Spatial arrangement of pre-war housing estates in the context of sustainable development goals on the example of the Księże Małe housing estate in Wrocław

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The article aims to present the assumptions and a part of the chamber study results conducted on the Księże Małe estate in Wrocław. The starting point for the research was the observation that the pre-war German housing estates were planned in a functional way, with great care for the surroundings of the buildings, as well as with the use of solutions that would now be defined as elements of blue or green infrastructure.

The history of humankind many times showed that calamities - natural disasters, wars and pandemics – are the turning points and shift people to innovative solutions. This position prompts one to think that the current climate crisis may therefore become the basis for completely new ideas, also in the field of architecture and spatial planning.

In the half of 2019, Royal Institute of British Architecture declared that its members in their actions will contribute to the reduction of greenhouse gas emissions. The 2030 Climate Challenge guidance [1] is a tool for architects that helps them find the connection between the target of mitigating climate change and certain actions in their practice. The emphasis is placed on the health and wellbeing of users, with focusing on their access to daylight and indoor thermal comfort and air quality. Another important issue raised in the guidance is the green areas quality – there shall be more green areas on the site than before its development and the biodiversity shall be significantly increased. At this point, it is worth to mention a research that has been conducted since 2019 by American interdisciplinary group, which focuses on the carbon impact of landscape architecture projects. The Climate Positive Design study [2] aims at answering the question if the design's carbon sequestration of living elements, such trees and bushes, can balance the operational emissions and carbon embodied in the materials used for site development.

The awareness of the need to take action to counteract the climate change consequences exists also in the Polish community of architects. Their declaration from October 2020 "Architects for the climate" [3], as well as the initiatives mentioned above, are in line with the Sustainable Development Goals. Seventeen targets related to environmental, social, and economic issues are included in United Nations' Resolution "Transforming our world: the 2030 Agenda for Sustainable Development" [4], which was adopted in 2015, also by Polish Government. Among all goals, the eleventh – "Make cities and human settlements inclusive, safe, resilient, and sustainable" – is related directly to the actual challenges in the field of architecture and urban planning. The Agenda focuses also on

Fig. 1. The original spatial development plan by Paul Heim and Albert Kempter of 1928 (on the left) juxtaposed with real plantings made in the 40s' of the 20th century (on the right). The retention basins, existing in the same place until today, are marked with blue squares

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Fig. 2. Filled retention basin in Katowicka Street

Fig. 3. Empty retention basin in Chorzowska Street

well-being of human and other species. Those problems can be solved in urbanized spaces by means of proper site development. Nevertheless, the step back into the future and a closer look at the case study of Wrocław pre-war housing estates shows that the solutions implemented almost a hundred years ago can be considered as a modern one in many respects.

Wrocław housing estates of the interwar period

First World War, called by then "great", had serious economic as well as social consequences. For the first time in the history of modern Europe, so many people lost their relatives in an armed conflict. Moreover, the following 1918 flu pandemic was also responsible for numerously deaths, especially among young adults [5]. Wrocław in post-war times had the highest population density among the cities of Weimar Republic [6]. A lot of families, especially migrant ones, lived in very poor housing conditions, without access to running water or daylight. The city authorities had to cope with the growing flats' demand and the bad health of the society. Soon after the war, efforts were made to build economic settlements that would become a response to the growing problems. For this purpose, among others, the company Siedlungsgesellschaft Breslau A.-G. was established. The participation of the authorities in the management and supervisory board guaranteed the implementation of the housing policy objectives [7].

At the turn of 1928 and 1929, an experimental housing estate at Księże Małe (then Kleintschansch) was built at the exit road leading to Opole. 765 small flats for people in a bad economic situation, among those 30 for large families [6], were built. It is worth mentioning that those small apartments at that time had a usable area of approximately. 46 sqm, which in modern conditions is considered as medium size flat. They were equipped with heat, gas, water and electricity. They had toilets and there were a common bath and laundry built on the site. The housing estate was laid out on the north-west south-east axis, which was dictated by the location of the existing route. The layout of the buildings was arranged in relation to the street so that the apartments had access to light and were located away from the main road. The estate has been quickly connected to the city centre by public transport. At the northern edge of the site, commercial premises have been designed for the café, bakery and dairy shop. The nursery school was originally planned opposite the building with a service part, as an extension of the residential building and closing of the central square. However, this plan remained unrealized and the kindergarten was finally built as an independent building in 1938.

