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Orginal Article

Pluralism of goals of proecological architecture

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Abstract: This article discusses selected concepts for defining the goals of modern pro-ecological architecture. It highlights a significant diversity of attitudes towards the issue of ecology in architecture. This clear pluralism of goals results from the priorities given to buildings and is the effect of emphasizing individual ecological problems to a various extent. In the present article, it has been demonstrated that two attitudes coexist today: the pro-environmental one and pro-humanistic one, with further variations occurring within the two approaches. Attention was also paid to the evolution of ecological goals in architecture, as well as to threats that may lead to its distortions under the influence of a narrow perception of these issues. The article is cognitive and is based on the analysis of the abovementioned attitudes. It aims at the organization of the knowledge and observations in this area. The authors recognize that a conscious and, above all, the apposite definition of ecological goals provides a foundation for creating architecture in line with the general concept of sustainable development. The authors are inclined to conclude that the contemporary model of a pro-ecological building should be based on balancing pro-humanistic and pro-environmental goals.

Keywords: pro-ecological architecture, green architecture, eco-friendly architecture, ecology in architecture, ecological goals in architecture

1. Understanding the ecological context

The ecological aspect of contemporary architecture is associated with the pro-environmental approach, in which the building is perceived in terms of its “life cycles”. The period ranging from the design phase and analysis phase to the demolition of the building is taken into account. Moreover, this approach constitutes a system approach, in which the system and the relations with its environment are clearly defined. Depending on the need to highlight the issue in question, the system and its input and output interactions are defined in various ways. However, the certain layout remains unchanged, namely one in which the building or,

in a broader perspective, the built environment constitutes the system, the input to the system refers to environmental borrowings, whereas the output is connected to the effects of the life cycle of the building.

Maria Stawicka-Wałkowska presents an example of such an approach, citing the model of the ISO 14001 environmental management system, which is a part of the ISO1400 set of standards [1]. In this model, the system is defined as the built environment understood in general terms. The demand for raw materials provides an input to the system, while waste, reduction of biodiversity and degradation of natural resources should be seen as the system output.

Another, more detailed, model can be found in the study developed by one of the largest pro-ecological design offices in Japan, Nikken Sekkei [2]. In the model called 'The "burden on the environment" generated by the life cycle of buildings', the building is regarded as a system composed of elements that make up its "life" cycle in chronological order. These elements include phases such as construction, utility process, renovation, and demolition.

In a closed system, each of these elements affects the one that follows it, given that phases of use and renovation form a local feedback system. The basic environmental resources needed for the "life" cycle of the building, such as water, materials, and energy constitute the input elements (entry) to the system. Its usage is defined as a burden to the environment. The output (exit from the system) may be defined as the effects of the "life" cycle of the building, in the form of pollution, heat and greenhouse gas emissions, waste, etc., all of which constitute another burden on the environment. It is particularly noteworthy that this model indicates the existence of the environmental burden not only at the exit of the system but also as the result of the input impact before the construction even begins. This means that when the pro-environmental approach is assumed, not only the direct impact the building exerts on the environment, i.e. during or after its implementation, is considered, but so is the impact exerted by the building in the pre-construction phase.

The pro-environmental approach emphasizes the one-way impact exerted on the natural environment by the anthropogenic environment. In this understanding, humans and their activities appear only as a factor that transforms the natural environmental system, rather than being subject to feedback. Meanwhile, as Andrzej Baranowski states, "it is now obvious that the meaning of the term "ecology" has been extended (..). Contemporary ecologists have stretched their field of research to incorporate the functioning of the environment understood as an ecological system, natural in its genesis, transformed and used by humans along with interactions between this system and the man-made technical system. The mutual interaction between natural and technical systems takes place on various planes (..). The two systems that strongly interact with each other can be considered as one supra-system; contemporary ecology in this sense refers to the entire natural and technical supra-system" [3].

