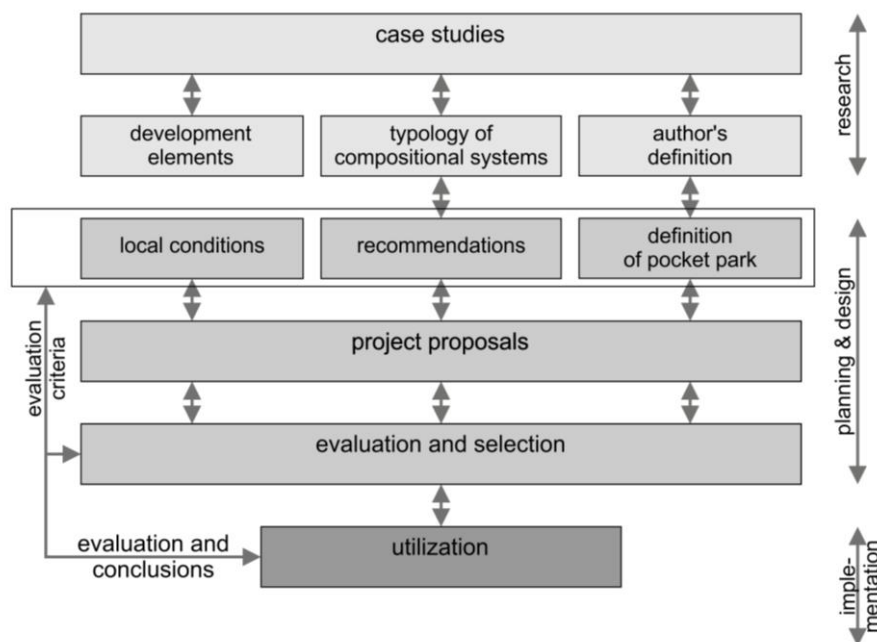


Fig.1. Diagram of the research method; graphic by authors

3. POCKET PARK DEFINITION, CASE STUDIES OVERVIEW

The importance of pocket parks for the local natural environment and local communities is confirmed by the multitude of recent similar developments. The study included cases previously considered representative of the assumed research, because they were described in important publications on landscape architecture, green space design and public spaces. The group also included two Polish examples. Due to the lack of a definition of the concept of a pocket park, it was taken as a criterion that the selected spaces must function in the literature and descriptions as pocket parks.

On this basis, the following were analyzed (Table 1, Table 2):



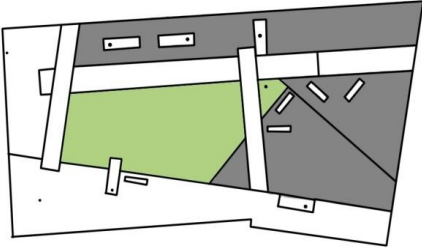
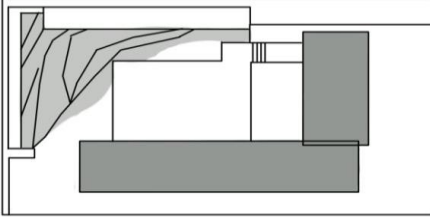
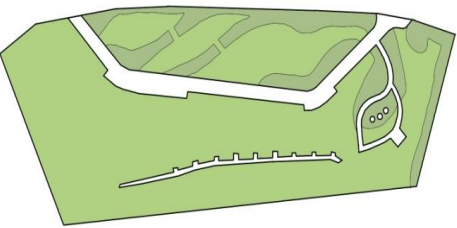
- P1: Jardin Public Edouard Glissant - Villeurbanne, France,
- P2: Meifeng Community Park - Shenzhen, China,
- P3: Balfour Street Park - Chippendale, Sydney, Australia,
- P4: Waterfall Garden Park - Seattle, USA,
- P5: Garden of Krakowians - Flower Garden - Krakow, Poland,
- P6: Paley Park - New York, USA,
- P7: Greenacre Park - New York, USA,
- P8: Floating Pocket Park - London, UK,
- P9: Water Playground - Jaworzno, Poland.

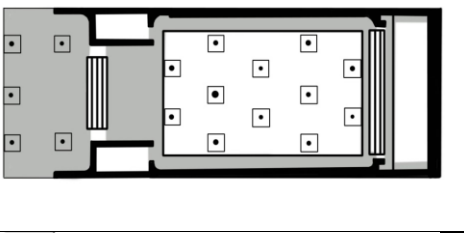
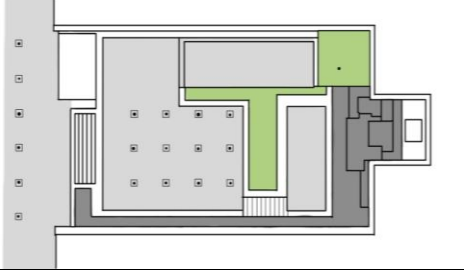
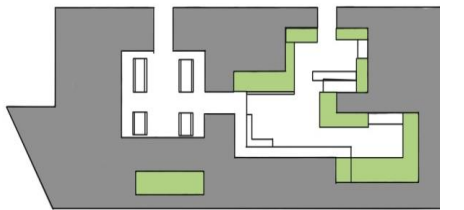
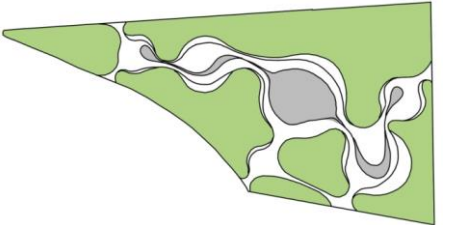
Table.1. Characteristics of the studied pocket parks. [4]

