POLSKA AKADEMIA NAUK ODDZIAŁ W LUBLINIE
POLISH ACADEMY OF SCIENCES BRANCH IN LUBLIN

TEKA

ISSN 1895-3980

KOMISJI
ARCHITEKTURY,
URBANISTYKI
I STUDIÓW
KRAJOBRAZOWYCH

COMMISSION
OF ARCHITECTURE,
URBAN PLANNING
AND LANDSCAPE
STUDIES

VOLUME XV/4

TEKA

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Volume XV/4

Lublin 2019

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KOMISJI ARCHITEKTURY, URBANISTYKI I STUDIÓW KRAJOBRAZOWYCH

Tom XV/4

Lublin 2019

Publikacja finansowana ze środków Polskiej Akademii Nauk

ISSN 1895–3980

www.pan-ol.lublin.pl
Wydawca: Politechnika Lubelska, ul. Nadbystrzycka 38D, 20–618 Lublin

Skład komputerowy
INFO STUDIO Agencja Reklamowo-Wydawnicza s.c., www.isar.pl

Realizacja
Biblioteka Politechniki Lubelskiej, Ośrodek ds. Wydawnictw i Biblioteki Cyfrowej
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TEKA 2019, Nr 4
Komisji Architektury, Urbanistyki i Studiów Krajobrazowych
Oddział Polskiej Akademii Nauk w Lublinie

Housing estate greenery in shaping the quality of housing environment on the example of Bialystok

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Summary: The housing environment is the basic area of human functioning, which via its quality affects the state of people's health and well-being. One of the main factors determining the high quality of the housing environment is an appropriate indicator of green areas per 1 inhabitant, which gives the opportunity to create friendly common spaces as well as the nature of the greenery itself. The article presents the analyzes of selected Białystok housing estates which implementation was based on various guidelines and indicators regulating the size of green areas in housing estates. The conducted research allowed to state that urban norms applied in the 20th century provided the best indicator of green areas per capita. Replacing them with a biologically active area ratio has minimized green areas in housing estates and it is becoming necessary to develop new urban indicators to improve the quality of the housing environment.

Keywords: housing estate greenery, urban indicators, urban normative, housing environment, Białystok

Introduction

The housing environment is the basic area of human functioning. It's here where a person rests, fulfills one's needs as well as struggles with daily duties. By its quality, the environment affects the state of health and well-being of the modern man and makes it possible to achieve a sense of social cohesion [Schneider-Skalska 2017].

The main element conditioning the quality of the housing environment, besides the spatial structure that gives a sense of security (by hierarchizing the space, maintaining it in a proper technical condition and on a human-friendly scale), is the presence of natural elements. Properly shaped greenery and water exert a positive influence on human condition and functioning. Through their size and diversity they affect the local climate [Kobylarczyk 2018]. They are an important parameter determining the quality of common spaces which give the possibility of social integration in the estate, shaping the identity and the uniqueness of the place [Szulczewska, Giedych 2011].

The very surface of green areas in the housing estate is also important for the quality of the housing environment. The type of rest, recreation and sport activities in the housing estate depend on the estate's size and the defined user. From the users ,and inhabitants' point of view, the area of green areas per one inhabitant is one of the most important indicators determining the standard of living in a residential environment and in a city [Zachariasz 2017].

Materials and methods

The assessment of the housing environment quality due to the equipment in green areas per one inhabitant and type of greenery was made on the basis of:

- analysis of the subject literature,
- knowledge of selected urban projects of multi-family housing estates in the city of Białystok,
- valorization of housing development (green inventory as well as development and equipment of green areas in housing estates).

Multi-family housing development has been continuously implemented in Bialystok since the end of World War II. Housing estates were implemented in changing political and economic conditions over time, and hence it happened based on for various guidelines and indicators regulating the size of green areas in housing estates.

- Established until the 1990s, designed on the basis of existing at the time urban norms and implemented by housing cooperatives.
- Established in the new political conditions after 1989, designed based on for spatial development plans and building conditions, implemented in whole or partly by housing cooperatives.
- Residential complexes designed and implemented after 2000 on the investment rules of a free market (developer, private investor) also based on spatial development plans and decisions on building and land development conditions.

Three Białystok housing estates were selected for the research: Osiedle Białostoczek, Osiedle Nowe Miasto II and Apartamenty Jagiellońskie.

The review of the housing estates was based on existing studies [Kłopotowski 2016, Dąbrowska-Milewska 2005], in which the authors group the housing estates of Białystok into individual decades of the 20th and 21st centuries and discuss their urban structure. Individual analysis of the spatial layout in selected housing estates with inscribed green areas was carried out through the prism of applying the criteria of current norms and applying the biologically active area factor. Then a comparative assessment of the housing estates' green areas was made.

Results

Until the end of the 1990s, green areas in housing estates in Poland were designed on the basis of applicable norms. They contained surface guidelines, determined in relation to the number of inhabitants, population density as well as the radius and range of service and frequency of use and the program guidelines (greenery and recreation) related to the user category [Zachariasz 2017]. They have undergone many changes and repeals as they lost their relevance as a result of economic and technical changes and also the progress of knowledge. The last binding one was the Urban Normative for residential areas from 1974[1], which, thanks to its indicators, enabled the protection of appropriate green areas in housing estates (Table 1).

It provided from 25.0 to 30.0 m^2 green area and recreation per capita in the isochrone of 800 meters [Dąbrowska-Milewska 2010]. The above-cited indicators guaranteed the possibility of relaxation after work, joint activities and facilitated social integration within the estate. However, they required the designation of large areas of land, and not every local government had such [Kobylarczyk 2018].

The political changes of 1989 affected the outdation of most normative assumptions. In 1994, the Spatial Development Act was adopted, which contributed to the deep liberalization in planning and the lack of introduction of any new urban standards or norms. The Construction Law and Regulation on the technical conditions of buildings and their location were also developed [Komar R. 2014]. The Regulation introduced the concept

1 Ordinance No. 9 of the Minister of Land Management and Environmental Protection regarding urban indicators and guidelines for residential areas in cities of 29.01.1974, which is called the Urban Norm for Urban Areas.

of a biologically active area[2] and specified its minimum area (25%) in multi-family housing areas, calculated as the ratio of the biologically active area to the plot area. However, the calculation only takes into account the area occupied by elements considered to be biologically active, and not the diversity in the structure of plants [Giedych, 2015]. New economic conditions (land prices, privatization, development market) as well as the use of only biologically active area parameters led to the intensification of development, fragmentation of the spatial structure of housing estates (fencing, acoustic screens) and the deficit of green social spaces in residential areas [Schneider-Skalska, 2017]. Green areas implemented in the form of gardens on roofs and terraces of residential buildings and on the underground garages that are legally permitted are often the only form of green areas in the estate. This limits future residents' access to compact green areas which give people the possibility of recreation, rest and social integration [Kłopotowski, 2016].

Table 1. Greenery, leisure and sport program for residential areas in cities [Zachariasz, 2006]

Level of population service	Service coverage	The type of open space	Area demand indicator [m²/M]	Access isochron [minutes]
ELEMENTARY	Backyard zone	net estate green areas	8,0	—
		playgrounds for children up to 6 years old	0,6	
		playgrounds for children 6–11 years old	1,0	
		backyard recreation for adults	0,4	
BASIC	Estate	recreation and sports areas	5,5	15
		children's gardens (Jordanian)	1,0–1,2	10–30
ABOVE BASIC	District	recreation and sports areas	5,0	—
		lawns	1,0	

This is a dissonance even to British guidelines, where in housing complexes larger than 50 family flats per one inhabitant there should be 20.0 m² of open green space [Kobylarczyk, 2018]. On the other hand, German indicators which use a converter for 1 flat predict a size of a playground of min. 60 m² (5.0 m²/1 apartment), in location ensuring visual and voice contact with an apartment. There is a need for a playground for older children after 50 flats above. After exceeding 75 providing access to sports grounds for teenagers and adults – assuming a conversion rate of 5.0 m²/1 apartment, and seating places and tables for games for seniors is obligatory [Schneider-Skalska, 2004].

Therefore, views on the need to develop new urban standards in order to secure spatial needs for green areas appear in the Polish architectural environment. G. Schneider-Skalska proposes comprehensive proposals the implementation of which will affect the creation of a healthy housing environment. She postulates the dependence of the multiplicity and equipment of the designed housing estate greenery on the number of apartments [Schneider-Skalska, 2004]. Whereas G. Dąbrowska-Milewska in her work proposes the division of green areas into (Table 2): home, basic and post-primary areas of public sport and recreation, for which it determines surface indicators, minimum surfaces and maximum access radius [Dąbrowska-Milewska, 2010].

2 The surface of the biologically active area, in accordance with the Regulation of the Minister of Infrastructure of 22 April 2002 on the technical conditions to be met by buildings and their location, is: "native land covered with vegetation and surface water on a construction plot, as well as 50% of the total terraces and flat roof surfaces, arranged as permanent lawns or flower beds on the ground ensuring their natural vegetation, with an area of not less than 10 m²"

Table 2. Recommended program-surface indicators for green areas and backyard recreation, publicly available green areas, recreation and sport [Dąbrowska-Milewska, 2010]

	Program	Minimum area	Indicators of minimum area	Max access radius
Household areas within a net construction plot	Playgrounds for the children of the max 7-year-old children	250 m^2	5 m^2/mk	50 m
	Playgrounds for older children (over 50 flats)			100 m
Basic public recreation and sport areas	Estate garden	2 ha	4,0 m^2/mk	500 m
	Sport fields for team sports		1,5 m^2/mk	
Above basic recreational and sport areas	Parks	2 ha	4,0 m^2/mk	1000 m
	Groups of sport fields, indor swimming pools, sports halls		2,5 m^2/mk	

Urban planning standards of programming the green areas binding in the 20th century, the currently applicable biologically active area indicator, as well as the proposed new urban indicators were and are intended to secure the area for residential green areas.

It is equally important to normalize the spatial structure of greenery in a housing estate with the use of indicators. Because, not only does the surface of the green matter in shaping a healthy housing environment, but also the right proportions of tall to low types of flora [Szulczewska, Giedych, 2011]. Already in the 1970s, it was postulated that the guidelines for designing should specify the minimum volumes of greenery that should be envisaged in the designs [Skibniewska, 1979].

Ecological and spatial indicators are already used in Europe and around the world. The main indicators which have an established position in shaping the spatial and natural structure of cities are: Biotope Area Factor – BAF (1994 Berlin), Green Space Factor – GF (2001 Malmo), Gryneery Provision – GnP (2005 Singapore), Seattle Green Factor – SGF (2007 Seattle)[3]. Their goal is to limit the negative impact of new investments on the natural environment in urban areas and to ensure proper living conditions for residents by: reducing the urban heat island, improving air quality, biodiversity protection and adequate rainwater management. The size of indicators is the ratio of ecologically active areas multiplied by an appropriate converter to the plot area, where, in addition to permeable surfaces, the general area covered with flora, additionally, areas covered by trees, shrubs and creepers are taken into account [Giedych 2015].

Case studies

The Białostoczek housing estate, completed in 1977–1986, is the largest housing estate among the areas selected for research – area: about 62 ha, population: about 10.5 thousand. Designed and implemented based on the Urban Normative for residential areas from 1974. Through perpendicular settings standardized buildings (5 and 11-storey buildings made in the OW-T system) created very diverse semi-open inter-block spaces, giving the possibility of individual arrangement of recreation places and playgrounds for children. The area of green areas in the net areas in the estate is about 10.7 ha. An area on the outskirts of the housing estate in the Biała River valley was allocated for the recreational garden and complex of physical recreation facilities. Unfortunately, the estate park was never implemented, and the area was left to the be managed in the distant

3 Biotope Area Factor (BAF) developed for the needs of landscape plans carried out in Berlin, Green Space Factor (GF) developed for the revitalization of the West Port in Malmo, modeled on Berlin indicators, Gryneery Provision (GnP) is one of the components of the Green Mark (Green Mark) awarded since 2005 in Singapore for investments in ecological solutions, Seattle Green Factor (SGF) indicator used for zones designated in the city's spatial policy, originally it was only applicable for areas with a commercial function, from 2010, the obligation to use it was introduced for housing with a residential function.

future. Currently, it is an undeveloped open area with low greenery of approximately 11.3 ha. Green in the estate are, first of all, fruit trees (a remnant of gardens and orchards of the former village) and plantings mainly from deciduous trees and shrubs, with a high predominance of high greenery. The adjacent gardens have lost their utility character and are currently dominated by decorative vegetation.

The Nowe Miasto II housing estate was implemented in the years 1990–2002 based on the Detailed Spatial Development Plan, with an area of approximately 30 ha and a population of 9,400. Residential buildings based on 4 and 5-storey buildings. The original plan assumed a housing estate consisting of 8 groups and a reserve of land for a school and estate park, which was eventually allocated for buildings. The first two teams built by the housing association were designed taking into account the guidelines of the Normative of 1974, which translated into extensive interiors with a fully adapted stand. Other housing complexes have already been implemented by development companies, and here the economic factor prevailed, which resulted in reducing the distance between buildings, building density and trimming green areas. All teams have applied the principle of creating shared interiors by stopping off inter-block spaces with playgrounds and leisure places as well as attractively composed, neat, low greenery. The area of inter-block greenery in the estate is about 5.6 ha. The intensification of buildings and the introduction of underground garages resulted in the necessity of constructing green terraces on garage roofs in order to obtain the appropriate factor of biologically active area. Their area is about 0.13 ha. The estate has a small recreational area equipped with: two playgrounds, a playground and an outdoor gym covering the space of 0.58 ha (that is what is left in the open area intended for the estate park). Settlement greenery is mainly low plantings from shrubs and short trees with a predominance of conifers, as well as perennial beds.

One may be tempted to state that the housing estate in question is a transitional form between multi-family housing estates of the modern period and currently implemented housing complexes.

The Apartamenty Jagiellońskie residential complex, the implementation of which has begun in 2017, was designed on a plot of approximately 3 ha based on a planning permission. Expected population is about 2.5 thousand (conversion of 3 people to 1 apartment). The complex consists of four 11-storey, detached buildings arranged longitudinally in relation to the street. However, due to their nature (C-shaped) they do not form a compact frontage. The landscaping did not use the terrain configuration as well as the attractive neighborhood of the Biała River Valley and adjacent open areas. There was also no connection between individual buildings, because the greenery of the complex was implemented entirely on the garage panels of individual buildings, which makes them separate „islands" detached from the surrounding open areas. The green areas of each building consist of: fenced green terraces assigned to apartments on the first floor, a common space with a small playground and slopes resulting from covering the garage walls. The total area of green areas in the complex is about 0.58 ha (common area – playground 0.26 ha, private green terraces 0.12 ha, green escarpments 0.19 ha). The spatial structure of greenery in the complex is: grassy surfaces, low greenery in containers associated with a private space (fenced terraces) and shrubs attractively composed on the escarpments covering the walls of underground garages.

Results

A comparative analysis of selected green areas in housing estates in Bialystok allows to form the following conclusions. Housing estates designed on the basis of urban norms have the largest green areas per capita (Table 3). In addition to the very surface of green areas, spatial continuity and links with open areas are also important. An additional factor influencing the quality of these settlements is the vegetation – an appropriate ratio of high to low greenery that has a positive effect on the microclimate of intra-block spaces (Table 4).

Table 3. Comparative analysis of greenery surface

Estate	Estate area	Green spaces area	Population	Green space area per 1 habitant
Białostoczek housing estate	62,0 ha	22,0 ha	10 500	20,9 m^2
Nowe Miasto II housing estate	30,0 ha	6,31ha	9 400	6,7 m^2
Apartamenty Jagiellońskie residentional complex	3,0 ha	0,58 ha	2 500	2,3 m^2

Table 4. Comparative analysis of spatial relationships and green areas in the estates

Estate	Interblock space binding	Rest and recreation areas	Tall types of flora	Low types of flora	Grassy area
Białostoczek housing estate	+++	+++	+++	++	+++
Nowe Miasto II housing estate	++	+	+	+++	+
Apartamenty Jagiellońskie residentional complex	–	–	–	+	+++

High degree +++ Medium degree ++ Small degree + None –

The resignation from urban norms and programming of greenery only on the basis of biologically active area (including greenery on roofs and fragmented forms) led to a drastic reduction of the greenery area per capita (Table 3). It also limited common spaces to the required minimum and prevented access to compact recreation and sports areas in the place of residence. Plant cover has also changed – first of all these are grass surfaces and low greenery, which mainly has an aesthetic function (Table 4). Therefore, it becomes necessary to bring about planning changes and the separation of new green areas organized in the structure of emerging districts [Kłopotowski, 2016] as well as the development of new urban indicators conditioning the formation of a healthy housing environment giving residents the opportunity of everyday contact with nature.