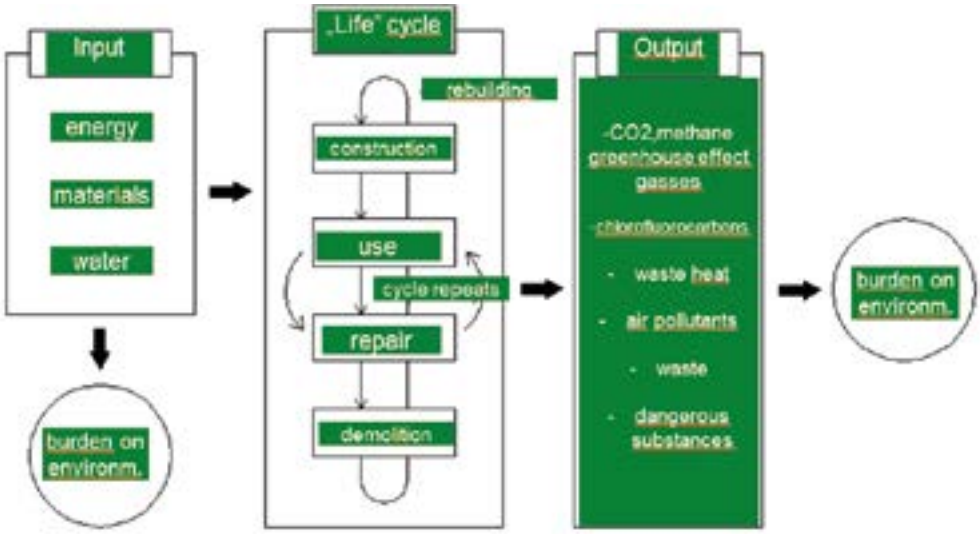

Fig. 1. The "burden on the environment" generated by the life cycle of buildings [2]

Attempts have been made to comprehensively cover the subject of ecology. The emergence of a separate field of research within it, namely urban ecology, can be seen as an example of those attempts [3]. Baranowski further quotes Barbara Szulczewska , who states that "there are at least two different definitions of city ecology: a part of traditional ecology that deals with the study of urban natural layouts, and an interdisciplinary approach to relations between human and the environment, considered in the context of urban planning and city management." [4] In her work, Justyna Kobylarczyk, among other researchers, remarks on the connections between the natural and human-shaped environment. The researcher emphasizes the importance of urban sozology in the process of shaping urban space [5].

Cognately, in relation to architecture, research relates to interactions between building users and the natural environment. This three-element system can, for instance, be considered as an ecological system in which the human becomes the subject. This approach seems particularly in line with architecture as a science and with utilitarian activity directed at fulfilling human needs. In this concept, presented by Zygmunt Szparkowski [6], the ecological system consists of three elements: the built (physical) environment, which may be understood in simplification as the building, user impact processes and the user condition as an exit from the system.

The entire ecological system may be seen as a part of the supra-system known as the architectural system. It serves as the last link of the supra-system and is directly influenced by utility processes that occur in the building. The natural environment is treated as the surroundings of the system, which means that the conception focuses on building-human relationships that are influenced by the natural environment. According to this approach, which can be called pro-humanistic approach, the natural environment does not constitute an element of the system, just as in case of the pro-environmental approach where human is not an element of the system.

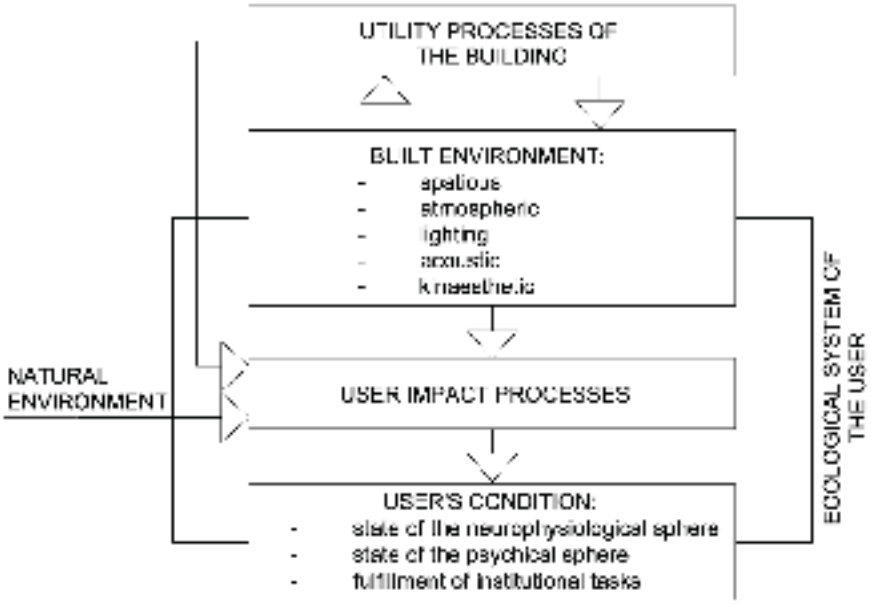

Fig. 2. The ecological system of the user (own study, based on [6])

Janusz Marchwiński and Katarzyna Zielonko-Jung pay attention to the essence of the pro-humanistic approach in areas related to energy issues, which seemingly focus on the building-natural environment relationship [7]. In their research on solar energy use in architecture, the researchers note that the application of such solutions is not only beneficial to the natural environment, but also to humans as building users. Adopting a system approach while considering the aforementioned issues, with attention to the building-user-natural environment triad of subsystems, seems to be especially suitable.