P1	Jardin Public Edouard Glissant location: Villeurbanne, France; proj.: Exit Paysagistes Associés; area: 3700m ² year: 2011; type: circle-shaped.	The park was created on a private plot of land with a residence surrounded by a wall. The goal of the project was to create an environmentally friendly place that could be used by residents, while maintaining its private character.
P2	Meifeng Community Park location: Shenzhen, China. proj.: ZIZU Studio area: 4974 m ² year: 2020; type: symmetric.	The park is an area of wide-ranging space revitalization, which has turned from a parking lot flooded with concrete into a place that integrates the local community, as well as introduces environmentally friendly solutions to a crowded city.
P3	Balfour Street Park location: Sydney, Australia; proj.: Jane Irwin Landscape Architecture (JILA); area: 640 m ² year: 2010; awards: Holbury Hunt Award 2010 – Urban Design/Outdoor Spaces.	It was built on wasteland owned by the State Railroad Administration. In 2010, residents, together with the City Council, were given the opportunity to convert the site under the Streets Alive program, which aims to adapt city-owned land into parks, gardens, and other green spaces.
P4	Waterfall Garden Park location: Seattle, USA; proj.: Masao Kinoshita, Sasaki Associates, Yoshikuni Araki; year: 1978; area: 432m ² ; awards: Environmental Award of the American Nurserymen Association, 1981.	An example of a private pocket park, open to the general public during the day. Closed at night.
P5	Kwietny Krakowian Garden location: Cracov, Poland;	One of the 18 parks of the Gardens of Krakowians project. The one with a floral

	<p>proj.: Zespół Kształtowania Przestrzeni Miejskich Zarządu Zieleni Miejskiej: K. Opalka, K. Dzieciołowska, M. Kruk, F. Paruzel, M. Kamać, M. Ptak; year: 2017; area: 1708 m²</p>	<p>theme expressed in form and educational function.</p>
P6	<p>Paley Park location: New York, USA; proj.: Zion & Breen Associates; area: 400m² year: 1967; awards: Albert S. Bard Civic Award.</p>	<p>Commissioned by the William S. Paley Foundation. The park is a private space, closed during the hours: 8am-8pm with an ornate iron gate. Entrance to the park is free.</p>
P7	<p>Greenacre Park location: New York, USA; proj.: Hideo Sasaki, Harmon Goldstone, area: 557m² year: 1971 r. awards: Boston Society of Landscape Architects, 20th Landscape Awards Program, Landscape Award.</p>	<p>One of the more famous pocket parks in Manhattan. It is privately owned by the Greenacre Foundation. Accessible during designated hours. It is characterized by an entrance trellis and a 7.6 m. waterfall.</p>
P8	<p>Floating Pocket Park location: London, Great Britain; proj.: Tony Woods, Garden Club Park year: 2017 r. area: 729m²</p>	<p>A floating park in Paddingtons Basin on the Grand Union Canal, part of the Greater London Authority's green infra-structure. It improves pedestrian connectivity over the canal and rivers through-out London.</p>
P9	<p>Water playground location: Jaworzno, Poland; proj.: RS+ Robert Skitek; area: 6900m² year: 2018; awards: internauts award: "POLSKI KRAJOBRAZ 2018. public space category; 2019"; second prize: "The best public space in Poland", 2019; honorable mention: "The best public space of the Silesian Voivodeship" in the category - public space 2019.</p>	<p>The park was created on the grounds of the former Jaworzno coal mine - on the so-called Planty.</p>

Table.2. Typological diagrams of the compositional systems of the studied pocket parks [4]

P1	By each turn, different zones of the park are revealed, with amenities for relaxation, play, walking and nature observation, which are demarcated by a variety of vegetation.	
P2	Free layout defined by arrhythmic shape and randomness. The idea of cracked concrete slabs, among which greenery was incorporated and supplemented with urban furniture.	
P3	Geometric layout - free, post-analysis of pedestrian communication. The solution organizes and divides the space into individual zones. The rest zone, which covers most of the area, has been marked in gray.	
P4	Geometric layout - orderly, straightforwardly inscribed in the compact urban development. Clear divisions resulting from the park environment.	
P5	Irregular layout with organic shapes referring to nature. This adds a sense of softness to the "boxy" urban space.	

<p>P6</p>	<p>The layout of the symmetrical composition. The main axis, running along the long edge of the square, divides it into two parts. A staircase leads to the park, with ramps on both sides for people with disabilities.</p>	
<p>P7</p>	<p>Geometric layout, orderly, straightforwardly inscribed in a compact urban development. Lack of symmetry axes and clear divisions resulting from the park's surroundings, and emphasized by the multi-level solution of the park's floor.</p>	
<p>P8</p>	<p>Geometric layout - orderly, surrounded by water.</p>	
<p>P9</p>	<p>The layout is irregular, "flowing", untwisted, encouraging play.</p>	

3.1.A summary of the characteristic land use elements of the studied cases.

The study of selected case studies was supplemented by the selection of various elements relevant to the proper functioning of the park space related to land use were presented (Table 3.). Ratings of:

+ (occurs in a distinctive way; in a large amount),

+/- (occurs in a neutral way, not distinctive),

- (does not occur, no such value or element was used sufficiently) were adopted.