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Tereny zieleni osiedlowej w kształtowaniu jakości środowiska mieszkaniowego na przykładzie Białegostoku

Streszczenie: Środowisko mieszkaniowe jest podstawowym obszarem funkcjonowania człowieka, które przez swoją jakość wpływa na jego stan zdrowia i samopoczucie. Jednym z głównych czynników warunkujących wysoką jakość środowiska mieszkaniowego jest odpowiedni wskaźnik terenów zieleni w przeliczeniu na 1 mieszkańca dający możliwość stworzenia przyjaznych przestrzeni wspólnych jak również charakter samej zieleni. W artykule przedstawiono analizy wybranych osiedli mieszkaniowych realizowanych w oparciu różne wytyczne i wskaźniki regulujące wielkość terenów zieleni w osiedlach. Przeprowadzone badania pozwoliły stwierdzić, iż normatywy urbanistyczne stosowane w XX w. zapewniały najlepszy wskaźnik terenów zieleni na 1 mieszkańca. Natomiast zastąpienie ich współczynnikiem powierzchni terenu biologicznie czynnego doprowadziło do minimalizacji terenów zieleni w osiedlach i konieczne staje się wypracowanie nowych wskaźników urbanistycznych w celu poprawy jakości środowiska mieszkaniowego.

Słowa klucze: tereny zieleni osiedlowej, wskaźniki urbanistyczne, normatyw urbanistyczny, środowisko mieszkaniowe, Białystok

TEKA 2019, Nr 4
Komisji Architektury, Urbanistyki i Studiów Krajobrazowych
Oddział Polskiej Akademii Nauk w Lublinie

Las Zwierzyniecki as an Element of the Composition of Green Areas in Białystok[1]

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Abstract: The article presents a historical and compositional analysis of the changes done to "Las Zwierzyniecki"[2] (now a public park and nature reserve) in Białystok. It describes the stages of its transformation in the context of the changes done to the baroque composition of the Branicki residence and menageries from the 18th to early 21st century. An attempt was made to describe the historical and compositional design guidelines for the modern revitalisation of Las Zwierzyniecki.

Keywords: Las Zwierzyniecki, nature reserve, baroque composition, greenery, Białystok

The baroque palace and garden complex in Białystok is the main element of a broad landscape composition built at the behest of hetman Jan Klemens Branicki in the Biała river valley [Kucharczyk, Maroszek 1985, p. 57–70; Turecki 1996, p.13]. Over the years elements of this composition have been modified. The influence of the original baroque composition can be seen particularly strongly in the changes to the green areas of Białystok – the city parks created around the residence and in selected areas of the former Duży Zwierzyniec (greater menagerie), part of which formed the modern Las Zwierzyniecki.

Research Objective and Current State of Research

The objective of the research was to create historical and compositional design outlines for the revaluation of Las Zwierzyniecki. The objective was dictated by a real need for the city to make use of the areas of Las Zwierzyniecki (currently composed by the neighbouring areas of a public forest and a nature reserve) to connect the new university campus with the other academic locations and the city centre. The plans put forward by the local authorities so far have caused an uproar in the media and popular protests. This has brought to light the lack of useful interdisciplinary, historical and compositional analysis, which should precede design and execution of any work done in the area.

Issues connected with the history of Las Zwierzyniecki are presented from many points of view. In historical works on the spatial development of the city Las Zwierzyniecki is usually listed as an element of the baroque composition, which is as a whole testament to the city's identity [Dolistowska 2009; Oleksicki 1996, p. 81–84; Oleksicki 1992, p. 4–6; Turecki 1996, p. 7–16]. Many scholarly works on the baroque residence list the Duży Zwierzyniec (Greater Menagerie) as the background for courtly life [Nieciecki 1996, p. 53–58; Nieciecki 1999, p. 139–155; Dziubecki 2010; Oleńska 2011]. Historical research and analysis relating to the revaluation of palace gardens can be found in academic journals and conference proceedings [Nieciecki 2014, p. 7–118; Ogród Branickich … 1998; Parki I ogrody zabytkowe… 2011; Sikora 2010, p. 32–42]. The history of Las Zwierzyniecki in the context of the Park Konstytucji 3 Maja (3rd of May Constitution Park) is discussed in detail in "Katalog

1 The study has been implemented from the resources of the S/WBiIŚ/2/16 statutory work financed by the Ministry of Science and Higher Education of Poland.

2 Roughly translatable as the the Zwierzyniec (menagerie) Forest.

parków i ogrodów zabytkowych dawnego województwa białostockiego. Stan z 1988 roku" [Bończak Kucharczyk, Maroszek, Kucharczyk 2000; Bończak Kucharczyk, Maroszek, Kucharczyk 2019]. Studies concerning the green areas of Białystok are supplemented with numerous articles (both scholarly and in the press) and studies done by the students of Architecture and Landscape Architecture from the Białystok University of Technology [Zarzecki 2014]. There are no studies devoted to changes to the composition of Las Zwierzyniecki. Because a nature reserve has been created in this area, there are more studies devoted to its flora and fauna, as well as environmental protection.

Methodology

Revaluation of historical gardens and areas of historic greenery in the city is undertaken in leading academic centers in Poland and abroad. Scientific research on the issue of restoring historic gardens is carried out from different angles: preserving the spatial composition [Böhm 2016; Kadłuczka 2018], preserving the value of the originality of the historic garden [Majdecki, Majdecka-Strzeżek 2018; Zachariasz2006, 2008], planting, and landscape context [Zachariasz 2007, 2008; Myczkowski 2003]. Research is conducted on a study scale of individual gardens and cities [Łakomy 2012; Mitkowska, Hodor, Łakomy 2012], as well as on the general method of operation. The analysis of the legibility of the spatial composition of the Las Zwierzyniecki was based on the experiences of the Krakow School and other Polish researchers [Sikora 2011, 2010]. The topic of social participation in the process of restoration of historic gardens has been included also [Koller-Szumska 2010].

History of the Development of the Spatial Composition of Las Zwierzyniecki in the context of the Branicki residence park complex

Las Zwierzyniecki is an element of the spatial composition of forests and parks forming the "green wedge" leading into the city, towards the Branicki residence from the North-East.

The Jan Klemens Branicki period (Baroque)

The times of Jan Klemens Branicki is the golden age in the development of Białystok, especially his baroque residence [Oleksicki 1996, p. 84–86; Nieciecki 1996, p. 53–58; Nieciecki 1999, p. 139–155]. The baroque palace and garden complex was adjacent to the city from the west and north, from other sides it was surrounded by animals forests: deer (from the south connected with the main compositional axis of the assumption) and fallow deer (from the east). These, in turn, were continued by Duży Zwierzyniec – the favorite hunting place of Branicki and his guests. In the 18th century Las Zwierzyniecki (known at the time as Duży Zwierzyniec) was a natural pine and spruce forest. At least 10 straight roads were marked out in the forest, crossing at various angles (Fig. 1A). They connected the residence with nearby villages and towns (Suraż, Bielsk), as well as an important compositional function, by forming lines of sight on attractive landscapes [Bończak Kucharczyk, Maroszek, Kucharczyk 2000, p. 39; Oleksicki 1996, p. 4–6]. Until the end of the 19th century some of these roads vanished, probably because they fell into disuse [Bończak Kucharczyk, Maroszek, Kucharczyk 2019].

The Partition Period

During the partitions of Poland the baroque residence fell into decline. The palace gardens and deer menageries deteriorated. Due to gradual deterioration they lost all of their original splendour [Dolistowska 2009, p. 15–196].

In 1895–1897 Stary Park (the old park) was created on the north side of the palace complex. Until 1918 Stary Park was known as Ogród Miejski (municipal garden) and later, until 1939 – Ogród Miejski im. Józefa Poniatowskiego (the Prince Józef Poniatowski Municipal Garden). In its original form it was a naturalistic composition

designed by Walerian Kronenberg with the cooperation of Teodor Chrzęński [Bończak Kucharczyk, Maroszek, Kucharczyk 2000, p. 37]. It was the main municipal park in Białystok at the time.

In the 1880s the Russian authorities had a strategic road to Baranowicze built, which divided Las Zwierzyniecki attitudinally into an northern and southern part. At the end of the 19th century a complex of buildings known as "Rozkosz" (delight), which served entertainment purposes, was built in place of the former forestry. A horse-drawn streetcar brought people to it running along one of the original trails (now the 11 Listopada street) [Maps of historical Białystok; Dolistowska 2009, p. 188–189]. The Rozkosz complex quickly became popular among the people of Białystok because of the open air parties, theatre and cabaret performances organised there. The place became attractive and summer houses began appearing nearby. The forest was decimated during World War I. A German military cemetery was placed in its north-western part. The cemetery no longer exists. In its place stands the building of the Białystok Radio station.

The Mid-War Period

In 1918–1939 the city authorities wanted to improve the city's image. This was largely to be achieved through modernisation and the creation of new green areas.

Park Planty was established in 1930–1938 in place of the old gardens and fallow deer menagerie surrounding the palace from the east and the south. They were designed by Stanisław Grala. The modernist character of the park's composition is seen in its broad diagonal main boulevard following an old ash and maple lined avenue [Bończak Kucharczyk, Maroszek, Kucharczyk 2000, p. 36; Poskrobko 1988, p. 21–23; Dolistowska, Szczygieł-Rogalska, Tomalska 2008, p. 84]. The line of the main prospect boulevard (the park's modernist axis) is emphasised by rectangular lawns with flowerbeds and lines of white cedar trees. Park Planty connected functionally and compositionally Park Stary on its north side with Las Zwierzyniecki in the south. In the second half of the 1930s Stary Park (at the time known as Ogród Miejski im. J. Poniatowskiego) was rebuilt in a modernistic style following the design of Stanisław Życieński-Zadora [Bończak Kucharczyk, Maroszek, Kucharczyk 2000, p. 38]. A rectangular plaza was created in front of the Dom Ludowy (People's House, designed by architect Jan Girin). Modern public parks (Park Stary and Planty with its boulevards) surrounded the baroque palace gardens. Their special arrangement refers to the compositional directions of the original composition.

The first attempts at bringing order to Las Zwierzyniecki in the mid-war period was the creation of a "living monument" giving its northern part the name Park Konstytucji 3 Maja (3 May Constitution Park) [Bończak Kucharczyk, Maroszek, Kucharczyk 2000, p. 40]. On 3 May 1921, on the 130th anniversary of the creation of the 3 May Constitution, three oaks, surrounded by a circle of 11 linden, were planted with ceremony at the junction of five footpaths. In 1924 Stanisław Życieński-Zadora created designs for a city park including the whole area of Zwierzyniec (Fig. 1B). The main element of the composition was a new avenue lined with a double line of trees (it was and almost straight continuation of the main avenue of Planty, at the same time matching the original radial distribution of the avenues in Duży Zwierzyniec) [Dolistowska 2009, p. 242–243]. On both sides of the main axis a network of footpaths developed, opening views on the forest. The geometric contrast between the straight main line of the composition and the twisting side paths was emphasised by three circular intersections on the main avenue. In 1930 renovation of Zwierzyniec in the modernist style began, based on a detailed plan by the city's first engineer J.B. Rybołowicz, which followed, in its main assumptions the 1924 design (Fig. 1C) [Bończak Kucharczyk, Maroszek, Kucharczyk 2000, p. 40]. The widened Aleja 11 Listopada (11 November Avenue) retained its original course. The new main avenue started at a circular junction connecting Zwierzyniec and Planty with three further such junctions emphasising its straight line. The first of them contained a monument and was encircled by an elliptical footpath [Bończak-Kucharczyk, Maroszek 2019]. In 1930 a monument was erected at the first junction in honour of dead officers and soldiers from the 42nd infantry regiment created by brothers Jakub and Kazimierz Juszczyk. The pathway system was complemented by avenues running along interesting groups of trees and shrubbery, a viewing platform on a small hill on the eastern side with a view on the ponds and stream in the north-eastern part [Bończak Kucharczyk, Maroszek, Kucharczyk 2000, p. 38; Maps of historical Białystok: 1937 map of Białystok, World War II era German map of Białystok]. In the 1920s and 1930s a sports complex was created on the west side [Bończak Kucharczyk, Maroszek, Kucharczyk 2000, p.38; Dolistowska 2009, p. 243]. The sports complex consisted of: city stadium (1926),

tennis courts, parachute tower. In 1920 a military cemetery was created at the junction of Al. 11 Listopada and Zwierzyniecka [Bończak Kucharczyk, Maroszek, Kucharczyk 2000, p. 38]. A monumental memorial created by J. Girin was erected in the cemetery in 1932. The cemetery stood out of its surroundings, it was surrounded with regular lines of cedars and oaks.

The division of Las Zwierzyniecki into two parts was established in this period – the more park-like northern part and a more forest-like southern part. The meridional division created by Aleja 11 Listopada was not a functional problem, because the traffic was limited [Dolistowska 2009, p. 243]. A bus line ran along Aleja 11 Listopada talking passengers to the restaurants in the former "Rozkosz" complex.

During World War II, in 1940 the Russian army destroyed the monument in honour of soldiers of the 42. infantry regiment, while the Germans cut down nearly 50ha of Las Zwierzyniecki to build an airfield in Krywlany [Bończak Kucharczyk, Maroszek, Kucharczyk 2000, p. 40],what is presented on German air photography from the final period of World War II.

After World War II

After World War II, even though the Branicki palace and its gardens were almost entirely destroyed, a decision was made to rebuild the baroque complex to preserve the cultural value of the cityscape. The residence was renovated in stages Nieciecki 2014, 7–118; Ogród Branickich 1998; Parki i ogrody zabytkowe 2011; Sikora 2010, p. 32–42; Sikora 2011].

The parks surrounding the residence were also renovated. The basic composition of Park Stary and Planty with Bulwary Kościałkowskiego (Kościałkowski Boulevard) created after World War Two remained true to the mid-war plan [Bończak Kucharczyk, Maroszek, Kucharczyk 2000, p. 36; Gawryluk 2015, p. 74–80]. The new elements of the plaza in front of the Aleksander Węgierko Theatre in Park Stary follow a modernist axial composition. In 2003–2007 the plaza was modernised (new pavement, fountain, lighting, street furniture), in 2014 a sculpture by Albin Sokołowski was placed in the centre of the plaza.

Changes to the visibility of the main axis of Planty were made by placing and removing small elements located along it. A monument in honour of the Soviet Army by Ślusarczyk and Danka, placed in the highest point of the axis was erected in 1951 and torn down in the 1990s. In 2000 the main fountain was modernised – the lighting sequences were harmonised with water jets. Other elements were also modified, which do not influence the legibility of the main compositional axis of Planty. In place of a so called "dry" fountain, a new playground was built following an individual project. The Serce (heart) pond nearby the rosary was also revitalised.

In the early plans developed for the city of Białystok after World War II Park Konstytucji 3 Maja (Park Zwierzyniecki at the time) and Las Zwierzyniecki were supposed to be a large green complex fitting the pre-war concept of a garden city proposed for Białystok [Oleksicki 2003, p. 98–107; Dolistowska 2009, p. 99–105 + graphic attachment].

In the 1960s Park Zwierzyniecki was excluded from the municipal area of Las Zwierzyniecki. Similarly to the other city parks it was under constant care and conservation. 30.12.1986 r. Park Zwierzyniecki was registered as a historical monument under the number A-138. The basic spatial composition of the park coincided with the pre-war concept. The course of the side alleys changed, but the main axis remained clear. The functional program for the park was modified [Bończak Kucharczyk, Maroszek, Kucharczyk 2000, p.41]. Construction in the 1960s and 1970s included: a small zoo called "Accent ZOO", and amphitheatre, fitness trail. At the turn of the 20th and 21st century a number of work projects were completed referring to the history of the park and further modernising its functional programme [Gawryluk 2015, p. 79]. New and reconstructed monuments were erected at the junctions (a memorial stone was erected in 2000 in honour of Polish soldiers murdered by the Soviets, as well as a replica of the monument honouring the soldiers of the 42. infantry regiment, who were killed in the war of 1920, created by brothers Jakub and Kazimierz Juszczyk, made in 1997 by Krzysztof Jakubowski and) and new pavements were laid. In 2007 the presence of a 3 May Constitution monument was re-established by placing a symbolic pyramid and planting additional trees. In 2010 a new playground was built and in 2010–2013 the existing small zoo was modernised.