Five outstanding architects – Paul Heim, Albert Kempter, Hans Thomas, Gustav Wolf and Rudolf Sack – participated in the design of the estate and tested new construction technologies, e.g. dust-free street surfaces. Although the buildings are the work of different designers, the estate is interpreted as one whole thanks to the simple shapes and the use of the same materials. The entire complex covers an area of 12,3 ha, while the buildings, as it was assumed in the original project, took up only 16.1% of the area.

Despite the impressive pace of housing construction in the post-war period, many people were hit by the homelessness and poverty crisis. There were seen the phenomenon of construction of illegal makeshift shed settlements [8]. In 1933, with the initiative of the city authorities, a colony of temporary houses was established independently on the west side of the estate. There were 112 apartments of various sizes built in semi-detached and single-family houses.

Sustainable site development of Księże Małe housing estate

The architecture of Wrocław pre-war settlements was the research subject of contemporary scientists – a particularly large contribution to the research state was made by Wanda Kononowicz, an architecture professor whose interests were related to the development of Wrocław in the interwar period. However, the site development of those estates has not been a subject of analyses before. Currently, access to many cartographic and iconographic sources allows for comparative research and evaluation of solutions adopted by designers, along with the evaluation of transformations which the area of study was subject to.

Fig. 4. Contemporary plantings were planted without any reference to the previous arrangement

Fig. 5. Old rows of trees perform not only a natural but also a social function, creating the characteristic landscape of the estate. However, their age makes that they will soon have to be replaced with new plantings

The difference between the original site development projects, deposited in the Building Archives of the city of Wrocław, by Paul Heim and Albert Kempter, and Hans Thomas and the aerial photographs made by Hansa Luftbild in Semptember 1931, supported by a geodetic map from 1932, aerial topographic photos from August 1944 and 1947 was analysed to determine if the primary design was implemented. The site studies with the support of modern resources, such as current geodetic and aerial maps, along with maps from Geological and Engineering Atlas of the Wrocław Agglomeration allowed to answer the question which elements of the pre-war development have survived to this day.

The original proportion of 1:6 of built-up area to the surroundings of streets and green cover makes the estate, in the eyes of contemporary people, one of the greener in the city. The important elements of the project were a large number of trees, appearing as green insulation belts along the outer streets, but also lines in the interblock interiors and accents in the form of groups of 4 and 5 on the corners of lawns (Fig. 1.). The double row of trees was planned to form an acoustic barrier along the main road and on the western edge of the estate. The arched road, today's Gliwicka Street, was highlighted with an avenue of trees and a double tree line on the eastern side, in such a way that it was planned to place a triple tree line on the side of the building. Furthermore, the walking road from the eastern side was to be lined with a row of trees from the estate side. Trees were to be a green framework for the whole site, providing shade insulation against dust and noise, as well as diversifying the same building facades. Between the buildings and on both sites of the main square, there were lines of trees on the north-south axis planned. There is no possibility to distinguish the plant species on the Heim and Kempter plan. The main difference in the Thomas design, which covers only the north-eastern part of the site, are the rows of coniferous trees emphasizing the entrances to buildings at Katowicka Street, instead of the line running from north to south. Nevertheless, neither Heim and Kempter original design nor Thomas concept were fully implemented.

The site development concept was realized about 1930. Double row of trees was planted along the western estate border and a single one along the walking road on the eastern site (Fig. 1.). The idea of a tree row in the block of flats interior was implemented only within the main square, which was planted on the eastern and western sides, at the facades of the buildings. What is characteristic of those times recorded in many photographs from that period, the interior served as a utility and recreational area. There were places for drying laundry, and two yards with sand-

boxes. The remaining interblock spaces were accentuated with groups of trees planted in fours, located on the access roads to the buildings. Along the Chrzowska Street there were Berlin poplars used. A formally interesting solution was applied in the spaces on the outer side of the estate on the eastern and western ends. By means of strip plantings of trees and hedges, a sequence of rectangular interiors, perpendicular to the facades of the buildings, was separated in which there were alternating grass surfaces and playgrounds with sandboxes.

The most innovative and interesting part of the estate are the retention basins that are placed along Katowicka and Chorzowska Streets (Fig. 2., Fig. 3.). High water level - currently approximately between 1 and 2 m below the ground level – conditioned, among others, the foundation of shallow basements. Although the construction of the sewage system was carried out at the time of establishing the estate, the gutters are not connected to the system. On the site, the rain water from the roofs is discharged into permeable green areas. Due to the high level of groundwater, the soil quickly becomes saturated with water during heavy rainfall and does not absorb additional rainwater. The timing of this solution is unknown, but there is not present on the aerial photos from 30's and can be seen on the aerial topographic maps from 40's. They preserved to the contemporary times in an almost unchanged shape and can be regarded as a part of the historic blue infrastructure system of the site.