Table 3. The occurrence of various elements related to land development in the analyzed realizations of pocket parks [4]

Feature	Case study								
	<i>P1</i>	<i>P2</i>	<i>P3</i>	<i>P4</i>	<i>P5</i>	<i>P6</i>	<i>P7</i>	<i>P8</i>	<i>P9</i>
Park's area [m ²]	3700	4974	640	432	1708	390	557	729	6900
composition with indication of different functions, different user groups	+	+	+/-	+/-	+/-	+/-	+/-	+/-	+
taking advantage of the variation in terrain	+/-	+	+/-	+	+/-	+	+	+	+
Urban furniture for educational needs	+	+/-	-	-	+	-	-	-	+/-
Urban furniture - shelters, covers, pergolas	-	+	-	+	-	-	+	+/-	-
Urban furniture dedicated for mobility	-	-	-	+	-	+	+	+/-	-
Additional uses - gastronomy	-	-	-	-	-	+/-	+	-	-
Water reservoir	+	-	-	+	-	+	+	+	-
Water retention	+	+	+	+	+	-	+	-	+
Waterfall/ floating /moving water	-	-	+	+	-	+	+	+	+
preservation of existing greenery	+	+/-	-	+/-	+	-	+/-	-	+
Vertical greenery	-	-	-	+	-	+	+	-	+

3.2. Summary of literature research - author's definition of pocket park.

As a result of the study, the authors proposed that a pocket park - is:

1. a small, publicly accessible, about 0.5 hectares in size, arranged green space;
2. in the form of a park - equipped with small architectural elements for resting or encouraging physical activity for children and adults;

3. located on a separate plot of land, next to a traffic route at a distance of no more than 400 m of pedestrian access;
4. organized or arranged, or maintained with the participation of the local community or leaders. [4].

4. A CASE STUDY OF THE PARK IN GLIWICE

The results of the research in terms of the author's definition as well as the relevant programmatic and spatial elements were used in an experiment involving a student competition for the development of urban wasteland in the center of Gliwice for the realization of a pocket park. Previous evaluation criteria, including the typology of compositional arrangements, were used to evaluate the submitted competition entries.

4.1. Characteristics of the competition area.

The area of development of the new park competition included plots of land: 285, 1368/1, 1368/2, located on Rybnicka Street in Gliwice. They are adjacent to plots: 278, 279, 280, 281 and 282, on which, in a historic villa, the company's headquarters is located. The villa was built around 1926 by Arthur Neumann at what was then Rybnikerstrasse 27 (Rybnicka Street 27). He was descended from the printing family of Gustav Neumann, who in 1825 founded the Neumanns Stadt-buchdruckerei (Municipal Publishing Office), which operated and developed until World War II. The end of the Neumanns' activities came in 1945, after which the furnishings of the building, which had changed users many times, were completely lost. It housed: a sanatorium for students at the Silesian University of Technology, later a kindergarten, the headquarters of the House of Polish-German Cooperation and now the headquarters of PWIK Ltd. Gliwice (Fig.2). The two-story building with an attic and a basement, which has been preserved to this day, is decorated with a gable and a risalit containing a staircase from Rybnicka Street.



Fig. 2. Reclaimed green area in the park next to the PWIK headquarters in Gliwice, [source: <https://msip.gliwice.eu/>], fot. Michał Stangel

4.2. Pre-project assumptions

Part of the property was used for years for farming purposes. From the period when it was managed by the Silesian University of Technology came a concrete hardening (Fig.3) of a section of the plot serving as a laboratory where experiments with small rocket engines were conducted. Later, when not in use, it was "overgrown" with self-sown trees, in a characteristic circular outline. Since 2020, successively, this urban wasteland has been restored to the city. The new owner, PWIK, demolished the concrete pavement, replenished the soil, and arranged it as a lawn with an irrigation system.



Fig.3. Inner central part of the study area before pavement demolition in 2020.
Fot. PWIK archive

Reclaiming urban wastelands in post-industrial cities, described above using the example of Gliwice, is an important activity, regardless of the size and scale of the reclaimed land. The importance of such activities is emphasized by Juliane

Mathey and Stefanie Rößler, noting that in densely built-up cities, urban wastelands are often the only areas where new green spaces can be created [19]. However, the direction of the transformation of such areas can primarily realize the specific po-needs of modern cities [3].

In addition, the area is located at a direct access distance of up to 400 m, from the large housing estates of Gliwice (the so-called Żwirki i Wigury and Sikornik), increasing biologically active areas for residents, and thus improving their housing conditions. This is an important action that the Sustainable Communities Resource Center highlighted when pointing out the role of planned pocket parks in Los Angeles for improving housing conditions, implemented as part of the Neighborhood Stabilization Program (NSP) [26].

The previous use of the site, consequently, led to natural succession with a characteristic form. This was a crucial factor, in the environmental and compositional context, necessary to consider in the planned competition solutions [Fig.4.].