In the 1970s 11 Listopada street was paved with asphalt and the roundabout at its end was removed. This divided the two parts of Las Zwierzyniecki with a street with automobile traffic. The western part of the municipal

forest, which is separated from the overall spatial composition, is now a green buffer between 11 Listopada and Świerkowa streets (and the nearby Białystok University of Technology and University of Białystok buildings) (Fig. 1D). In the eastern part of Las Zwierzyniecki an avenue remains leading to a circular junction where a memorial stone was placed in 1965 [Bończak Kucharczyk, Maroszek, Kucharczyk 2000, p. 41]. The stone was erected in honour of cpt. Stanisław Skarżyński, who flew over the Atlantic in 1933. The stone was moved to the junction from the square between the pre-war Park Zwierzyniecki and the barracks.

Some of the old footpaths in Las Zwierzyniecki disappeared or were removed. Over the years the footpath encircling the junction also lost its legibility (Fig.1D) [Zarzecki 2014, p. 63–64].

On 14 June 1996 a decree by the minister of the environment created a nature reserve called "Las Zwierzyniecki" with an area of 33.8 ha in the north-western part of the municipal forest. It was created in view of the scientific and educational value of its marshy forests characteristic for the region.

At the turn of the first and second decade of the 21st century the first stage of a new University of Białystok campus was built near the southern edge of Las Zwierzyniecki, designed by architect Marek Budzyński and his team. To create lines of communication between the various universities and the city centre, a concept was proposed called Park Czterech Uniwersytetów (the Four Universities Park) to be built in Las Zwierzyniecki.

Stages of development of the park composition of Las Zwierzyniecki

The stages of transformations in Las Zwierzyniecki were established based on an analysis of the history of development of the area, archival plans and maps of Białystok, as well as modern topography and flora.

Table 1. Stages of development of the park composition of Las Zwierzyniecki

	Stage	Characteristics of the stage
1	18th to early 20th c.	2nd half of 18th c. baroque composition of Duży Zwierzyniec. Multidirectional, multi-axis network of forest roads and paths, communication and landscape connections. In the 19th c. the composition loses its legibility.
2	Mid-war period	A modernist park connected with a landscape system, clear internal views
3	After World War II	The legibility of the modernist composition deteriorates. 1960s – the municipal forest is separated out – ongoing succession. 1996 – creation of a nature reserve in the north-eastern part of Las Zwierzyniecki – natural succession.

Analysis of the modern composition. Results

The modern composition of Las Zwierzyniecki is largely gone. Despite its forest character the main element of the modern composition are the four clear avenues radially diverging from the main circular junction. The oval avenue surrounding this junction at a distance of 110 m, which was a characteristic element of the modernist concept, is now almost invisible, its old course is partly visible in tree plantings. Marcin Zarzecki indicated in his analysis that the double circle of trees is broken in place of the edge of the German wartime airstrip [Zarzecki 2014, p. 62–63]. The composition was not completed with new plantings after the war. The peripheral avenue is all the less legible, as it does not currently function as walking path.

The main junction with the four converging avenues and the semi-circular junction closing the main avenue are inside or at the edge of the nature reserve (Fig. 2A). Fallen trees are not removed and can be seen in the protected part of the forest (Fig. 2B).

In the part of the municipal forest between 11 Listpoada and Świerkowa there are only unplanned transverse footpaths.

Propositions for design guidelines from a historical-compositional perspective. Discuss

Las Zwierzyniecki is an integral part of the green areas connected with the 18th century Branicki residence in Białystok. Even though it is the only city park which is not legally protected as a historical monument, because of its importance for the whole composition, it should be treated like the other parks [Zachariasz 2019, 2007, 2006; Kadłuczka 2018, Łakomy 2012]. In this sense it would be a good practice to include the guidelines of the Florence Charter for forest revitalisation [Zachariasz 2008, p. 150–161].

Las Zwierzyniecki is strongly connected with the history of the city and is an important element of its identity. At the same time it is obvious that historical park complexes undergo modification as their functions and surroundings change. We often see new identities arise or be introduced to a historical context in order to preserve and protect it [Bohm 2015; Myczkowski 2003]. Introducing new walking paths into the municipal forest would be expedient from this point of view, because it would fit better into the old park composition, restoring its legibility.

Białystok is an academic city. Currently many university buildings have accumulated around Las Zwierzyniecki. Walking lanes placed with respect for the ecological and cultural values of the forest would be an answer to the current needs of the city. Revaluation of a forest, which keeps to a certain standard brings various benefits: cultural (recreating the legibility of the historical composition), functional (improving communication and adding recreational value), social (increased sense of security) and economic (improving attractiveness for tourists; greater attractiveness of an area increases the value of surrounding real estate).

Suggested design guidelines taking into account historical and compositional values for the revitalisation of Las Zwierzyniecki:

- reducing the division of the forest into two parts by 11 Listopada street and its isolation from Park Konstytucji 3 Maja by Zwierzyniecka street (e.g. by changing the organisation of traffic in 11 Listopada and by vertically separating pedestrian and recreational traffic from automobile traffic in Zwierzyniecka by building a tunnel, elevated footbridge, gangway connecting both parts of the park, or other similar solutions);
- improving the legibility of main park interiors: circular junctions, the peripheral avenue and the radial avenues. In the contended area where avenues and junctions run along the limits of the nature reserve an interdisciplinary expert panel should be created to establish the best course of action [Zachariasz 2019, 2008, p. 154][3];
- design works should be inspired by the history of changes to the spatial and landscape complex [Zachariasz 2014][4];
- managing the forest and replenishing the tree stand in a public park should honour the historical values of the place;
- improving the standard of functional furnishings of the walking avenues and choice of materials should honour cultural values[5].

Establishing the final design guidelines should be made by committee of experts in a variety of various fields (architecture, landscape architecture, history, environmental protections, urban planning, etc.) The implementation should be preceded by consultations with the community to explain the concepts [Szumska-Koller 2010,

3 A. Zachariasz presents examples of contested (protection of a nature reserve vs protection of a historical monument) parks in Warsaw, as well as positive solutions in Pieskowa Skała in Ojców National Park, where vegetation is regulated to reveal a view of the castle.

4 All further changes to the composition of public parks connected with the palace gardens in Białystok were a continuation of these gardens providing a continuous "green wedge" reaching all the way to the city centre. Recreated or transformed parks were not copies of the baroque composition, but were inspired by it and at the same time were an expression of their respective epochs and a reflection of contemporary trends (naturalist and later modernist composition of Park Stary; modernist composition of Planty and Park Konstytucji 3 Maja). The entirety of the complex formed a coherent spatial composition formed of elements in different styles. In this sense, modern operations in Las Zwierzyniecki should also be an expression of the modern approach to the design of public parks, where inspiration for a new concept is drawn from the history of the place and its old identity, which is given a new identity concurrent with the identity of Białystok.

5 The functional program suggested for Las Zwierzyniecki cannot conflict with the historical and natural character of the place (e.g. in terms of noise, traffic, pollution, etc.) Suggested functions include: historical function (preserving the legibility and continuity of the green wedge, clarity of composition), communication (walking routs: university – city centre – housing quarters), entertainment (active and passive), science (nature reserve), education, tourism (cultural landscape).

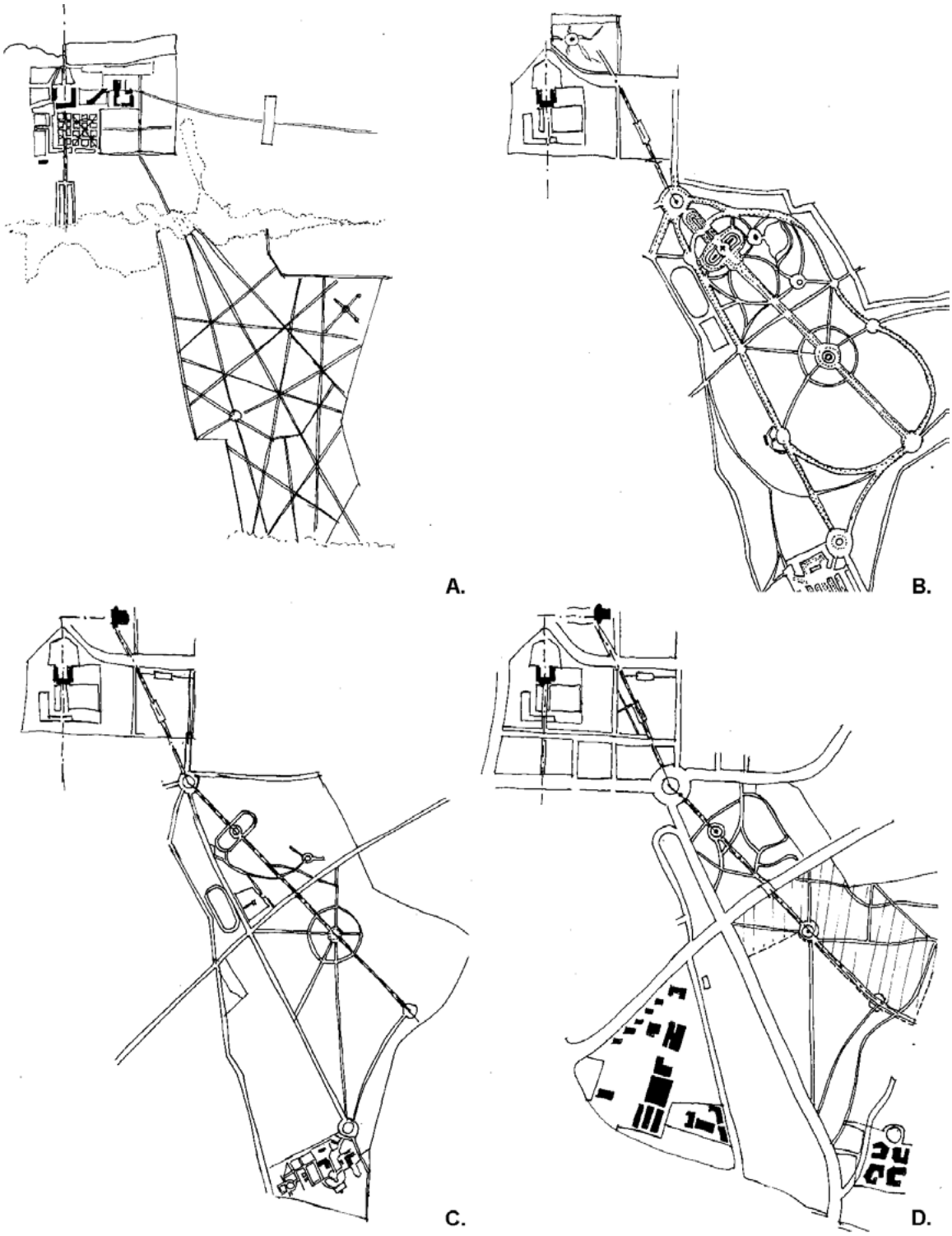

Fig. 1. Changes to the spatial composition of Las Zwierzyniecki in Białystok: A) Duży Zwierzyniec of the baroque Branicki residence, B) Design for Park Zwierzyniecki from 1924, C) the Park and Las Zwierzyniecki in 1937, D) Current state of Las Zwierzyniecki (all illustrations made by the author based on literature of main subject, 2018).

p. 57–60][6], especially after the lack of public consultations in 2017. The conflict situation resulted in halting the process of park revaluation.

Conclusions

Knowing the historical spatial composition of Las Zwierzyniecki in Białystok should be the main inspiration for the project of its revaluation. The proposed guidelines are supposed to help preserve the cultural values of the place, while at the same time giving it a modern dimension – a testimony to the times. The designs for the forest should be characterised by particular care for its existing natural and cultural value, important for the place itself, but also for the continuation of the baroque composition initiated in the 18th century by Jana Klemens Branicki.

A)  B) 

Fig. 2. Contemporary Las Zwierzyniecki: A) the main avenue closed by main junction, B) the nature reserve "Las Zwierzyniecki" (all photos made by the author, 2018)

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6 In communicating information to the local community concerning revaluation of Las Zwierzyniecki the city's experience with revaluating the palace gardens should be used. The media discussion so far, between the proponents and opponents of changes to Las Zwierzyniecki, resulted in compromises which did not answer the functional and compositional needs, as well as environmental protection conditions.

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Las Zwierzyniecki jako element kompozycji terenów zieleni Białegostoku

Streszczenie: W artykule przedstawiono historyczną i kompozycyjną analizę zmian dokonanych w „Lesie Zwierzynieckim" (obecnie park publiczny i rezerwat przyrody) w Białymstoku. Opisano etapy jego transformacji w kontekście zmian dokonanych w barokowym układzie rezydencji Branickich od XVIII do początku XXI wieku. Podjęto próbę opisania historycznych i kompozycyjnych wytycznych projektowych współczesnej rewaloryzacji Lasu Zwierzynieckiego.

Słowa kluczowe: Las Zwierzyniecki, rezerwat przyrody, kompozycja barokowa, tereny zieleni, Białystok

TEKA 2019, Nr 4
Komisji Architektury, Urbanistyki i Studiów Krajobrazowych
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Green areas in Białystok

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Summary: This work contains a description of four housing estates in Białystok from different decades of the 20th century. The approximate percentage of green areas in these states was determined based on available sources. Existing development plans were analysed with a view to the records regarding greenery. Own observations allowed to define the state of green areas – their functions, accessibility, quality and relation to space. The results of the analysis made it possible to discuss the observed problems and indicated the ways to solve them.

Key words: housing development, green area, local development plan, sustainable development, biologically active area, site summary

Introduction

There are numerous definitions of urban green areas. Most often it is understood as the general vegetation within the city limits and housing structures, which arose as a result of planned human action, taking into account the natural greenery present in the area. It is classified in various ways, in terms of functions, structure or accessibility.

Urban green areas are important elements of the city. They also perform numerous natural, social, economic, cultural and aesthetic functions. They have a positive effect on the climate and sanitary conditions as areas of air regeneration and exchange, suppress noise, shield from smoke and dust, bind carbon dioxide, has antibacterial effects and ionize the air [Banaszak, Izdebska, 1995]. They are an important component of the space planning process, introducing variety, contrasting with the architecture or emphasizing the forms [Zachariasz 2006]. They also become a place of recreation and social integration [Degórska 2004]. The New Charter of Athens emphasizes that *„ maintaining a possibility of contact with natural elements is not only a source of well-being, but also a prerequisite for survival",* also notes that *„environmental quality is a major factor in guaranteeing the economic success of a city – it also contributes to social and cultural vitality"* [The New Charter of Athens, 2003]. The standards of the World Health Organization indicate that the minimum area of green areas per one inhabitant should be 50 square meters. Moreover, the European Commission emphasizes the importance of the role that greenery plays in the process of sustainable urban development. This is particularly noticeable in the countries of Western Europe, where post-industrial areas are often transformed into green forms of high value as part of urban regeneration [Asani 2007].

It can be easily noticed that the need of green areas is used advantageously by various economic entities. For example, developers in Gdańsk add the word "Park" to their new housing estates' names, e.g. Alfa Park, Central Park, Chmielna Park, City Park, Gdańsk Myśliwska Park, Jodłowy Park, Neptun Park, Oliwa Park

[Korwel-Lejkowska, Topa 2017]. The names of two Białystok housing estates: Zielone Wzgórza ('Green Hills') and Leśna Dolina ('Forest Valley') can also prove this. Without a doubt, greenery significantly affects the way we see a modern city and its elements; it even becomes its showcase [Godzina 2015; Sutkowska 2006]. It is emphasized that in the face of the progressing urbanization and transformation of the urban landscape, greenery is a means of protecting man and his living environment [Oleksiejuk 2005]. The impact of green areas on the reduction of the cost of communal services, the development of the local economy and improvement of the quality of life of residents is also significant [red. Berghöfer 2011]. The presence of more arranged green areas translates into greater potential for shaping the functional and spatial structure of the city [Godzina 2015]. In addition, public space (of which green areas are one type) of high aesthetic quality makes people want to stay in it longer and establish social contacts more willingly [Gehl 2009]. It is also noteworthy that the quantity and quality of urban greenery can be one of the indicators of sustainable development [Mierzejewska 2004].