The degradation of the estate's greenery layout began during the war. Some trees were damaged as a result of earthworks due to the necessity to construct air-raid shelters. A worth attention post-war solution is the evergreen belt on the side of the main road. This type of planting provides a year-round acoustic barrier. However, it seems that there are no elements of the pre-war development in the estate, except for retention basins. There is a lack of a comprehensive approach to greenery. New plantings are made ad hoc. Most grand trees are old and in poor condition and are replaced with smaller trees that do not provide ecosystem services such as those large (Fig. 4., Fig. 5.).

Conclusions

In summary, the ongoing climate crisis challenges designers of urban spaces in the environmental, social, and economic spheres. The well-being of a human in the built-up public space depends on many factors, but microclimate parameters, especially during heat waves, can be clearly changed to the advantage by the presence of large trees and water. Studying projects from almost a hundred years ago, when time made architects face the need to meet the challenges of overpopulated poorly functioning cities, it seems that a remedy was seen likewise in access to components of the environment - sunlight, greenery and water. In the smaller scale, the knowledge of the historical arrangement of housing estate public spaces may become the basis for contemporary design activities. In a broader context, the former principles of developing a blue and green infrastructure system shall be perceived as a point of reference for implementations in the spirit of sustainable development.

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Abstract: The article aims to present the assumptions and a part of the chamber study results conducted on the Księże Małe estate in Wrocław. The starting point for the research was the observation that the pre-war German housing estates were planned in a functional way, with great care for the surroundings of the buildings, as well as with the use of solutions that would now be defined as elements of blue or green infrastructure. Thus, the pre-war spatial arrangement manner is in line with the contemporary postulates of sustainable development and "healthy" cities. However, the functions of green areas and their elements have degraded over time and nowadays it is often possible to read the former planning concept only by means of comparative cartographic studies. The results of the preliminary research confirm that the subsequent housing development transformations were of a degrading nature, and the pre-war character of the building surroundings is illegible for residents and readable in archival materials that have not been elaborated so far. Recalling the memory of the former arrangement method may contribute to project activities in the area of urban adaptation to climate change, and past practices, a model for shaping contemporary urban plans.

Keywords: land development, urban adaptation, sustainable development, urban landscape

Streszczenie: ZAGOSPODAROWANIE PRZEDWOJENNYCH OSIEDLI W KONTEKŚCIE CELÓW ZRÓWNOWAŻONEGO ROZWOJU NA PRZYKŁADZIE OSIEDLA KSIĘŻE MAŁE WE WROCŁAWIU. Artykuł ma na celu przedstawienie założeń i części wyników badań kameralnych prowadzonych dla osiedla Księże Małe we Wrocławiu. Punktem wyjścia do rozpoczęcia badań było spostrzeżenie, że przedwojenne osiedla niemieckie zostały zaplanowane w sposób funkcjonalny, z dużą dbałością o otoczenie budynków, a także z zastosowaniem rozwiązań, które obecnie określono by jako elementy błękitnej czy zielonej infrastruktury. Tym samym przedwojenny sposób zagospodarowania wpisuje się we współczesne postulaty zrównoważonego rozwoju i „zdrowych" miast. Funkcje terenów zieleni oraz ich elementów uległy jednak z czasem degradacji i obecnie odczytanie dawnego zamysłu planistycznego możliwe jest często jedynie za pomocą kartograficznych badań porównawczych. Wyniki wstępnych badań potwierdzają, że kolejne przekształcenia sposobu zagospodarowania osiedli miały charakter degradujący, a przedwojenny charakter otoczenia budynków jest nieczytelny dla mieszkańców i możliwy do odczytania w archiwalnych materiałach, które do tej pory nie były opracowane. Przywrócenie pamięci o dawnym sposobie zagospodarowania może być przyczynkiem do działań projektowych w nurcie adaptacji miast do zmian klimatu, a dawne praktyki – wzorcem dla kształtowania współczesnych zamierzeń urbanistycznych.

Słowa kluczowe: zagospodarowanie terenu, miejska adaptacja, zrównoważony rozwój, krajobraz miejski