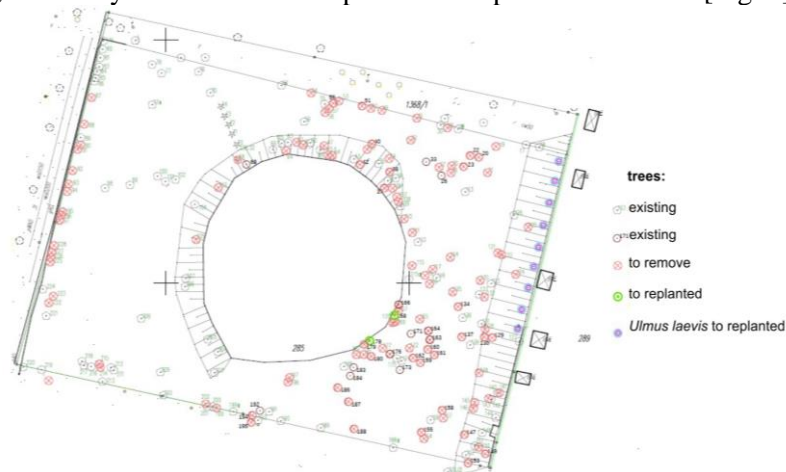


Fig.4. Inventory of the existing stand of trees within the limits of the planned project solutions. [source: PWIK archive]

A separate problem for pocket parks, besides their connection to local communities, is how to provide them with funding for their operation. Various possibilities are pointed out by Peter Harnik [13]. This fits in with the discussion that has been undertaken about planning green spaces for local communities, aiming to raise the level of healthiness and realization of postulates of sustainable development. This is not a separate issue, but an interdisciplinary approach to planning green spaces in the city, considering such elements as public transportation, housing, and water management. This is cross-sectionally summarized by Viniece Jennings, Matthew H. Browning and Alessandro Rigolonne, after over-analyzing the experiences of Denver, Los Angeles, and Chicago in aspects of the relationship between recreation, water management, transportation, land use and housing. Their analysis most

often shows a cross-cutting, interdisciplinary approach, but there are examples of narrower action between sectors, which nevertheless show the potential that green spaces bring to cities [15]. The benefits, measured as Peter Harnik points out by the number of users, can refer to systems: public transportation, social welfare, or education, and can be an indicator of task accomplishment in budget proposals [12].

4.3. Research results and functional and spatial indications for the planned pocket park in Gliwice.

The literature research indicated that for the proper functioning of the pocket park planned in the indicated location, it should meet the criteria:

- leaving the existing stand of trees;
- the possibility of implementing a variety of event scenarios: workshops for children, workshops for residents, mini-concerts, picnics, demonstrations demonstrating a pro-environmental attitude including concern for drinking water, rainwater occurring in nature, demonstrations demonstrating rational management of water and waste;
- possibility of other events or demonstrations proposed by the authors;
- leaving the possibility of access for vans and cars (e.g., for the installation of a mini stage, location of foodtrucks, etc.);
- proposals for plantings and greenery arrangement solutions, including maintenance and care.

These guidelines formed the basis for the evaluation of the competition's works. The adopted method of research for selected realizations of pocket parks was also used to analyze the proposed competition solutions. The results of the analysis were the basis for determining for the Investor the most appropriate, from the point of view of the conducted research, results and analysis and design pro-positions of the author teams.

4.4. Typology of competition's proposals

The competition received 24 works. The jury included representatives of the organizer, PWIK sp. z o.o., and authorized designers. In the first phase, 12 works meeting the basic criteria were selected. Next, the works were evaluated using the criteria proposed by the authors.

Because of the adopted method of research of selected examples from the analytic part, the authors analyzed, relevant to the correct functioning of the park space, the elements related to the management of the area are presented (Table 4.). Names of projects - based on the proposals of the author teams. The ratings adopted were:

- + (occurs in a distinctive way; in a substantial number),
- +/- (occurs in a neutral way, not distinctive),

- (does not occur, such an asset or element was not used sufficiently).

Table 4. The occurrence of various elements related to land development in the analyzed realizations of pocket parks [4]

<i>feature</i>	<i>Project code name</i>											
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>	<i>I</i>	<i>J</i>	<i>K</i>	<i>L</i>
composition with indication of distinct functions and user groups	+	+/-	+	+	+	-	+	+	+/-	+/-	-	+
taking advantage of the variation in terrain	+	+	+	+	-	+	-	+	-	-	-	+
urban furniture for educational needs	+	+	+/-	-	+	-	+	+/-	-	-	-	+
urban furniture - shelters, covers, pergolas	+	+	+	+/-	+	-	+	+	+	+	-	+
urban furniture dedicated for mobility	+	+	+	+	+	+	+	+	-	+	-	-
additional uses - gastronomy	+/-	+	+	-	+	+	+	-	+	+	-	+
water reservoir	+	+	+	-	-	-	+	+	-	+	-	-
water retention	+	+	+	+/-	-	+	+/-	+	-	+	-	+
Waterfall/ floating /moving water	-	-	+	-	-	+	-	+	-	-	-	-
preservation of existing greenery	+	+	+	+	+	+	+	+	+	+	+	+
Vertical greenery	+	+	+/-	-	+	+	-	+	+/-	-	-	-

The compositional solutions proposed in the competition were similar. Most of the works left the central meadow as a leisure space, undeveloped. All works proposed investing in neighboring areas using different forms and scale. A synthesis of the compositional arrangements of land development is shown in Fig.5.

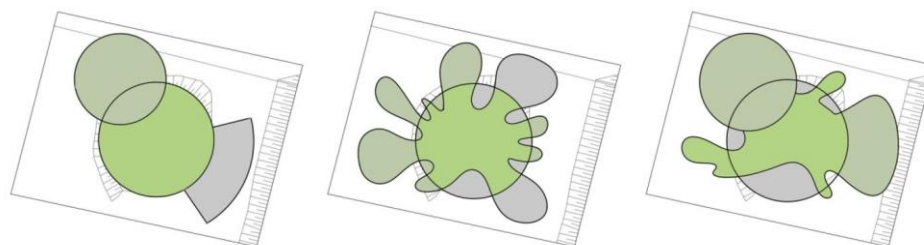


Fig. 5. Compositional layouts proposed in competition works - synthesis; Klaudia Elsner in [4]

4.5. Characteristics of the winning entry

Based on the evaluation, concept (A) was selected, meeting the assumed criteria except for the flowing water element. The authors were Martyna Kotulek and Wiktoria Pawlus.