For the purpose of this study, four housing estates in Białystok built in different time frames were selected: Piaski (1970s), Słoneczny Stok (1980s), Zielone Wzgórza (1990s) and Nowe Miasto (developing since the late 1980s to the present). The local plans were analyzed for greenery records, greenery calculations were made based on publicly available orthophotomaps and vector data and own field observations were carried out. The obtained diagnosis of the current state of greenery in these estates – its main functions, quality, accessibility and connection with space – allowed to indicate the biggest problems and the ways to solve them.

Characteristics of residential green areas in Bialystok on the example of selected housing estates

The Piaski Housing Estate was established in the 1970s following the project of the Zakład Projektowania Inwestycyjnego „Inwestprojekt" in Białystok. The main designer was mgr inż. arch. Danuta Łukaszewicz [SM Piaski website, access 30/05/2019]. In 2004, the estate was combined with Osiedle Tysiąclecia, which is in turn a clear example of a self-sufficient housing estate. Its construction began in 1959 with the thought of both residential buildings and social infrastructure, e.g. shops, nurseries and kindergartens. To this day, Piaski and Osiedle Tysiąclecia are considered the most thought-out and best implemented investments in the city. The presence of ore green areas compared to other housing estates in Białystok can be noticed [Kłopotowski 2016]. The only drawback is the fact that the designer of this estate, arch. Marian Najmowicz, did not foresee the need for more parking areas – at the time (1960s), the cars were quite rare in Poland, so nowadays green areas are being adapted for car parks.

Although currently Piaski and Osiedle Tysiąclecia are again separate units, even on official city portals it is still shown that Osiedle Tysiąclecia is part of Piaski. Therefore, for the purposes of the analysis, these estates were treated as a coherent whole.

There are two local spatial development plans in this area – *MPZP części osiedla Piaski w Białymstoku (rejon ul. Mazowieckiej i Żelaznej)* from 2011 and *MPZP części osiedla Piaski w Białymstoku (rejon ul. M. Curie-Skłodowskiej i Legionowej)* from 2019. These plans contain both typical entries (determination of the share of biologically active area and designation of arranged green areas) and more precise ones, indicating the nature of the estate (preservation and development of green areas, preservation of the biologically active surfaces around trees, as well as an order to plant at least one tree for each cut down within a building plot and at least one tree for 5 parking spaces within the parking lot or at its borders). There are no plans regarding only the greenery, and a separate company is responsible for maintaining it within the estate. It is also worth mentioning that there is a natural monument established on October 29th, 2016 – pedunculate oak *Quercus robur* that is over two hundred years old, 23,50 m high and with trunk circumference of 326 cm measured at a height of 130 cm [GDOŚ, access 27/04/2019].

Słoneczny Stok was established in the 1980s. Its designers, Jan Citko and Janusz Dmowski, paid special attention to the terrain layout, making the use of space dependent on it [Kłopotowski 2016]. There are 3 local spatial development plans in the estate:

- *Zmiana MPZP części rejonu administracyjnego Starosielce-Marczuk (rejon ulicy Szarych Szeregów)* from 1997;
- *MPZP części osiedla Słoneczny Stok w Białymstoku (rejon ul. W. Witosa)* from 2004;

- *MPZP części doliny rzeki Bażantarki (odcinek w rejonie Stawów Marczukowskich i ul. ks. Jerzego Popiełuszki w Białymstoku* from 2010.

In the first of these documents, there is a record about the need of developing at least 25% of the area as the housing estate green (defined as: '*lawns, woodlands and bushes, playgrounds for children and places of everyday rest*'). The records of the next document mention greenery only in the form of a ban (a ban on planting trees and plants with extensive root systems in the technical infrastructure area). The last document is different, as it regards the valuable natural area of the Bażantarka river valley. It imposes several obligations: maintaining the continuity of spatial connections within the natural system and the biological housing of the river bed, protection of the open waters, shaping biologically active natural floodwaters due to the renaturalization of Stawy Marczukowskie and the banks of the Bażantarka river bed. It also bans introduction of vegetation incompatible with habitat conditions, plantings that divide the river valley transversely and activities that could potentially harm the environment. There are no plans regarding only the greenery, and a separate company is responsible for maintaining it within the estate.

Zielone Wzgórza was established in the early 1990s. Two local spatial development plans are in force there – the already mentioned *Miejscowy plan zagospodarowania przestrzennego części doliny rzeki Bażantarki (odcinek w rejonie Stawów Marczukowskich i ul. Ks. J. Popiełuszki) w Białymstoku* and *Miejscowy plan zagospodarowania przestrzennego części osiedla Zielone Wzgórza w Białymstoku* from 1997. The latter one, the oldest such document in Białystok, was drawn up for the planned investment (current Galeria Zielone Wzgórze, construction of which began in 2006). It claimed that the original vegetation cover should be kept until its implementation and the future greenery was to fulfill only decorative and – along the communication routes – protective functions. However, its share in the entire area was not determined. Given the specifics of the estate (the lack of larger green areas, squares or parks), this was not a particularly apt move. There are no plans regarding only the greenery, and a separate company is responsible for maintaining it within the estate.

The last of the examined units is Nowe Miasto. Its construction began at the end of the 1980s. Nowadays, it is the most densely populated housing estate in Bialystok, neighbouring the rapidly developing village of Kleosin and Krywlany airport [Portal Białystok Online, access 12/02/2019]. There are 6 local spatial development plans in its area:

- *Zmiana MPZP części osiedla Nowe Miasto w Białymstoku (rejon ul. Zapiecek)* – 1997;
- *MPZP części osiedla Nowe Miasto w Białymstoku (rejon Al. I. J. Paderewskiego)* – 2006;
- *MPZP części osiedla Nowe Miasto w Białymstoku (w rejonie ulic: K. Pułaskiego i Transportowej)* – 2006;
- *MPZP części osiedla Nowe Miasto w Białymstoku (w rejonie ulic Ścianka, Starosielce i P. Łodzińskiego)* – 2006;
- *MPZP części osiedla Nowe Miasto w Białymstoku (w rejonie ulic Pułaskiego, Sławińskiego i Wiadukt)* – 2008;
- *MPZP części osiedla Nowe Miasto w Białymstoku (w rejonie ulicy Składowej)* – 2010.

The first document does not mention greenery at all. The next one contains information on allocating 29 hectares of agricultural land for non-agricultural purposes and 0,5 hectare of forest land for non-forest purposes (i.e. for new residential and service buildings). Further records impose the necessity of allocating part of the area for insulation green areas and leaving the existing forest to serve as public and recreational greenery. They also require that the watercourse valley along Aleja J. J. Paderewskiego shall be preserved in its natural and semi-natural state. However, no records mention the required minimum share of biologically active surfaces in the housing estates.

MPZP części osiedla Nowe Miasto w Białymstoku (w rejonie ulic: K. Pułaskiego i Transportowej mentions the allocation of 8,9 hectares of agricultural land for other purposes. Unlike the previous document (notabene, passed on the very same day), it contains more detailed records regarding greenery. For example, it requires maintaining a minimum of 40% share of biologically active surfaces in the areas intended for education buildings, 30% in the areas intended for religious buildings and housing estates with service buildings. It should be noted that these values are higher than the ones in different local development plans in force in Białystok.

Another of the analysed documents also specifies the minimum share of biologically active surfaces for different zones, just like the previous plan. In addition, it imposes the obligations to preserve the existing stand of noble species with a breast height diameter exceeding 30 cm, to maintain the biological housing and the

open nature of the Bażantarka watercourse, and – regarding the construction of car parks – to introduce high greenery in the proportion of at least one tree for five parking spaces.

The fifth analyzed local plan sets similar proportions for the biologically active surfaces. It also indicates the area designated for public greenery with a recreational function, ordering the preservation of the existing stand and the structure of the vegetation cover. Moreover, the document enforces maintaining the continuity of spatial connections of the Horodnianka river valley and other biologically active areas through biological maintenance of the river housing and its open nature. It also imposes the obligation to create dense multi-stage greenery strips along Aleja I. J. Paderewskiego, especially in the vicinity of residential and service buildings, and allotment gardens. Additionally, it requires the introduction of high greenery – a minimum proportion of one tree for five parking spaces.

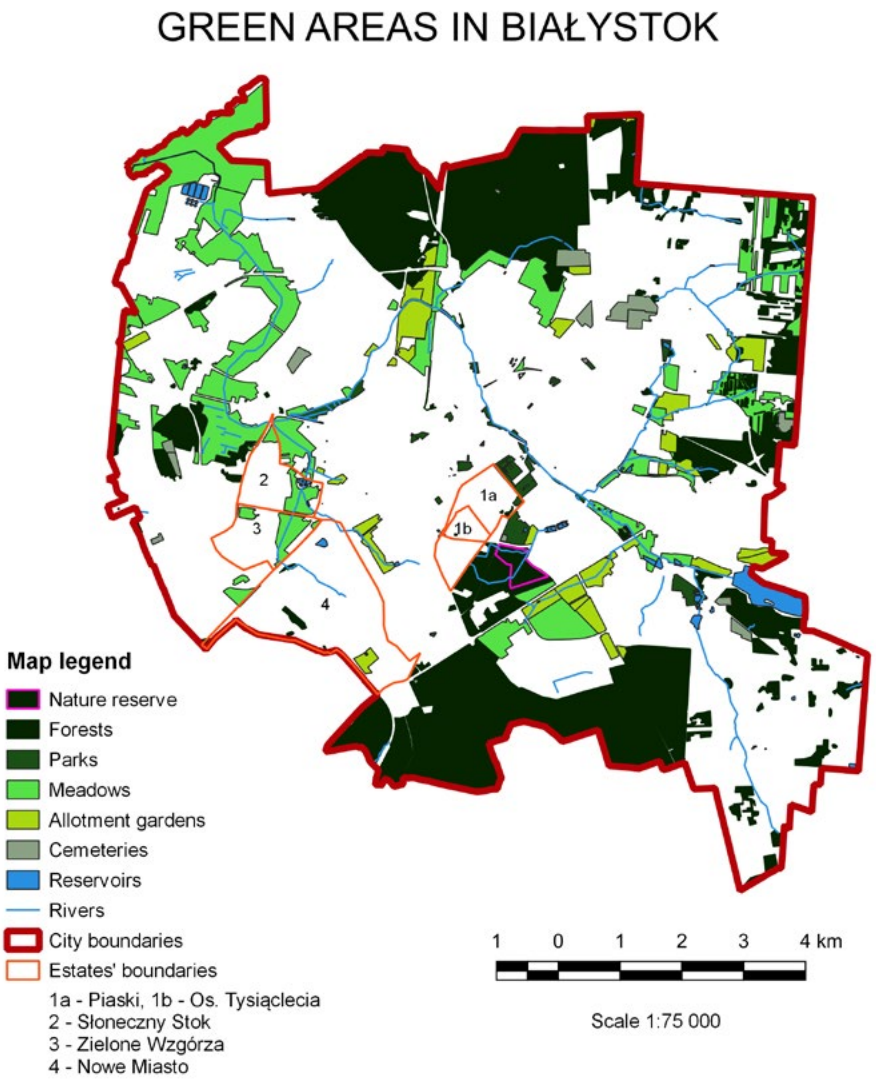

Fig. 1. Green areas in Białystok, own elaboration in QGIS 3.4.8 based on available public sources

The last of the examined documents requires: the preservation of the existing watercourse in the form of an open ditch with the biological casing of the banks, the maintenance of the existing stand and the structure of the plant cover in the area designated for arranged greenery, and the use of undeveloped and unpaved surfaces for various forms of greenery with elements of landscape architecture. The records regarding the share of biologically active surfaces are identical to the ones in the other plans in force within this estate. There are no plans regarding only the greenery, and a separate company is responsible for maintaining it within the estate.

Figure 1. shows the green areas in Bialystok and the borders of the examined estates. Table 1 presents the share of various types of the greenery in the chosen estates, calculated using available orthophotomaps and vector data. It should be noted, though, that only the areas with specific function were taken into account. The share of greenery understood as biologically active surfaces would be higher. The conclusions of the inventory carried out on April 24–26th, 2019 are presented in Table 2., while Table 3. lists the possible solutions of the observed problems.

Table 1. Share of individual types of green areas in the area of housing estates, own study

Estate	Piaski and Tysiąclecia	Słoneczny Stok	Nowe Miasto	Zielone Wzgórza
Total area of the estate [hectare]	**133,41**	**108,78**	**389,38**	**114,04**
Green area [hectare]	**21,21**	**41,80**	**48,75**	**45,37**
Total greenery [%]	**15,90**	**38,43**	**12,52**	**39,78**
Forests and trees [%]	0,74	–	2,01	5,20
Parks and recreation areas [%]	0,54	2,95	–	–
Fields [%]	–	24,67	–	26,73
Allotments [%]	–	–	2,09	–
Playgrounds [%]	0,71	1,69	0,23	0,68
Military training fields [%]	–	–	6,72	–
Lawns [%]	7,15	–	–	–
Water tanks [%]	–	1,58	0,45	–
Greenery accompanying transit routes [%]	5,44	2,57	0,29	2,15
Greenery accompanying educational facilities [%]	1,32	4,97	0,73	5,02

Table 2. Presence of green areas in housing estates

Estate	Piaski and Tysiąclecia	Słoneczny Stok	Nowe Miasto	Zielone Wzgórza
Main functions	Recreational, insulating, aesthetic	Areas of great natural value (Bażantarka river valley), recreational, isolating and aesthetic	Insulating, productive (allotments), other (military areas)	Valuable natural areas (Bażantarka river valley), isolating, aesthetic
Quality	Good (one park and other ones neighbouring, large share of high greenery, presence of old trees and 1 natural monument)	Rather good (recreational areas and valuable natural areas, rich and diverse decorative greenery)	Below the average (no recreational areas, neglect of some areas)	Average (no recreational areas but valuable natural areas, rich and diverse decorative greenery)

Estate	Piaski and Tysiąclecia	Słoneczny Stok	Nowe Miasto	Zielone Wzgórza
Connection with space	Good (direct connection with green areas important for the city, greenery filling the space between buildings)	Rather good (the presence of recreational areas, greenery filling the space between buildings, enhancement of buildings' aesthetical values thanks to decorative greenery)	Below average (greenery accompanying single-family buildings as a way of separating them from the surroundings, open areas only where technical infrastructure prevents different use)	Average: (enhancement of buildings' aesthetical values thanks to decorative greenery, greenery accompanying single-family buildings as a way of separating them from the surroundings)
Availability	Good (publicly available; proximity of parks located in neighboring estates)	Rather good (publicly available but some residents may have difficulty reaching it due to the difference in altitude)	Below average (most of greenery not publicly available)	Rather good (publicly available)

Table 3. Possible solutions of the observed problems

Estate	Suggestions
Piaski & Osiedle Tysiąclecia	1. Preservation of existing greenery – preventing the land from being used for other functions 2. Construction of diverse associated infrastructure
Słoneczny Stok	1. Introduction of more high greenery 2. Creating new green areas in the centre of the estate
Nowe Miasto	1. Renovation of green area 2. Introduction of more high greenery. Should it be impossible due to the presence of technical infrastructure – replacing lawns with flower meadows 3. Creating new green areas in the centre of the estate
Zielone Wzgórza	1. Introduction of more high greenery 2. Creating a recreational area accessible to all residents

Summary

Green areas play an important role in shaping the city's image. They significantly improve the aesthetics of the environment, shape the microclimate and protect against noise and pollution. In addition, they constitute the most accessible recreation areas for residents and create conditions for social integration. It is therefore necessary to develop favorable greenery solutions in the spatial planning process and to identify specific areas of greenery as important for the city in order to protect them from improper and uncontrolled investment in the future.

It is worth remembering that not all types of greenery perform identical functions. Therefore, reducing the issue of greenery in the planning process to a certain percentage of biologically active surfaces is highly disadvantageous. The local plans should contain more detailed entries. For example, more land ought to be

allocated for greenery and the existing stand shall be preserved. Landscape architects should play a greater role in the process of creating new estates, so that the buildings are harmoniously incorporated into their surroundings and accompanied by carefully selected vegetation that would enhance their features. The solutions such as green roofs or green walls can be employed. Although they will never completely replace 'classic' green spaces, their presence is also beneficial thus highly desirable.

Considering the condition of the greenery in the examined housing estates in Białystok, it can be stated that its potential is under-utilised. The existing green areas are well-kept and pleasing to the eye, but it should be remembered that the aesthetic function should not be the only one they perform. The analyzed estates lack easily accessible recreational spaces for residents and larger green areas within their borders, such as parks. In addition, shortage of high greenery can be seen in three out of four analyzed estates. Hence the solutions:

- Prevention of turning the green areas into parking lots;
- Maintenance of existing greenery and ensuring they perform their functions well;
- Increasing the share of high greenery;
- Creation of recreational areas that would be accessible to all residents of a given housing estate. If it is impossible to attain a larger area for the park, it is postulated to create several pocket parks, evenly distributed throughout the estate.

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TEKA 2019, Nr 4
Komisji Architektury, Urbanistyki i Studiów Krajobrazowych
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Social participation in designing urban spaces related to green areas on the example of Białystok

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Abstract: Social participation is a tool thanks to which newly designed places can be adapted to the needs of residents as much as possible. People can also decide to extend the functional program of the housing estates where they live. Therefore, this phenomenon has a real influence on shaping their close surroundings. The article analyses how social participation takes place in Bialystok on the example of the Civic Budget organized by the Municipal Office.

Keywords: social engagement, participation, Bialystok, Civic Budget, land development

Introduction

The sense of connection with the place of residence has various meanings for people, which may manifest in the form of local patriotism that they share with their neighbors. One of the levels of the spatial and social structure of the world is formed by the inhabitants of settlement units together with a given place, i.e. e.g. a city district. Such a community is shaped by collective contacts of people (not necessarily personal) and at least a superficial knowledge of the place [Pawłowska 2001]. The ability to have an influence on various decisions of the authorities in matters concerning residents strengthens their sense of belonging and gives them causative power. Therefore, social engagement refers to the participation of individuals in collective activities undertaken in the communities to which they belong or in which they live every day. The right reference frames is, in this case, the idea of civil society [Kaźmierczak 2011].

Participation is not limited to information but is primarily interactive. It is also not a random activity, but a consciously organized process of involving citizens. Thanks to this, they gain a certain level of influence on the decisions they make [Kaźmierczak 2011].

Material and methods

In the article, there was searching for a way in which social participation influences the city's landscape and contributes to the creation of new places, in particular, those that are related to green areas. The study was conducted on the example of the Bialystok city, where the Citizens' Budget (in polish: Budżet Obywatelski) has been carried out annually for several years. The whole process is public and the City Hall provides on its website information on implemented projects in individual editions of this initiative. Based on the obtained data, the projects were classified according to their type to show the strength of impact and possibilities of influencing that the inhabitants of Białystok both on the view of their nearest neighborhood locally and on the city scale. The submitted projects were divided into a housing estate and municipal. However, in this study, it was

decided to collectively summarize all implementations regardless of the project's scale, while the differentiation criterion was the type of investment and its purpose.

Results and discussion

Social participation

The concept of social engagement means the participation of citizens in managing the affairs of the community of which they are members. Therefore, it is difficult to talk about maintaining harmony between spatial and social development of a place without allowing residents to co-decide on its spatial development. Local government activists organizing people's participation in spatial projects contribute to the sense of inhabitants' familiarity with a given area in the same way as an architect designing a house, urban planner shaping a square, or sculptor creating a monument [Pawłowska 2001].

An important goal of participation is to involve future users in the specific design process. It requires some effort made by local authorities in cooperation with experts, but the successful participation of residents in designing brings many benefits. Members of the community should be invited to engage in the early stages of design because their participation only after all-important decisions could be considered dismissive. Experts should prepare many different variants of solutions to choose from and reveal the scope of their capabilities so that quick actions can be taken. For future users participating in the design process to have a good idea of the new appearance of space, it is good to use visual or spatial materials showing design solutions [Bell et al. 2004].

In Poland, many different instruments and techniques are using to involve citizens in deciding on public matters. To order such forms of participative tools, the following divisions were introduced:

- due to the base for taking action by public authorities:
  a. obligatory – public authorities have their constitutional or statutory obligation to use them,
  b. facultative – used as a supplement to mandatory tools or to improve the quality of public management, their use depends on public authorities,
- due to the implementation method and used techniques:
  a. based on traditional institutions of direct democracy (e.g. referendum, access to public information, institution of complaints and requests, meetings and public debates),
  b. innovative, using communication and participation methods specific to the enterprise sector (customer-oriented), using new communication techniques (ICT), or using modern research techniques [Noworól et al. 2012].

K. Pawłowska [2012] in her article *Partycypacja społeczna w podejmowaniu decyzji dotyczących przyrody w mieście (en: Social participation in making decisions about nature in the city)* describes the basic forms of participation, dividing the whole process into 5 phases:

- Phase 1 – informing stakeholders
  - Public information sharing alone may not be sufficient to effectively interest the local community. Good practice in this case is modeling on commercial advertising and using information forms appropriate for a specific target group.
- Phase 2 – pre-project analysis of needs
  - Badania społeczne nie mogą ograniczać się jedynie do przeprowadzenia ankiet. Powinno stosować się metodykę odpowiednią do oczekiwanych rezultatów, dlatego też np. przeprowadzanie warsztatów projektowych będzie lepszą metodą w przypadku chęci pozyskania inspiracji niż wypełnianie ankiet.
- Phase 3 – project presentations and explanations
  - Just meeting the legal requirements to make individual documents available for review does not guarantee the effectiveness of starting a dialogue with stakeholders. It is also good to explain the plans so that they should be understood by non-professionals. The presenting person should be well prepared for the presentation and explanation of the project.

- Phase 4 – public discussion
  - Discussions should take place not under pressure of conflicts, but on the initiative of local authorities with the participation of a mediator who wants both parties to reach an agreement. Lack of knowledge in the field of social communication in people conducting such discussions can only cause the escalation of conflicts.
- Phase 5 – negotations
  - Compromise is not the best result of negotiations, because in this case, both sides must give up something. Therefore, a win-win agreement should be sought. For negotiations to take place in an atmosphere of mutual respect, it is worth inviting a competent mediator to them.

The implementation of the individual phases is directly related to the use of tools used in social participation, among which can be distinguished:

- studies,
  - quantitative methods,
  - qualitative methods,
- debates,
- workshops[1].

Fig. 1. Leaflet encouraging to submit the project to the civic budget (source: http://www.bialystok.pl/pl/wiadomosci/aktualnosci/bialostockie-centrum-konsultacji.html)

Conducting research is mainly aimed at understanding the needs and opinions of the local community that are related to selected issues. Studies are mostly conducted in many forms. Those are surveys, polls, and interviews using paper or electronic questionnaires. They can be also conducted in oral form. Quantitative methods are used to collect data that allows answering the question "how much?". They tell us among others, whether the idea has more supporters or opponents. Qualitative methods, on the other hand, rely mainly on observation and searching for causes and motivations. It is also practiced that studies are mixed and carried out by combining both methods. Thanks to the debates, it is possible to find out the opinions of its participants during discussions on a given topic. They are mostly in open forms and experts associated with a given issue are invited to it. Workshops, on the other hand, are used to involve the community in practical aspects such as developing an action plan or visions of desired changes. Very rarely the authorities limit themselves to choosing only one tool because greater effectiveness in participation is obtained by combining them in various combinations, e.g. debates + studies, workshops + debates, etc. and in particular, using all the tools consecutively according to a specific schedule.

1 http://partycypacja.fise.org.pl/x/777930 (dostęp: 13.02.2017)

Initiatives like the civic budget are good examples of involving residents in the space planning process (Fig. 1). Therefore, citizens can submit their projects for consultation and consideration, and those with the most votes will be implemented. A specific amount of money is allocated for implementation to be used in housing estate and city-wide projects.

Participation in Białystok

The Civic Budget is an initiative under which the inhabitants of Białystok decide about the allocation of part of the city's budget. They have the opportunity to submit proposals of their projects for implementation and then they can vote for them. Therefore, it is a form of facultative participation organized by local authorities. As part of the Bialystok Civic Budget, since 2013 it is possible to submit projects belonging to the city's or district's tasks, having a city-wide or housing estate character2. Moreover, they should be located in the area belonging to the municipal.

Projects submitted to the budget of 2020 had to have the support of at least two city residents, which is a significant simplification compared to previous years, where it was required a minimum of 20. It is worth noting that the preparation of the city resolution draft about the particular editions of the Civic Budget also takes place on the road of social consultations at the very beginning. After the resolution comes into force, residents are informed about the upcoming possibility of submitting their projects via the website and leaflets.

Then, the recruitment process is carried out simultaneously with the public consultation. In recent years, information and educational meetings with the inhabitants of Bialystok have been held several times and in various places, during the period intended for submitting and consulting projects. Most often in the second quarter of the year to which the given edition of the Civic Budget concerned. Special consultation points serviced by the employees of the office are available in the buildings of the Municipal Office in Bialystok. There are also organized so-called marathons for writing applications, i.e. events where people are encouraged and supported to submit a project almost all day long.

	BUDŻET OBYWATELSKI	BUDŻET PARTYCYPACYJNY	BUDŻET OBYWATELSKI	BUDŻET OBYWATELSKI	BUDŻET OBYWATELSKI	BUDŻET OBYWATELSKI	BUDŻET OBYWATELSKI
	2014	2015	2016	2017	2018	2019	2020
PRZEZNACZONA KWOTA	10 mln zł	12 mln zł	20 mln zł	10 mln zł	10 mln zł	10 mln zł	12 mln zł
LICZBA PROJEKTÓW ZAKWALIFIKOWANYCH DO GŁOSOWANIA	51	56	57	62	44	93	90
		24 duże	28 ogólnomiejskich	25 ogólnomiejskich	17 ogólnomiejskich	16 ogólnomiejskich 36 osiedlowych	29 ogólnomiejskich
		32 małe	29 osiedlowych	37 osiedlowych	27 osiedlowych	33 oświatowe 8 zielonego budżetu	61 osiedlowych
LICZBA PROJEKTÓW REKOMENDOWANYCH DO REALIZACJI	7	15	39	29	36	27	32
		4 duże	18 ogólnomiejskich	7 ogólnomiejskich	11 ogólnomiejskich	8 ogólnomiejskich 10 osiedlowych	11 ogólnomiejskich
		11 małych	21 osiedlowych	22 osiedlowych	25 osiedlowych	8 oświatowych 1 zielonego budżetu	21 osiedlowych
PROJEKTY ZREALIZOWANE	7	14	36	26	26	4	wschodzący Białystok

Fig. 2. Table showing the number of projects submitted in subsequent editions (source: Materials shared by City Office of Białystok in presentation that presents results of Civic Budget 2020 on their website).

The next step is the verification of the projects and the announcement of qualified projects that people can vote for. At the same time, a promotional campaign is starting to encourage residents to vote for selected

2 http://cas.bialystok.pl/pl/budzetobywatelski/

projects. In recent years, a festival has also been organizing where the originators could encourage the selection of their projects. Each resident can vote on the internet or by paper form. Through the last few years, as a result of this initiative, many projects were implemented, as shown in the table below (Fig. 2).

The projects concerned many aspects of citizens' lives. They can be included in the following categories:

- communication – projects aimed at renovation, modernization, extension or construction of new pavements, bicycle paths, parking lots or roads;
- cultural events – that is, the organization of various types of social, cultural, educational or sporting events;
- land development – projects related to green areas as well as sport and recreation;
- sports facilities – single sports facilities such as fields or an outdoor gym;
- other – projects that cannot be assigned to the above categories (eg related to the city's history or health protection).

Below, it is presented a chart with the participation of individual categories of projects that qualified for implementation in the 2016–2020 editions, compared to their overall number.

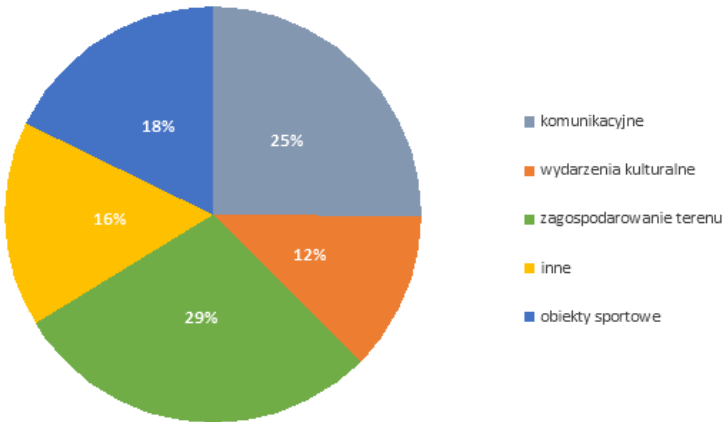

Fig. 3. Percentage share of individual projects qualified for implementation in the 2016–2020 editions (source: Prepared by author basing on data shared by City Office of Białystok).

Based on this pie chart, it can be stated that projects aimed at developing a specific area represent the largest percentage of all projects submitted, followed by projects related to improving communication. However, taking into account the trend in reporting the number of individual projects (Fig. 4), it can be concluded that the number of projects that would need the knowledge of landscape architects at the consultation stage may increase even more.

Reducing the number of required signatures to submit the project is a big simplification. For example, it is enough to have the support of the closest family (and fulfill the requirements from resolution) to have a chance for the second stage. It happens probably to encourage residents to submit more projects. But on the other hand, the quantity will not always result in the quality, and the question arises if the entire amount of budget should always be spent, or maybe it would be better to focus on developing the best ideas. For this purpose, it would be helpful to introduce some certain conditions that must be met in order for the project to be implemented (submitted to tender). Of course, it is difficult to talk about all projects here, but it happens that a relatively small group of people in the city scale decides about the implementation of the given project, regardless of whether deeper analyzes would show its validity. A good example is the construction of 16 petanque tracks in a poor functional arrangement in Fredro Park. 946 people supported this investment amounting to 205,000 zł. It was enough for it to be implemented, while only 2 or 3 such tracks could be enough, and the rest of the area could be arranged (and money spent) differently. There are also cases where the number of votes even below 200 (e.g. 164 in 2016 or 116 in 2017) determined the qualification of a given project for implementation.

Despite all, the amount of work put into activating the society and encouraging it to participate brings not only many benefits but also opportunities to improvement of relations with local authorities and improve their functioning through cooperation. Such integration serves the mutual recognition of limitations and new possibilities.

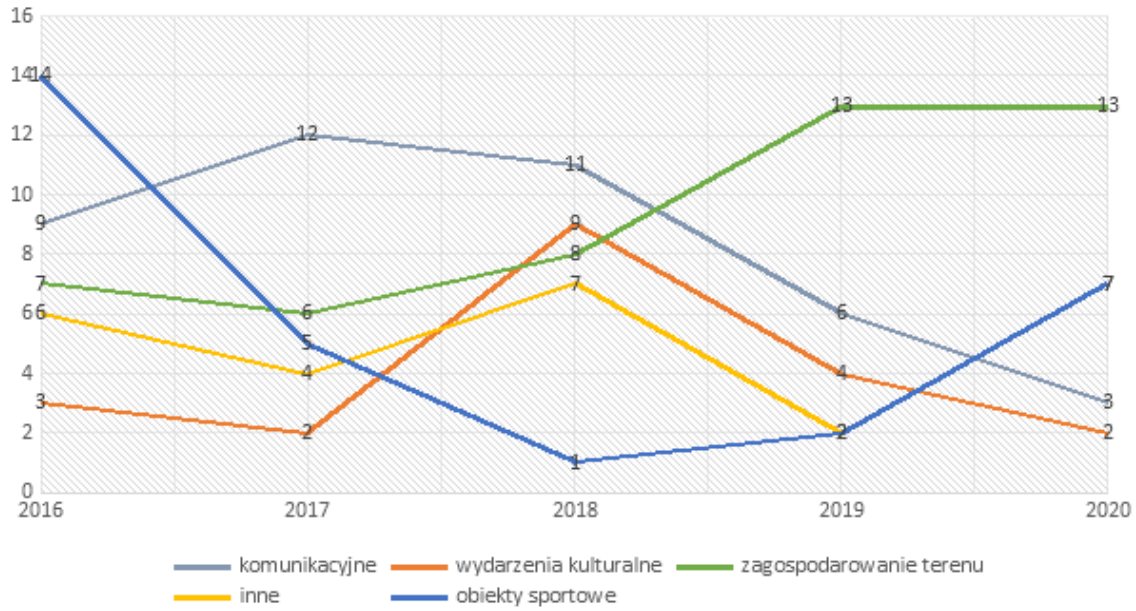

Fig. 4. Change in the number of qualified projects over subsequent editions (source: Prepared by author basing on data shared by City Office of Białystok).