The main goal of the project was the concept of a place with recreational, ecological, and educational values. Therefore, the adopted solutions assumed minimal interference in the plot area.

The functional-spatial program provided several zones: entrance, walking, and internal green circle. According to the guidelines, the circle remained in the form of a large lawn, with paths around it and two technical pavilions for daily recreation (deck chairs and other equipment) and occasional (equipment required for events). Two entrance areas have been proposed: the existing one and an additional second entrance from the side of the allotments.

Green walls have been proposed to purify the air and suppress noise from Rybnicka Street. Ecological elements - especially those related to water and its management - are an essential element: a tank collecting rainwater from the roof of the historic building and the parking lot, which can be connected to the irrigation system of the grass circle. Excess water is to be discharged into sprinklers, as well as water pumps for children, and then into a hydrophytic pond. A demonstration rain garden in a container fed by rainwater from the roof was also proposed. The designed park was to be a place for recreation and the organization of events related to PWIK's activities, including those of an educational and social nature, e.g.: an eco-resident competition, celebration of World Water Day, an annual competition for students and eco-fairs [4].

5. DISCUSSION ON THE EFFECTS AND EVALUATION OF IMPLEMENTATION

The Rybnicka pocket park opened on 02.09.2021 along with a ceremony and concert (<https://gliwice.eu/aktualnosci/miasto/zazieleniamy-gliwice> (access: 2022.11.11)). It has been shaped according to an altered concept, compared to the one selected through the competition. Random urban furniture has been installed, new trees have been planted, no paving has been provided and the park started to operate with one existing entrance open daily and closed at night. This initiated observations of the effects of such a change, which allowed the authors to record observations on its functioning.

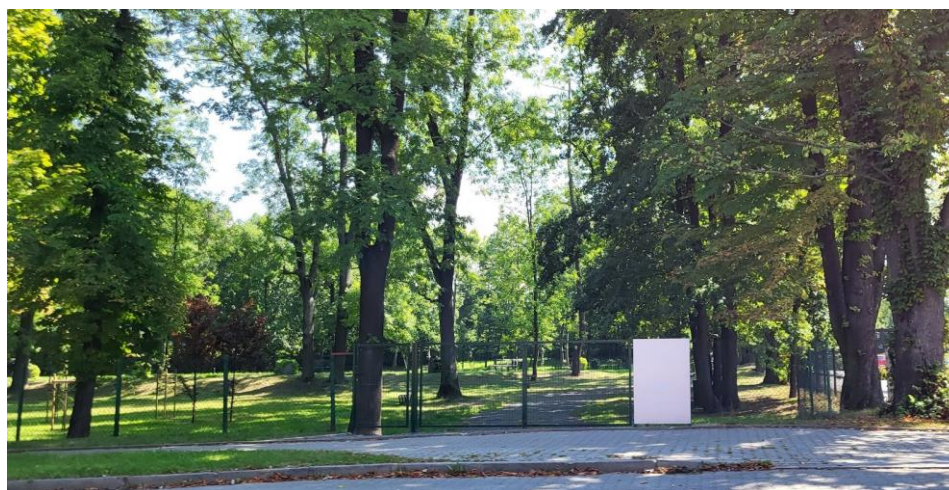


Fig. 6. Rybnicka pocket park, main entrance, 2022.08; authors' photo

5.1. Evaluation of the implementation of the competition objectives.

The primary function of small parks and squares is the "meeting" and "rest and relaxation" needs of potential users [18], [9], [2].

Studies conducted by Grahn P. and Stigsdotter U.K., [10], Nielsen T.S. Hansen K.B. [21], Peschardt K.K et al [23], Izakovičová Z et al [14] further indicate that users are more numerous when these areas are located on the road between destination points, that is, most often between housing - public transportation - work.

The implementation of the park deviates markedly from the winning design, as well as from the above-mentioned, most common design proposals. This results in little interest in the park, despite meeting the criteria of location and presence of greenery, due to the adopted functional program. It is an important additional

element, attracting the relevant user groups [23]. It can be concluded that "Zieleńiec at Rybnicka" is another example of green areas, like those already existing. The authors attempted to empirically assess the number of users of the park during the summer, in August 2022. The purpose of the study was to assess whether the new park is used in such a minimalist form (only a few benches were provided on the site) and with the provision of a single entrance. It was verified whether and how many users are in the park. The number at various times of the day on weekdays and at the weekend was verified. The first research showed an exceedingly small number of users, more than one, but no more than three people, regardless of the time of day (Fig.7).



Fig.7. Users in the Pocket Park at the Rybnicka street in Gliwice in August 2022. Fot. Author's photo.

5.2. Assessment of the performance of green areas in heavily urbanized areas - air quality criterion.

In industrial and post-industrial agglomerations, current levels of air pollution, which are monitored daily, are important. Access to current data is widespread, thanks to popular cell phone applications. The source of the data is also the GIOŚ, which, in accordance with the provisions of the Environmental Protection Law, conducts measurements of concentrations of sulfur dioxide, nitrogen dioxide, oxides of nitrogen, benzene, carbon monoxide, ozone, PM10 and PM2.5, and measurements of lead, arsenic, cadmium, nickel and benzo(a)pyrene in PM10. (<https://powietrze.gios.gov.pl>). Due to the importance of these indications, their results are used to send alerts by the Government Security Center (ALERT RCB), which affects the presence of users of public spaces, including city parks.