Fig. 5. Boule tracks in Fredro Park (source: gisbialystok.pl).

By including the area's inhabitants in planning, it is possible to use their practical knowledge, as well as their inspiration and ideas. On the other hand, the authorities can explain their intentions more effectively and learn about the residents' reaction to the proposed changes. Designers have a chance to better understand the needs of future users, so they can better adapt space to them. The opportunity to participate in the design process also contributes to greater acceptance and increased public confidence in current and future projects.

Educated over time, residents can participate more and often in the plans of local authorities, which is conducive to the development of civil society. Whereas, public information about enterprises reduces the phenomena of corruption, nepotism, cronyism or manipulation [Pawłowska 2008]. The possibility of social consultation of local problems is conducive to their identification and increases the probability of developing accurate and socially acceptable decisions aimed at a constructive solution to such problems. Improving the dialogue between local authorities and the community significantly limits the rising of conflicts, promotes the activation of society and ultimately contributes to the increase of the resident's quality of life [Kwiatkowski 2003].

People involved in the process of social participation also acquire knowledge about the competences of individual city departments and institutions that can help them in solving various problems [Zając 2014].

Conclusion

The local community, due to their daily functioning in a given area, has a broad view on many issues that concern it. The sooner residents are included in the space planning process, the better. It is good to encourage people to get involved in transforming space as soon as possible, thanks to which they will increase their sense of community and responsibility for a given place [Project for Public Spaces 2000]. Social participation is, therefore, a tool thanks to which newly designed places can be adapted to the needs of residents as much as possible.

However, if people have a free hand, they will not always be aware of their needs or may not know what the possibilities of transforming their environment are. They also often look through the prism of local trends, as it is good illustrated by the "mass production" of subsequent outdoor gyms. As a result, many such places become empty over time. Therefore, it can be stated that meetings with experts in the field of space design at the initial application stage would help to make a project that is better adapted to the needs of a given group (and at the same time going by the principles of composition and aesthetics). Examples are the designs that for example, have been created in cooperation with landscape architects since the very beginning. They are well thought out, not only when there is a space with a larger area for development. Creating a place design as a result of an invitation to tender does not necessarily have to bring the same effects as in the case when more guidelines would have been established in the earlier stages of the project in cooperation with specialists. On the other hand, architects and designers who lived in the space covered by the Civic Budget, also have the opportunity to submit the design just like any other citizen. Perhaps their engagement in this area (on a micro and macro scale) would contribute to improving the city's image.

Note. The article was prepared in frames of the statutory work S/WBiIS/2/2016 realized by WA, PB.

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Partycypacja społeczna w projektowaniu miejskich przestrzeni związanych z terenami zieleni na przykładzie Białegostoku

Streszczenie: Partycypacja społeczna jest narzędziem, dzięki któremu nowo projektowane miejsca mogą być w jak największym stopniu dopasowane do potrzeb mieszkańców. Ludzie mogą również decydować o rozszerzeniu programu funkcjonalnego osiedli, na których mieszkają. Zjawisko to ma więc realny wpływ na kształtowanie ich najbliższego otoczenia. W artykule przeanalizowano sposób w jaki partycypacja społeczna odbywa się w Białymstoku na przykładzie organizowanego tam przez Urząd Miasta Budżetu Obywatelskiego.

Słowa klucze: partycypacja społeczna, Białystok, Budżet Obywatelski, zagospodarowanie terenu

TEKA 2019, Nr 4
Komisji Architektury, Urbanistyki i Studiów Krajobrazowych
Oddział Polskiej Akademii Nauk w Lublinie

Disabled people in housing estates

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Abstract: Much attention is paid to adapting public buildings or transport for the disabled. Not much, however, to spaces where the journey to a given destination begins. The path that has to be walked from the apartment until reaching public transport can significantly hinder the lives of people with reduced mobility. A housing estate is also a place where people spend a large part of their free time. Therefore, in order not to exclude disabled people from social life, designing such places in an accessible way is extremely important. And exactly this issue was raised in this article.

Keywords: accessibility, universal design, people with disabilities, disabled, housing estate

Introduction

Mutual contacts of people are shaping the community, so the accessibility of place of residence is an important factor of social integration. The lack of proper adaptation of a commonplace of residence can exclude many people from social life [Pawłowska 2001]. It is estimated that in Poland alone, about 12.2% of the population is struggling with various dysfunctions [Adach-Stankiewicz et al. 2012],which means that the issue of adapting the environment for such people should not be ignored. An additional problem turns out to be the global growth trend of people with disabilities [Złowodzki 2008].

Designing a space accessible to disabled people, apart from being guided by the law, requires knowledge of ergonomics related to the physical properties of disabled people [Jasiak and Swereda 2009]. Thanks to this, it is possible to adjust the elements of a given area so that they are most adapted to the needs of such people. They are related to, among others with effortless movement and overcoming both technical and architectural barriers [eBIFRON 2012]. The main matter should be the needs of people in wheelchairs and people with visual impairments (including the blind) because they have the greatest difficulties with effortless movement in a given space. The elderly are another group with reduced physically agility that cannot be ignored. Given the aging tendency of society as a result of the demographic decline and the high rate of emigration, many people may be left unsupervised in the future. In the case of poor accessibility of space, this will mean significant difficulties for them in moving or even limiting their living space to the limits of the apartment.

Therefore, regardless of the initial concept, the project should include the need to comply with regulations and standards as well as matters related to ergonomics or OSH. Among the basic provisions that set out the minimum requirements are:

- Act – Building Law of 7 July 1994 (OJ 1994 No. 89 item 414 with later amendments),
- Regulation of the Minister of Infrastructure of 12 April 2002 on the technical conditions that should be met by buildings and their location (OJ 2002 No. 75 item 690, with later amendments),
- Standards related to specific solutions depending on the function [Ujma-Wąsowicz 2005].

It should be emphasized, however, that ergonomic issues are not always included there. By examining the interrelationships between a man and his environment, it is possible to determine more accurately his mobility space, and as a consequence also the needs and functional capabilities of a disabled person [Błądek 2003]. Therefore, the above issues should be supplemented with other specialist literature, such as the Neufert

architectural design manual [Neufert 2011] or various publications related to universal design. It can be found there many dimensions obtained based on anthropometric data.

The accessibility of the multi-family residential buildings, as J. Pallado [2007] rightly points out in his book, is also largely associated with their location, and hence, the topography of the place, green areas and buildings existing there, ways of arrival, conservation and environmental conditions, as well as urban guidelines or spatial context.

Material and methods

The text concern the issue of housing estate design in an accessible way to people with special needs, such as people with disabilities and the elderly. Based on the literature on the subject, legal acts and accessibility standards, parameters that should be considered when designing such spaces have been characterized. A set of guidelines was also developed to help designers plan the availability of housing estates. In the studies, such spaces had been treated as attending the communication functions with the rest of the city and as a space with recreational and social function.

Results and discussion

Neighborhood space

When moving on the housing estate, the situation when it is necessary to overcome height differences is almost unavoidable. The consequence of this state of affairs is the need to use stairs. This is the reason for limiting access to many places. Studies show that this is a barrier for nearly 30% of the population [Ujma-Wąsowicz 2005], so not just for people classified as disabled.

However, before the detailed parameters related to the design of stairs and ramps will be quoted, it is worth to be familiar with the general principles of conduct when planning availability in a given area. Wherever possible, the design of stairs (in particular, single steps) and ramps should be avoided in favor of gentler slopes over longer sections. To allow disabled people to move effortless, the value of such longitudinal drops should be limited to a maximum of 5%, because larger inclines significantly impede wheelchair travel. However, it is recommended that the transverse fall never exceeds 2%. To ensure safety, the surface should be even and rough enough to exclude the possibility of tripping or slipping. Besides, when designing surfaces there should be taken into account such features as hardness, absorbability, and elasticity [Czarnecki and Siemiński 2004].

The main pedestrian routes should be wide enough to allow free movement of people moving in both directions. The determinant, in this case, is once again the size of the wheelchair. It is assumed that the width of 180 cm is sufficient to enable two trolleys to run side by side. However, this number should be taken as the minimum value. A width of 200 cm or more are also used [Wysocki 2012], to provide greater comfort for pavements where there is increased pedestrian traffic. The optimal value of other pedestrian routes is 150 cm, which means that people in wheelchairs can easily maneuver. However, narrower walkways (like 120 cm wide) are also allowed – if we provide there maneuvering spaces of 150x150 cm, at least every 20 m (Fig. 1); and 90 cm – if the length of such narrowing does not exceed 150 cm [Kowalski 2010]. The last case usually occurs when there are any items of equipment on the path. It is also worth noting that the aforementioned numbers refer to the usable width, which means the space after deducting such elements and the legroom of potential users of benches. However, the roads leading to the entrances of buildings should be at least 150 cm wide [Kowalski 2010]. The good practice is to mark the edge of the road so that it contrasts with the adjacent ground. It should be also taken into consideration the height of communication routes, which should be at least 220 cm. However, if for some reason some items of equipment are below this value, they should be marked by a contrasting warning threshold [Kowlaski 2011].

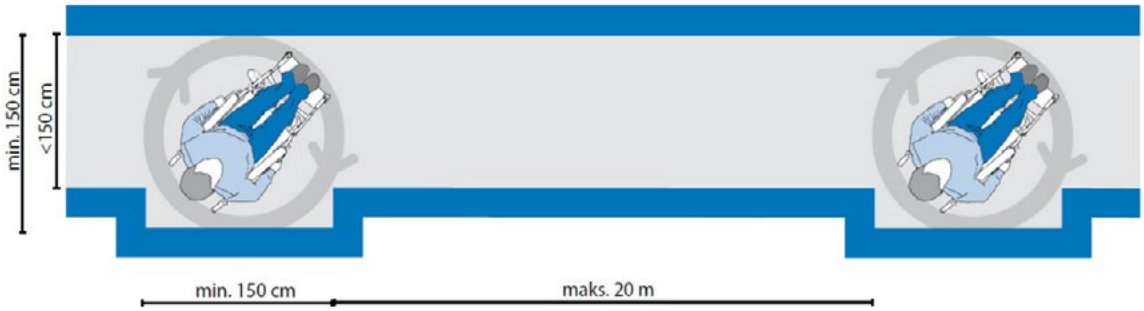

Fig. 1. Dimensions of communication paths (source: Kowalski 2010)

Properly designed stairs significantly improve the safety and comfort of use, especially for people with limited mobility. The average length of a human step is, in this case, a value that should be guided in the design. Thanks to this knowledge it is possible to apply a given formula:

$$2h + s = 60 - 65 \text{ cm} \qquad \text{[RMI §68 ust. 4]}$$

This means that the double-height of the single-step added to its width should be as much as the mentioned average step length. The number of steps in the run should be a maximum of 10, but if the difference in levels requires more, a proper landing should be used [RMI §68 paragraph 1]. Its length in the case of multi-family residential buildings should be at least 150 cm, while this size in the case of terrain stairs is not specified in the regulations. However, if it is possible, due to the improvement of the comfort of use, their minimum values should be assumed analogous to multi-family residential buildings. It is recommended that the number of steps will have been odd (and not less than 3). The width of the steps of the terrain stairs and at the main entrances to buildings should be min. 35 cm. Step height considered comfortable to use is about 15–17 cm, while a lower value is considered more convenient. M. Wysocki in *Accessibility standards for the city of Gdynia* recommends their height even at 12 cm for added comfort. The surface of the steps should be protected against slipping, especially their edges. Stairs at the entrances to the buildings should be designed so that their (usable) width is at least 120 cm. If possible, they should be protected from the effects of weather conditions. It should also be ensured that the steps have a suitable profile without undercuts or notches and that balustrades and handrails have a comfortable grip [Nowak 2008]. They should be used on both sides when the height of the stairs exceeds 50 cm and it is necessary to use intermediate handrails if the width of the flight of stairs exceeds 4 m, every 4 m maximum [RMI §296 paragraph 3]. Due to visually impaired people, important elements of the stairs are changes in the texture and color of the pavement in the 60 cm strip before and after the stairs. Thanks to this it is known where the change in height level begins. It is also practiced that all the edges of the steps are marked in a contrasting way. However, it is more important to mark the first and last step of the stairs. An additional auxiliary element is the contrasting color of the handrail, that should run along the entire stairs [Kowalski 2008]. In addition, it should protrude by 30 cm in the section before and after the stairs. The handrails should be finished in a way ensuring safe use [Nowak 2003]. Their thickness should be 3–5 cm and height 90 cm [Meyer-Bohe 1998] (better if it would be double on heights at 75cm and 90 cm).

Ramps are elements that greatly facilitate, and sometimes even allow at all, to overcome height differences, especially for people with mobility dysfunctions. However, in this case, the design guidelines should be followed. The basic feature of ramps is their slope, and its values are precisely specified in Polish legal acts. The smaller it is, the more convenient it will be to use, but at the same time, a greater distance will have to be traveled by a person moving e.g. in a wheelchair. Similar to stairs, landings should also be used in this case, and the maximum permitted length of the run without using it is 9 m. Dimensions should be taken depending on the location. Landings in front of the door should have a minimum length of 150 cm, and if the location and size of the door require additional maneuvering space, appropriately more. Whereas, landings between ramps should have a minimum size of 150×150 cm [RMI §71 ust. 3].

The ramp must not be narrower than 120 cm and it should be ensured that its edge is limited by the minimum 7 cm high threshold to exclude the possibility of wheel slip. It is also necessary to design handrails parallel

to the ground at heights of 75 cm and 90 cm on both sides. If any of them are near the wall, a distance of at least 5 cm should be kept. It is also recommended to roof the ramps and the use of top lighting falling on the running surface with an intensity of at least 100 lux [Budny 2009]. Similarly to stairs, contrasting markings should be introduced at the top and bottom of the driveway, and the beginning and end of the level change should be marked through a different surface texture [Wysocki 2010]. The space for maneuvering (150×150 cm) before and after the ramp is often forgotten, but it should be designed there [Kowalski 2013].

Attention should also be paid to the mobility difficulties related to crossing high curbs. To overcome such barriers, there are designing curb ramps. The law regulates its maximum slope at 15%. However, guided by the needs of people in wheelchairs, the maximum value should be 5% and the width minimum of 90 cm. Only height differences that not exceed 2 cm are allowed [Kowalski 2010]. Car parks are an important element of any housing estate. There should be also designed parking spaces intended for the disabled. They should be located as close as possible to a suitably adapted entrance to the building or when there is no such nearby – as close as possible to free exit from the parking lot. The number of spaces reserved for disabled people depends on the size of the car park. Different variants of such parking spaces are provided (Fig. 2). First of all, they should have larger than standard dimensions. Disabled person should be able to leave the vehicle effortless, so a width of 3.6 m is required [Neufert 2011]. In addition, entering the sidewalk from such a place should take place with avoidance of the road traffic lane [Kowalski 2010].

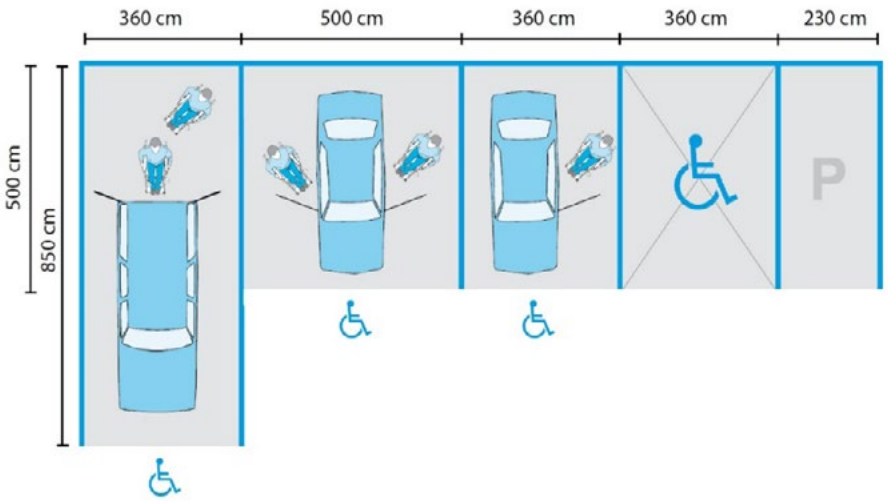

Fig. 2. Dimensions of parking places for disabled (source: Kowalski 2010).