The completed green area and selected examples of urban green areas in Gliwice lie in the vicinity of a GIOŚ measuring station, through which air pollution levels can be monitored. Low interest in the new green areas provoked the authors to check the data from the following periods: winter 28.12.2021-26.01.2022 (Fig.8.) and summer in the period: 23.07.2022-21.08.2022. (Fig.9.)

with a summary of concentrations of: PM10, sulfur dioxide (SO₂) and benzene (C₆H₆) concentrations.

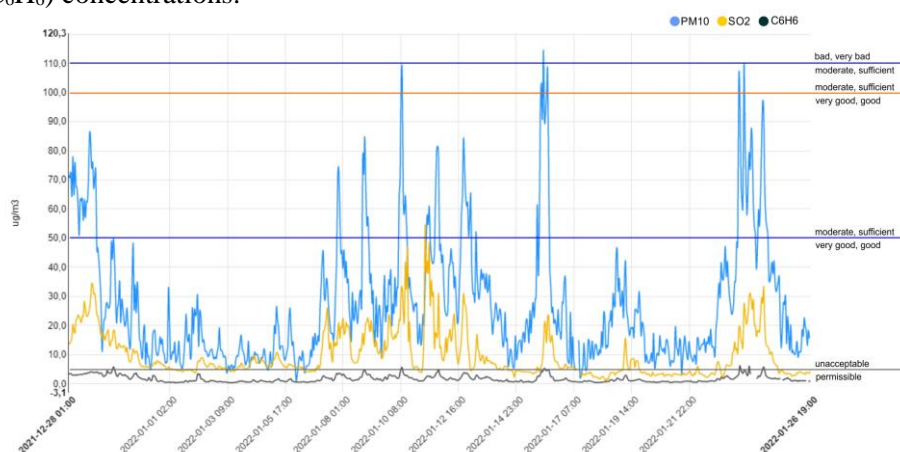


Fig.8. Research lab by Mewy street, Gliwice. Air pollution in the period 28.12.2021-26.01.2022.; authors on the basis from <https://powietrze.gios.gov.pl/pjp/current>, access: 26.01.2022]

The survey shows that the level of sulfur dioxide remained in the particularly good and good ranges; the level of PM10 particulate matter in the post-equivalent period on days: 28-29.12, 07-12.01, 15.01 and 25-26.01, (9 days) rose to the moderate and sufficient range, remaining in the good and particularly good ranges on the remaining days. In contrast, benzene (C₆H₆) concentrations exceeded unacceptable levels on days: 29.12, 10.01, 15.01 and 24.01 (4 days).

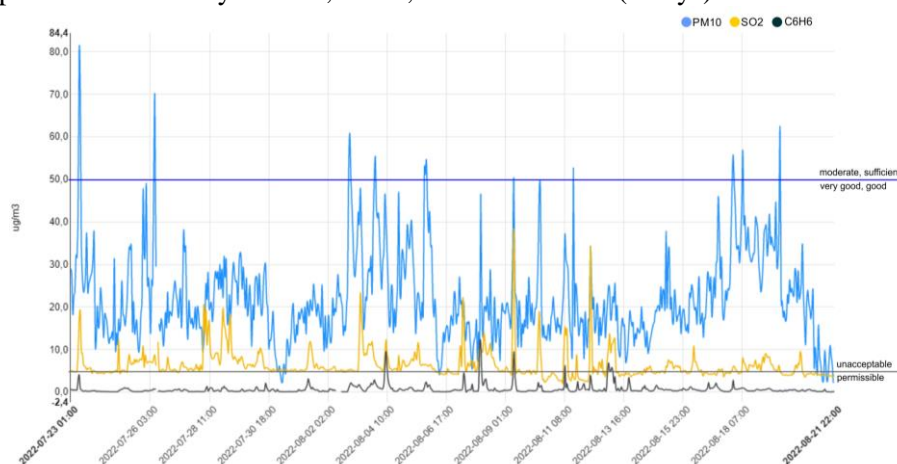


Fig.9. Research lab by Mewy street, Gliwice. Air pollution in the period 23.07.2022-21.08.2022. [źródło: <https://powietrze.gios.gov.pl/pjp/current>, access: 26.01.2022]

The study (Fig.7) shows that sulfur dioxide levels remained in the particularly good and good ranges. The level of PM10 particulate matter in the comparative period on days: 23.07, 26.07, 02-03.08, 05.08, 18-19.08 (7 days) rose to the moderate and sufficient range, remaining in the good and particularly good ranges on the other days. In contrast, benzene (C₆H₆) concentrations exceeded the unacceptable level on 04.08, 07-08.08, 11-12.08 (5 days).

From the comparison of the studies, it is concluded that in the summer, when there is more interest in staying in green areas, the studied air, especially in terms of particulate matter, less often exceeds sufficient values.

5.3. Performance evaluation of green areas in heavily urbanized areas - noise criterion.

In heavily urbanized areas, urban green spaces are exposed to high noise levels. These levels are felt by users, and this affects the perception of the attractiveness of public spaces. In the case of the study area, this is a particular nuisance, known to residents of this part of the city. This is confirmed by acoustic maps of the city, which show noise levels of 55-70 dB for the mentioned area. (Fig.8). Such maps are, in their assumption, "an element supporting the planning of residential development areas, the creation of spatial development plans, (...) it allows to identify and locate noise sources responsible for exceeding the limit values, as well as to take effective measures to silence or reduce noise emissions."

Such supportive and nuisance-eliminating measures, according to Polish regulations, include so-called noise-sensitive objects and areas for which noise limit values are set. These areas include parks and squares, which, when located in areas in the downtown zone of cities with a population of more than 100,000, have specified permissible values for noise levels². Acoustic maps, containing, which are created based on long-term noise assessment indicators, determining the permissible long-term average sound level in dB, and the limit values are determined for diverse types of indicators, including: L_{DWN} i L_N ²

² L_{DWN} - is the long-term average sound level expressed in decibels (dB), determined over all days of the year, taking into account the time of day, the time of evening and the time of night, L_N - is the long-term average sound level A expressed in decibels (dB), determined over all times of night of the year.

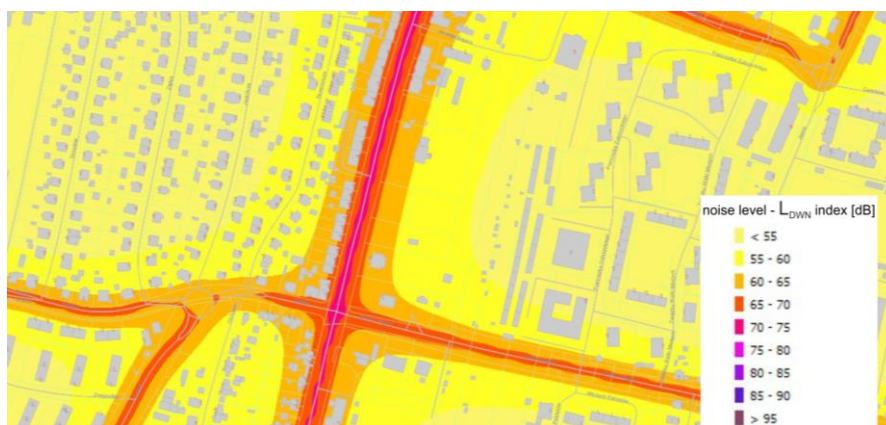


Fig.10. Noise level map, index L_{DWN} , at the Rybnicka street next to the pocket park.
[source: Miejski Serwis Informacji Przestrzennej Gliwice, [Municipal geo information service], <https://msip.gliwice.eu/>, access: 24.06.2022]

6. CONCLUSIONS

The preliminary research conducted was aimed at determining the functional and spatial program of the pocket park, which, if implemented, would guarantee its attractiveness. At the same time, the research showed that an essential element in the functioning of such areas in urban areas is the participation of the local community in the process of creating the park or its use.

The observations made allow the following conclusions.

- deviation from the objectives of the competition, including the reduction of park equipment, reduced its attractiveness, which translated into a reduction in the number of interested parties;
- local environmental conditions: air pollution and noise and the lack of development elements that offset its impact did not change the perception of a green area located on a troublesome thoroughfare;
- due to the existing development (2020), the area of greenery per capita has not changed and thus the NVDI index (Normalized Difference Vegetation Index - an index used in remote sensing measurements to determine the developmental state and condition of vegetation) has not changed;
- the provision of land has increased the area of parks per capita;
- the percentage of residents having green areas within walking distance of 300 meters and being able to reach green areas during a 15-minute walk has increased;
- the area of urban wasteland has decreased.

The presented results of the study are of a supra-local nature. The conclusions described and recommendations can be useful in planning and shaping new pocket

parks with a particular focus on urbanized areas of post-industrial cities. The results of the research also indicate the need for further research and expansion.

ADDITIONAL INFORMATION

Student competition for the development of design concepts entitled: "Functional and spatial program and development of the area of the pocket park located at ul. Rybnicka 27, in Gliwice", was carried out within the framework of the contract for the execution of scientific and research work entitled: "Study of the possibility of arranging a pocket park for a social responsibility education center including environmental and cultural education located at ul. Rybnicka 27, Gliwice" number: NB-224/RAr-1/2020; 01/010/NB_20/0059, signed between Przedsiębiorstwo Wodociągów i Kanalizacji Spółka z o.o. in Gliwice and Silesian University of Technology, Faculty of Architecture on: 05.10.2020.

REFERENCES

1. Banzhaf, E, Arndt, T and Ladiges, J 2018. Potentials of urban brownfields for improving the quality of urban space. In: Kabisch, S, Koch, F, Gawel, E, Haase, A, Knapp, S, Krellenberg, K, Nivala, J, Zehnsdorf, A, (eds) *Urban transformations, sustainable urban development through resource efficiency, quality of life and resilience. Future City 10*. Springer, 221-232.
2. Baur, JWR and Tynon, JF, 2010. Small-scale urban nature parks: why should we care? *Leisure Sciences: An Interdisciplinary Journal* 32, 195–200.
3. Blake, A 2005. Pocket Parks, Open Space Seattle 2100: Seattle, WA, USA, p. 3.
4. Bradecki, T and Opania, S [ed.] 2021. Park kieszonkowy w Gliwicach. Studium możliwości aranżacji na centrum edukacji odpowiedzialności społecznej, edukacji ekologicznej i kulturalnej, [*English: Pocket park in Gliwice. Possibility study for an education center for social responsibility, environmental and cultural education*], Wydawnictwo Politechniki Śląskiej.
5. Cohen, D,(and all) 2014. The Potential for Pocket Parks to Increase Physical Activity, National Institutes of Health (NIH), NIH Public Access, p. 19-26.
6. Cutler, ME, Boyd D, Foody G M, and a. Vetrivel, 2012, Estimating tropical forest biomass with a combination of SAR image texture and Landsat TM data: An assessment of predictions between regions, *ISPRS J. Photogramm. Remote Sens.*, vol. 70, pp. 66–77.
7. El Aziz Noha, A 2015. Potentials of creating pocket parks in high density residential neighborhoods: The case of Rod El Farag, Cairo city, *International Journal of Development and Sustainability*, Vol. 4, number:7, p. 808-810.