Space equipment

According to Regulation of the Minister of Infrastructure of 12 April 2002 on the technical conditions that should be met by buildings and their location § 40 ust. 1:

> *In a complex of multi-family buildings covered by one building permit, depending on the utility needs, provide playgrounds for the youngest children and recreational places available for the elderly and disabled, with at least 30% of this area in biologically active area, if not it is determined differently in the decision on building conditions and land development.*

From the perspective of planning accessibility, it looks like that when designing such areas, additional space of at least 90x120 cm should be considered, preferably near the benches. As a result, people in wheelchairs have a place to stay without being isolated from other people using the seating. It should also be ensured that the paths leading from residential buildings to these places are free of curbs and stairs (when possible) [Kowalski

2011]. When designing pedestrian routes, the principles of accessibility planning described earlier should be also taken into account.

Besides, in spaces that require overcome longer distances seating spaces should be provided at a maximum distance of 30 m. They should be located near the sidewalks, but not directly on them. These places should be planned in such a way that the legs of people using, for example, benches, do not disturb people moving on designated paths [Kowalski 2010]. Park benches should also have appropriate dimensions strictly resulting from ergonomics, which directly reflects into comfort of use. In chapter 9. ADA Standards for Accessible Design from 2010 can be found the recommended bench dimensions. Their length should be at least 1065 mm. The seat should be designed at a height of 430 to 485 mm, while its width (depth) can vary in the range of 510–610 mm. Recommend version is the bench with backrest, which can be shifted back in relative to the end of the seat by a maximum of 64 mm and start at most 51 mm above its plane, and end at least 455 mm, which translates into its minimum height – 404 mm. Armrests are not required, but if they do appear, they should be about 205 mm above the seat, and their width is recommended in the range of 100–130 mm[1]. In practice, it looks like the benches are usually about 150–180 cm long and about 90 cm high. An additional advantage is the appropriate backrest profile and the angle it creates with the seat (it is recommended within 96°–98°)[2].

In a given place there may be some elements of small architecture, such as lighting poles, litter bins, picnic tables, information boards, road signs, bollards, etc. The arrangement of these elements can be problematic, especially for people with sight impairments. Therefore, it is necessary to use the so-called rule of one line. Placing such elements in a straight line parallel to the pavement axis will result in ordering and strengthening its outline. Elements attached to the columns should be directed along the axis of the path so that they do not interfere with the space designated for movement [Centre for Excellence... 2012]. It is recommended that the distance between individual free-standing objects should be at least 120 cm, preferably 150 cm. Moreover, they should contrast with the background [Czarnecki and Siemiński 2004]. Information boards and display cases should be located outside the usable area of the pavement. If any of the elements protrude beyond the facade of building for a minimum of 10 cm and is placed at a height of between 30–220 cm, a warning element that can be felt with a white cane should be used, along its entire contour [Kowalski 2011] (Fig. 3). If, however, there are drain grates in pedestrian routes, they should be located perpendicular to the direction of moving to prevent stuck of wheelchair wheel. Besides, the maximum opening width can be a maximum of 2 cm [Czarnecki and Siemiński 2004].

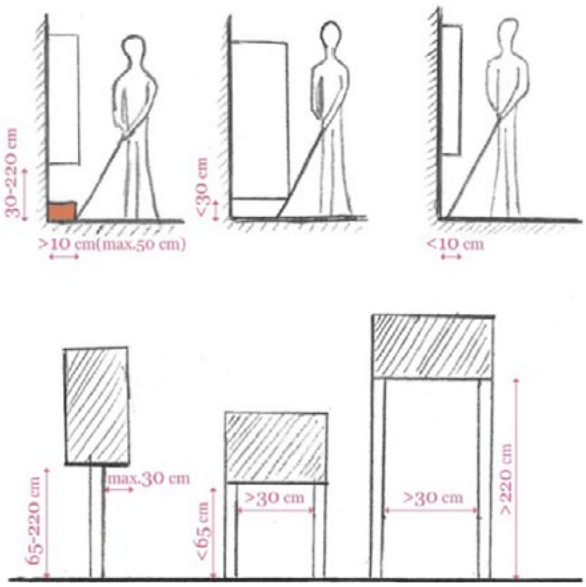

Fig. 3. Rules of safe arrangement of information signs (source: Kowalski 2011)

1 http://www.ehow.com/info_8707000_dimensions-outdoor-benches.html (dostęp: 05.02.2017)

2 http://ladnydom.pl/Ogrody/1,113380,16780740,Lawka_w_ogrodzie.html (dostęp: 05.02.2017)

In most cases, disability does not disqualify people from being physically active. Of course, this is a kind of obstacle and causes some restrictions, but properly adapted space and devices give them a chance to be active. The most important rule is to follow the same guidelines as for other elements of space. Therefore, appropriate surface should be taken into consideration (sandy surfaces should definitely be avoided), the width of the access to devices, maneuvering spaces in front of them and their dimensions (Fig. 4). It is best if the instructions for using the machine are also written in Braille language. Surfaces on playgrounds should additionally meet the fall prevention standards. It can be e.g. plastic material meeting the HIC criterion (head injury criterion) specified in the PN-EN 1177 standard.

Designing at least some devices suitable for use by people with disabilities in places intended for sports and recreation will have a positive impact on their integration with other residents. The more, some of those devices can also be used by non-disabled people. This is especially important for children who would like to play with their peers.

Fig. 4. Examples of devices that can be used by people in wheelchairs (sources: inter-fun.ploferta_szczegoly.html,22,3829 and trainer.net.pl/pl/niepelnosprawni/257-ed-01-a-wyciag-pylon.html)

Conclusion

In light of the rapidly passing human life, it is easy to attribute architecture to longevity that does not require change. However, it should be remembered that it should be mainly useful for people, especially in the case of housing estates. This translates directly into maintaining appropriate standards that change with social evolution. Therefore, living spaces should be constantly modernized to keep up with development or go even ahead of it to some extent. However, this requires appropriate financial outlays, which may prove to be a barrier that cannot be overcome [Wyżkowski et al. 2004]. By increasing the accessibility of housing estate, it can significantly contribute to reducing the fear of disabled people about social exclusion and improving their quality of life [Borowiecki 2016]. The cooperation of aspects such as interpersonal integration, properly shaped surroundings and elements supporting the movement, reflect directly into the improvement of their quality of life on many levels. Thanks to this, they have a better chance to shape their lives freely and independently [Kuldshun and Rossmann 1980].

Note. *The article was prepared in frames of the statutory work S/WBiIS/2/2016 realized by WA, PB*

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Ludzie niepełnosprawni w przestrzeniach osiedlowych

Streszczenie: Wiele uwagi poświęca się przystopowaniu budynków użyteczności publicznej, czy też transportu dla osób niepełnosprawnych. Niewiele natomiast przestrzeniom, od których podróż w dane miejsce docelowe się rozpoczyna. Droga, jaką należy pokonać momentu opuszczenia własnego mieszkania, aż do dojścia do komunikacji miejskiej może znacząco utrudnić życie osobom o ograniczonej mobilności. Osiedle mieszkaniowe jest również miejscem, gdzie ludzie spędzają dużą część swojego czas wolnego. Dlatego, aby nie wykluczać z życia społecznego osób niepełnosprawnych, projektowanie takich miejsc w sposób dostępny jest niezmierne istotne. Właśnie to zagadnienie zostało poruszone w niniejszym artykule.

Słowa klucze: dostępność, projektowanie uniwersalne, ludzie niepełnosprawni, osiedla mieszkaniowe

TEKA 2019, Nr 4
Komisji Architektury, Urbanistyki i Studiów Krajobrazowych
Oddział Polskiej Akademii Nauk w Lublinie

Biologically active area in low-rise high-denisty housing development with an example of Bialystok

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Abstract: The biologically active area is one of the most important elements of residential development. Its size is determined by the percentage factor established in local spatial development plans and laws regulations. The publication was set minimum values for this ratio for single-family and multi-family housing, and the outcomes were compared with a new type of housing, currently popular in Poland, low-rise high-density residential development. The studies were done on the example of the city of Bialystok, where there are many buildings of this new type of housing.

Key words: low-rise high-density housing development, single-family housing, multi-family housing, biologically active area, the percentage ratio

Introduction

Biologically active areas are an important and inseparable element of residential buildings and their immediate environment [Small urban dictionary, 1970]. These surfaces, together with the vegetation covering them, allow creating a favourable microclimate for the inhabitants' life [Rozanski, 1959].

In terms of function, biologically active areas belong to the group of spaces with accompanying green [Arranging green areas, 1953]. In each of the two types of residential development in Poland, the function of biologically active areas is a little different. In single-family housing, they are used for active and passive recreation for one family (private spaces). In multi-family housing, they have a recreational and aesthetic function as well as... "are intended for a short rest for all residents..., as well as being the primary playground for children..." [Korzeniowski, 1981] (open and social spaces).

Nowadays in the housing of Poland, we are dealing with a new, specific type of residential development – low-rise high-density housing (Fig.1), which is being built on areas intended single-family residential.

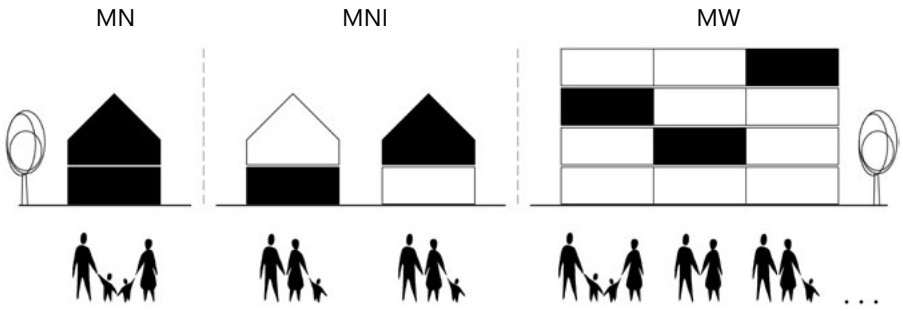


Fig. 1. Types of residential development: MN – single-family housing MNI – low-rise high-density housing, MW – multi-family housing; Source: author's graphic

This type of housing development based on law regulation for single-family buildings at the same time using a legal provision [Building Law, 1994] allowing for the separation of two apartments in one segment of single-family housing. In this way, the population density in a given area increases, and hence the number of users of green areas. The nature of green areas and their function is also changing.

The publication attempts to answer the question of how can be compared the percentage factor of biologically active areas of a low-rise high-density housing development with these ratios became from existing residential development types.

Materials and methods

The definition of the biologically active area and its percentage ratio in the residential development was described based on legal regulations [Regulations of technical requirements... 2002] and city guide [Urban planner's guide 2003].

The values determining the biologically active area in residential areas were compiled on the example of Białystok, analyzing 50 local spatial development plans (based on urbanity documents available at www.gis-bialystok.pl/plany). 20 of these plans concerned single-family housing and 10 of them multi-family housing. Rest of the plans (20) concerned both types of residential development. As an outcome of the analysis, the values of the percentage indicator characteristic for single-family and multi-family housing were determined.

The results were compared with the values of the percentage factor of biologically active area occurring in a new, specific type of residential development in Poland – low-rise high-density housing. The study was based on 25 examples of this new type of buildings located in Bialystok and its surroundings. These houses had to meet the criteria – the heights of an apartment – up to three floors and the numbers of residential premises in one building or segment constituting a complex of compact housing development (twin or terraced) – two apartments in back-to-back or over-and-under layout. The green area and the area of backyard terraces were taken into account. Internal road approaches and walkways to residential buildings were omitted.

The publication presents similarities and differences in the context of the biologically active area between known types of residential development and low-rise high-density housing development.

Results and discussion

The Definition

The definition of the biologically active area is contained in legal regulations apply for housing development: "ought to be understood as an area with a surface arranged in a manner providing natural plant vegetation and rainwater retention, as well as 50% of the terraces and flat roofs with the same surface and other surfaces providing natural vegetation, of an area of not less than 10 m^2, as well as the surface water in this area" [Regulations of technical requirements... 2002]. A similar definition can be found in Lexicon of urban planning and spatial planning: "surface of biologically active area – native land and surface water on building plot, as well as 50% of the sum of terraces and flat roofs with an area of not less than 10m^2, arranged as permanent lawns or flowerbeds on the ground ensuring their natural vegetation." [Saternus P., 2013].

Value of the percentage factor of the biologically active area

Also in legal regulations, we can find the value of the percentage factor (25%) of the biologically active area used, among others, in housing development. However, this provision applies only to multi-family housing. At the same time, it indicates the possibility of changing the value of the percentage ratio through the provisions of the local spatial development plan, which also determines the size of the biologically active area in the areas of single-family housing.

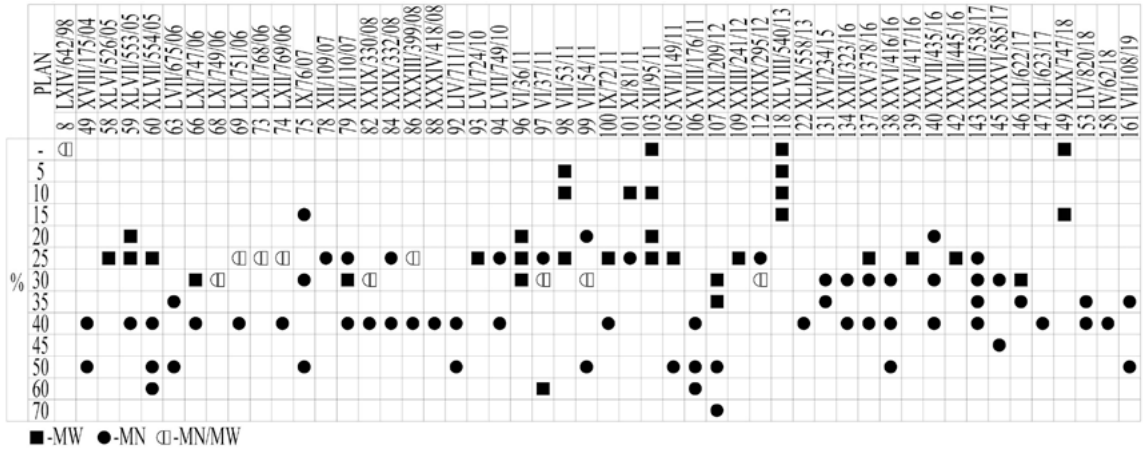


Fig. 2. Required minimum values of the percentage factor of the biologically active areas in spatial development plans in Bialystok; MN – single-family housing, including single-family compact housing (twin, terraced, group); MW – multi-family housing; Source: author's graphic

The table (Fig. 2) presents the results of an analysis of 50 local spatial development plans in Bialystok, in the context of the minimum requirements for the percentage factor of biologically active area for given types of residential buildings – single-family and multi-family. The results indicate large discrepancies in the values of required percentages within each of the types of housing development. This situation results from conditions of location (place, position in the city), the state of the existing land development (existing buildings, infrastructure) and design expectations of residents or investors. For example, in Plan No. 97, the high percentage of the biologically active area (60%) concerns a part of areas designated for multi-family housing located near the watercourse being a tributary of the Dolistowka River. In the remaining area of the building quarter, this ratio is a minimum of 30%. In turn, in the case of the oldest surveyed local spatial development plan (No. 8), the biologically active area was omitted. Only the value building area for the planned buildings is given.

The next chart (Fig. 3) shows and compares the required minimum values of the percentage ratio for single-family and multi-family housing.

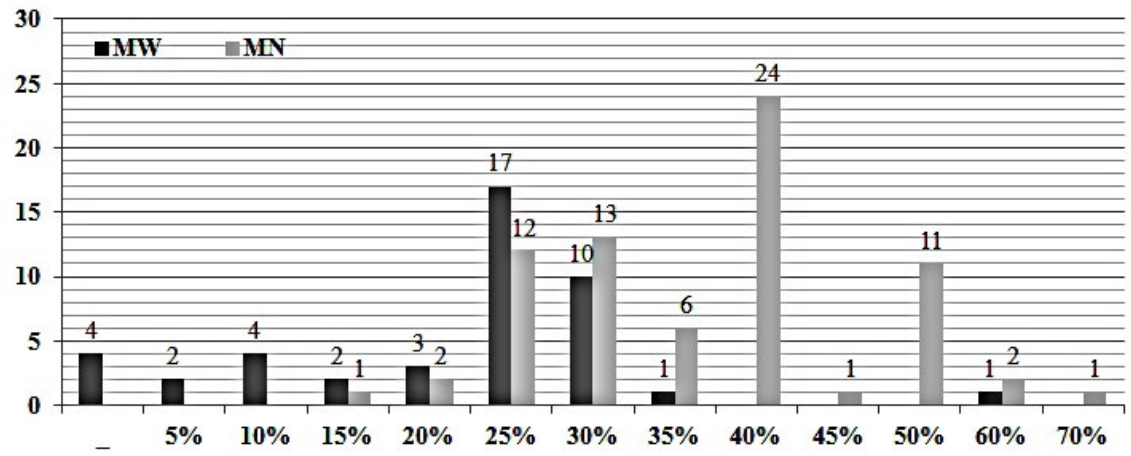


Fig. 3. Quantitative statement of values of the percentage factor in spatial development plans in Bialystok; MN – single-family housing, including single-family compact housing (twin, terraced, group); MW – multi-family housing; Source: author's graphic

Based on the prepared statement, we can indicate the most commonly used minimum percentage factor for each type of residential development. In the case of single-family housing, the percentage of the biologically active surface is usually 25–40%. For multi-family housing, this value is equal to the requirements contained in

the regulations of technical requirements and amounts to 25%. The values of 25% and 30% also indicate a kind of border between types of residential development. Larger values are characteristic rather for single-family housing and smaller for multi-family housing.

Low-rise high-density housing development

This type of housing construction became popular in Poland in the second half of the first decade of the 21st century and is building in single-family housing areas. In the single-family building or segment (semi-detached or terraced), are being designed two apartments in back-to-back or over-and-under layout (Fig. 4).

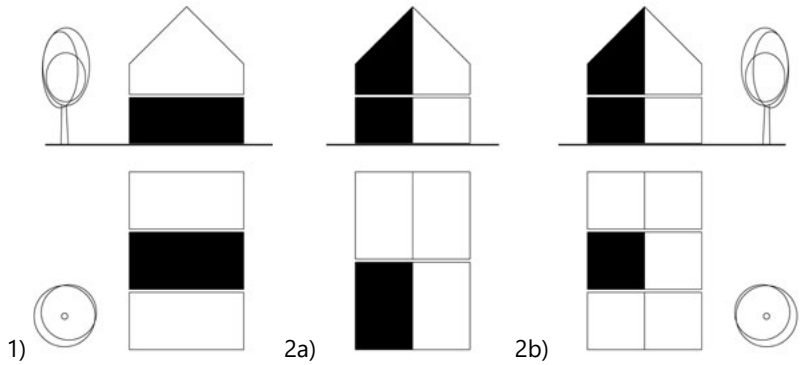


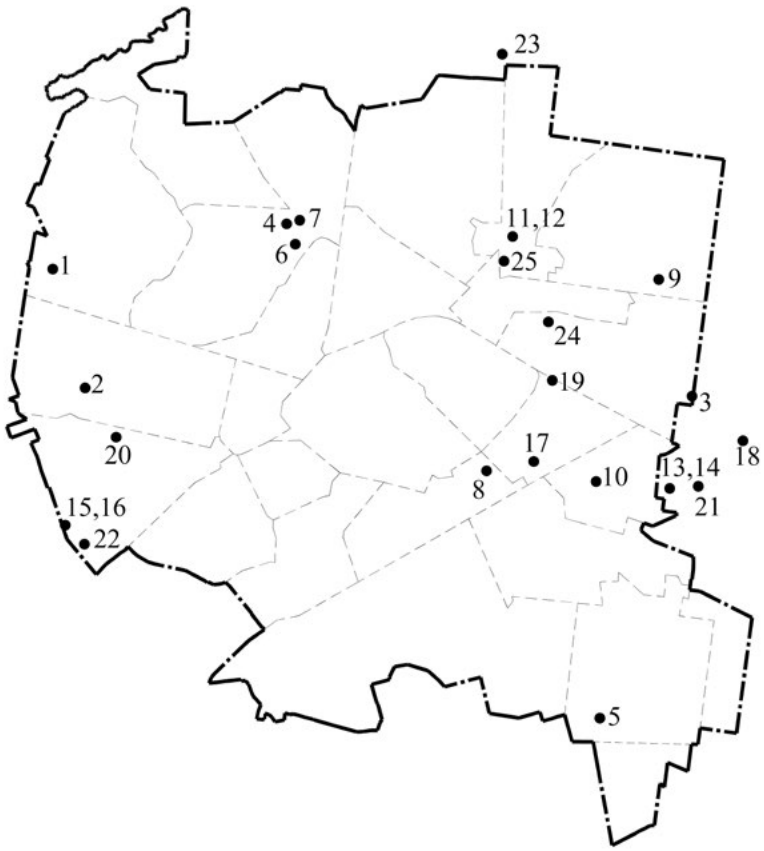
Fig. 4. Type of buildings of low-rise high – density housing :1) over-and-under flat type buildings, 2a), 2b) back-to-back residential buildings; Source: author's graphic

Besides solutions from single-family housing, we also have elements borrowed from multi-family buildings, for example, combined internal and external communication (pedestrian and vehicular), underground multi-garages under the slab, common litter bins and playgrounds. But without having to meet higher requirements for multi-family buildings (dimensions, distances).

Functionally, this type of housing is located between two known types of buildings – single-family and multi-family. We can compare it to the semi-collective buildings in Western Europe, which are characterized by 2–3 over-and-under apartments in 2–3 storey buildings. These flats also have "close although often not direct connection with green areas, which have very intimate character and belong to small built-up areas" [Seruga W., 1984].

The biologically active area in low-rise high-density housing development with an example Bialystok and its surroundings.

Low-rise high-density residential buildings have been built in Bialystok and its surroundings (Fig. 5) since 2008. In the case of the housing estate of Bialystok-Bagnowka at Ks. J. Puchalski St., this process is continuous and developmental. A specific feature of Bialystok buildings of this kind of residential development is the equal distribution of apartments layouts: over-and-under flats (13 examples) and back-to-back suites (12 examples). In Poland, instead, for the most part, there are being built flats with over-and-under configuration.



1. Bacieczki, Owocowa St.
2. Boboli St.
3. Ciolkowskiego St.
4. Cisowa St.
5. Dojlidy Gorne St.
6. Dziesieciny St.
7. Dziesieciny 90 St.
8. Jagiellonska St.
9. Ks.J. Puchalskiego St.
10. Lesna St.
11. Lacznikowa St.
12. Lacznikowa St.
13. Marcina St., Zascianki
14. Marcina St., Zascianki
15. Niewodnicka St.
16. Niewodnicka St.
17. Nowowarszawska St.
18. Palmowa St., Grabowka
19. Piasta St.
20. Rybnika St.
21. Szlachecka St., Zascianki
22. Szwajcarska St.
23. Wierzbowa St., Wasilkow
24. Zacisze St.
25. Zgody St.

Fig. 5. Location of buildings of low-rise high – density housing development in Bialystok and its surroundings; Source: author's graphic

Research on low-density, a high-density housing development in Bialystok indicates a large discrepancy in the obtained values of the biologically active area (Fig. 6). The difference between the smallest and highest percentage ratio is 37.47%. The obtained average (34.96%) coincides with the values of the percentage characteristic for single-family housing.

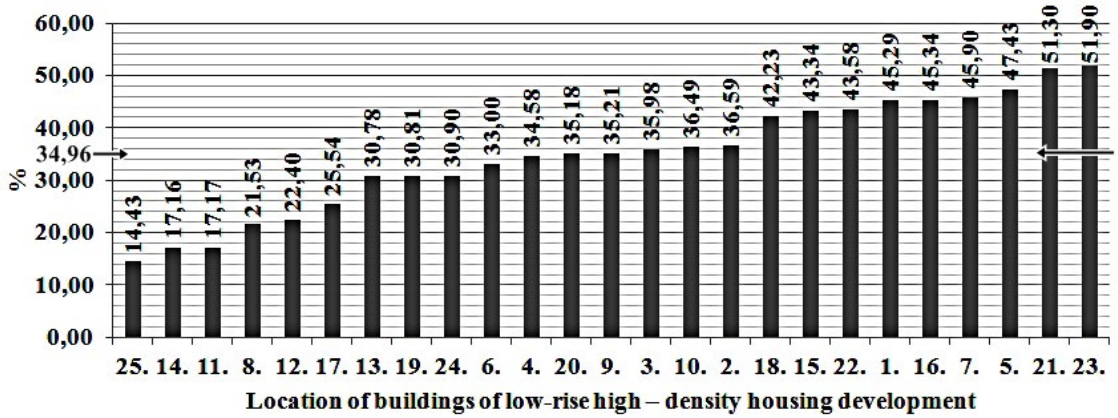


Fig. 6. Values of the percentage ratio biologically active areas in low-rise high-density housing development in Bialystok with an average of outcomes; Source: author's graphic

In the case of 4 this type of buildings (locations no. 25,11,8,12), the obtained values are comparable with the results obtained in intensive multi-family housing development. The reasons for this situation should be sought in the location and shape of the plots and the building intensity. All these buildings were built on deep and narrow width plots. The buildings themselves, with a large building area, are located along with the plot with minimum distances from the plot boundaries. Leading to the apartments walkway and driveway paths extend over the entire length of the plot. That limits the size of the biologically active area, which is located on the other side of the building and usually has a width 4m (minimum distance wall with windows from the fences). In the case of low-rise high-density building in location no. 14, the low percentage ratio is caused by the fact, that all biologically active area is on the construction slab (covered underground garage – the solution from multi-family housing). For this reason, the percentage factor had to be reduced by half to value 17,16%, according to defined in the technical requirements.

The distribution of the percentage ratio of the biologically active areas looks similar in both configuration of apartments – the back-to-back and over-and-under (Fig. 7). But this situation is affected by the earlier described example of the location no. 14 with an underground garage, which caused the average of values percentage factor reduction. Without this case, can see that in buildings with back-to-back flats layout, are getting higher values of percentage ratio of biologically active areas. The reason for this is the structure of buildings and also the presence of four-family buildings with a large area of backyard greenery.

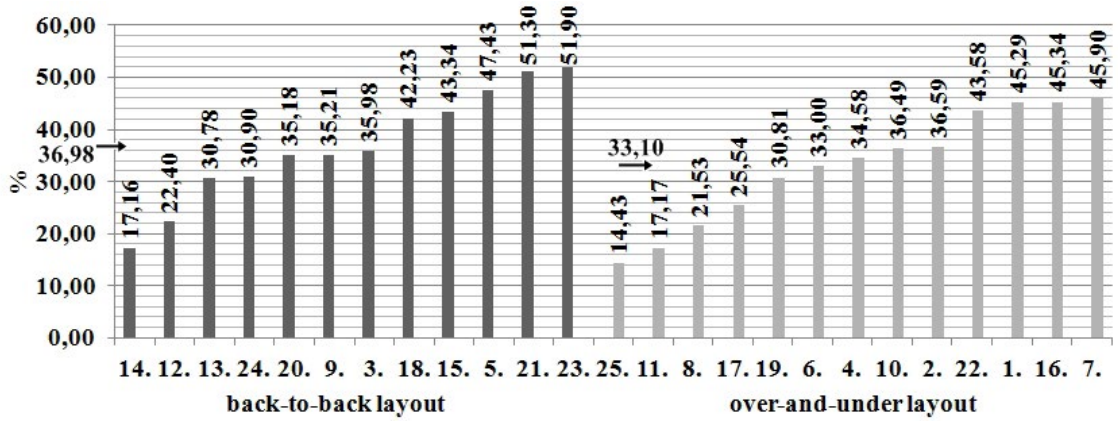


Fig. 7. Values of the percentage ratio of biologically active areas in low-rise, a high-density housing development in the combination of two types of building: with back-to-back flats and over-and-under suites. The average results in each option; Source: author's graphic

The outcomes of the percentage factor of the biologically active area from individual low-rise high-density buildings were also compared with the records of local spatial development plans (Fig. 8). In 15 cases (locations no. 1, 2, 4, 6, 7, 8, 9, 11, 12, 15, 16, 17, 20, 22, 24), we can correlate the obtained values with spatial development plans. The percentage factor of the biologically active area is not consistent with the demands of plans in 5 sites (locations no. 4, 8, 11, 17, 20). In 3 of these (locations no. 8, 11, 17), local plans were enacted after the buildings were built. In the remaining two examples, the reason why the required minimum percentages have not been reached is unknown.

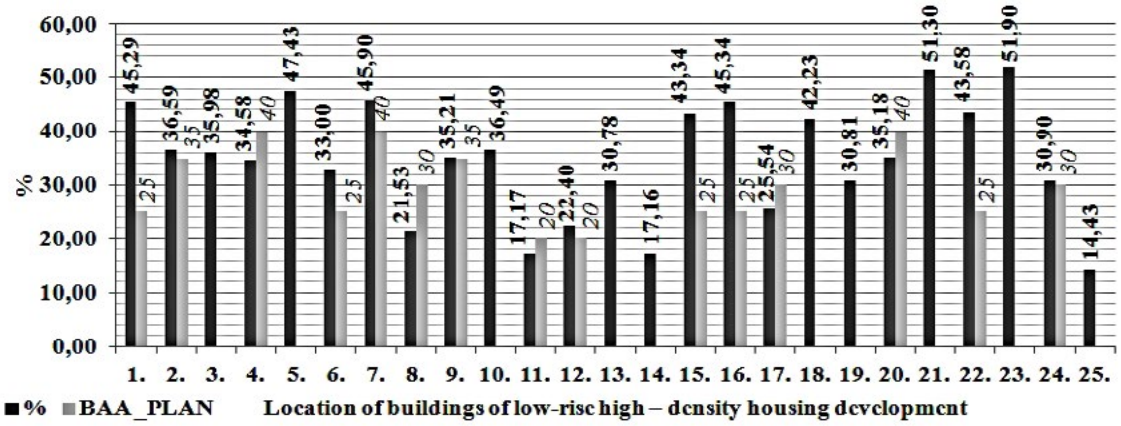


Fig. 8. Values of the percentage ratio biologically active areas in low-rise high-density housing development (%) in comparison with the required minimum values of the biologically active area from spatial development plans (BAA); Source: author's graphic

Conclusions

The conducted research indicates that the percentage ratios of biologically active areas of low-rise high-density residential development are consistent with those required in single-family housing. In specific cases, the size of the biologically active area is reduced to values used in multi-family housing development. It caused by conditions of the location (size, shape, plot site) and/or functional solutions.

The outcomes also indicate that are influenced by the biologically active area has the layout of flats in the study buildings. The higher values of percentage factor are getting for low-rise high-density housing with the back-to-back apartments.

Although sizes of biologically active areas in low-rise high-density residential development are like in single-family housing, the nature of backyard greenery and the number of users change. As in multi-family housing, we can only talk about semi-private spaces, and in many cases even about social and open spaces (especially for apartments in an over-and-under layout).

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Teren biologicznie czynny w niskiej intensywnej zabudowie mieszkaniowej na przykładzie Białegostoku

Streszczenie: Teren biologicznie czynny jest jednym z ważniejszych elementów zabudowy mieszkaniowej. Jego wielkość determinuje współczynnik procentowy ustalany w miejscowych planach zagospodarowania przestrzennego oraz regulacjach prawnych. W publikacji określono minimalne wartości tego wskaźnika dla zabudowy jednorodzinnej i wielorodzinnej, a wyniki porównano z nowym, obecnie popularnym w Polsce typem zabudowy – niską i intensywną zabudową mieszkaniową. Badania przeprowadzono na przykładzie miasta Białegostoku, w którym występuje wiele realizacji tego nowego typu zabudowy mieszkaniowej.

Słowa kluczowe: niska intensywna zabudowa mieszkaniowa, zabudowa jednorodzinna, zabudowa wielorodzinna, teren biologicznie czynny, współczynnik procentowy

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