8. Elmqvist, T, Fragkias, M, Goodness J, Güneralp B, Marcotullio, PJ, McDonald RI, Parnell, S, Schewenius, M, Sendstad, M, Seto, KC and Wilkinson, C 2013, *Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities, A Global Assessment*, Springer Open.
9. Gehl, J 2010. *Cities for People*, Island Press, Washington, Covehlo, London, 68.
10. Grahn, P, Stigsdotter, UK 2003. Landscape planning and stress. *Urban Forestry & Urban Greening* 2, 1–18.
11. Hamin Infield Elisabeth, M, Abunnasr Yaser, Ryan Robert L [ed.] 2019. *Planning for Climate Change: A Reader in Green Infrastructure and Sustainable Design for Resilient Cities*, , Routledge.
12. Harnik, P 2003, *The Excellent City Park System: What Makes it Great and how to Get There*, Trust for Public Land, p. 26-40.
13. Harnik, P 2008, *Creating and Maintaining Parks: Funding and Other Means*, in Lewis M (Ed.). *From Recreation to Re-Creation: New Directions in Parks and Open Space System Planning*, American Planning Association, Chicago, Illinois, pp. 75-88.
14. Izakovičová, Z, Petrovič, F, Pauditšová, E 2022, *The Impacts of Urbanisation on Landscape and Environment: The Case of Slovakia*. *Sustainability*, 14, 60. <https://doi.org/10.3390/su14010060>
15. Jennings, V, Browning, M H Rigolon, A, 2019, *Urban Green Spaces: Public Health and Sustainability in the United States*, *Springer Briefs in Geography* p. 71-93.
16. Latif, Z A, Zamri, I, and Omar, H 2012, *Determination of tree species using Worldview-2 data*, 2012 IEEE 8th Int. Colloq. Signal Process. Its Appl., pp. 383–387.
17. Lemes de Oliveira, F 2017, *Green Wedge Urbanism: History, Theory and Contemporary Practice*, Bloomsbury Academic.
18. Maas, J, van Dillen, S.M.E., Verheij, RA, Groenewegen, PP 2009, *Social contacts as a possible mechanism behind the relation between green space and health*. *Health & Place* 15, 586–595.
19. Mathey, J and Rößler, S 2022, *Approaches to Developing Urban Wastelands as Elements of Green Infrastructure*, [in:] *Urban Wastelands: A Form of Urban Nature?* [ed.:] Di Pietro F., Robert A., City and Nature, Springer, 273-294.
20. Montaña Novoa, R 2013, *Sustainable Green Spaces in the Compact City: The Provision of Adequate Green Spaces as a Solution to the Deterrents of City Centre Living*, Lap Lambert Academic Publishing.
21. Nielsen, TS, Hansen, KB 2007. *Do green areas affect health? Results from a Danish survey on the use of green areas and health indicators*. *Health & Place* 13, 839–850.

22. Peschardt, K K, Schipperijn, J, Stigsdotter, U K 2012, Use of Small Public Urban Green Spaces (SPUGS), *Urban Forestry & Urban Greening* 11(3), p. 235-244, 2012.
23. Peschardt, KK, Schipperijn, J, Stigsdotter, UK, 2012, Use of Small Public Urban Green Spaces (SPUGS), *Urban Forestry & Urban Greening* 11 (2012), 235– 244.
24. Puay Yok Tan, Chi Yung Jim[ed.], 2017, *Greening Cities: Forms and Functions*, Springer.
25. Schipperijn, J, Ekholm, O, Stigsdotter, UK, Toftager, M, Bentsen, P, Kamper-Jørgensen, F and Randrup, TB 2010a. Factors influencing the use of green space: results from a Danish national representative survey. *Landscape and Urban Planning* 95, 130–137.
26. Sustainable Communities Resource Center, "Turning Blighted Properties into Pocket Parks: Los Angeles Case Study", *Sustainable Communities E-News*, Vol. 1 No. 2, 2012, źródło: https://archives.huduser.gov/scrc/sustainability/newsletter_032312_2.html (access: 2022.06.17).
27. Wines, J 2000, *Green Architecture*, Benedikt Taschen Verlag GmbH, Koln.
28. Yin, R K 2014, Studium przypadku w badaniach naukowych. Projektowanie i metody, [*Case Studies in Research. Design and methods*], Wydawnictwo Uniwersytetu Jagiellońskiego, Kraków, s.48.
29. Zachariasz, A 2005, *Zieleń jako współczesny czynnik miastotwórczy ze szczególnym uwzględnieniem roli parków publicznych [Greenery as a contemporary city-forming factor with special emphasis on the role of public parks]* , Monografie, seria: Architektura, Politechnika Krakowska, Kraków.
30. Zepf, M 2015, *Greenery in the city: innovative and sustainable planning with urban flora*, Jovis.

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