2. Ecological goals

Pro-ecological architecture should be considered not through the prism of physiognomic characteristics of buildings, but rather in terms of the goals and related postulates it is exposed to. The variety of ways to implement these goals results partly from social, cultural, economic, environmental, and other factors, all of which make researchers perceive pro-ecological architecture as a break with the anonymity of the Western culture in the construction sector. Brian Edwards remarks on the direction for pro-ecological search in architecture, indicating the need to draw patterns from cultures other than the Western consumer culture. The principles of this search are included in four postulates [8]:

- sufficiency – it refers to constructing buildings and equipping them with what is necessary and needed; according to this theory, even the low-energy building, if its energy consumption indicates the generation of waste, cannot be perceived as pro-ecological;
- responsible management – a postulate based on the philosophical idea that no area should be seen as private property and therefore those who manage areas become responsible for others;

- social responsibility – building homes should serve people rather than the individual goals of the developer;
- project spirituality – temporal and spiritual elements must form an integral whole.

The definition of pro-ecological goals in construction and architecture has been subject to a noticeable evolution, the origins of which date back to the turn of the 1960s and 1970s. An important foundation for these goals was provided by pro-ecological movements and initiatives that originated almost a decade earlier, together with the famous publication by Rachel Carson entitled "Silent Spring" from 1962 [9]. It is widely believed that pro-ecological architecture was initially identified with the so-called low energy design, narrowing the issue to energy conservation. It was a natural reaction of developed countries to the energy crisis that was taking place at that time. It was in the late 1980s, mainly due to the Brundland Report, that the goals of pro-ecological architecture were broadened so as to encompass matters concerning the reduction in material consumption and waste production, creation of a healthy internal microclimate and reduction of the negative impact a building exerts to the environment. It has only been for about a dozen years that we have been observing the complete or perhaps nearly complete complexity of the issues the pro-ecological searches face. These include economic, social and ethical goals. However, it is important to note that the above applies mainly to developed countries, where a high level of ecological awareness can be observed. In developing countries, on the other hand, this process is taking place with some delay, albeit according to the laws of succession and diffusion [10], it should be expected that the modern understanding of ecological issues will be achieved there as well.

The goals of pro-ecological architecture, or at least their gradation, vary depending on the region of the world, as they result from local needs and priorities. For example, in countries located in hot and dry climate zones, especially in the Third World countries, achieving effective water management is one of the priority goals. In European countries, this goal is inferior to aspects related to energy saving, as most of these countries have a major share in global energy consumption. In the USA, on the other hand, despite the fact that the country is the largest energy consumer in the world, the problem of energy saving fails to be taken as seriously as it is in Europe. This fact can be explained by significant reserves of fossil fuels and thus relatively low prices of such fuels in the USA. There, it becomes a priority to protect and secure cleanliness of biologically active areas that successively give way to contaminated areas previously occupied by the industry or affected by its impact.

Despite the above, numerous attempts are being made to characterize the most crucial, universal goals of pro-ecological architecture. James Wines formulates them in quite a detailed manner, listing the following postulates [11]:

- a reasonably small scale of buildings – as an alternative to urban megastructures blamed for high energy consumption, material resources and water consumption, that, nevertheless, satisfy the needs related to population growth;
- the use of renewable and recyclable materials – as an issue of conscious selection of building materials in the design phase with a view to the repeatability of their use;
- the use of low-embedded energy materials – as a conscious decision on the selection of materials in terms of their "biography", i.e. due to the lowest amount of energy needed to produce them;

- the use of local materials – as a derivative of the above issues with an emphasis on minimizing the energy needed to be used to transport building materials to the construction site;
- water saving through recovery systems – understood as effective gray water management (e.g. rainwater), mainly in dry climates;
- low building maintenance costs – understood as a means of preserving the fossil energy sources required in order to create the indoor environment of the building (e.g. heating, cooling);
- adaptability ("recycling") of the building – understood as a tool for the limitation of the built-up area sprawl, as well as a tool for the protection of the existing building tissue, also in the cultural and formal- spatial sense;
- reduction of ozone-depleting substances – a postulate intended to dismiss (in Wines' opinion), the most serious threat to the future of the human existence by appealing to the responsible life attitude of each person; it also concerns the issues of material selection, recycling and the search for alternative energy sources;
- natural environment protection – treated as one of the most important ecological demands and understood, i.e. as a necessity to preserve natural areas in urban spaces and as a legislative battle against the dynamic expansion of the construction market;
- energy saving – as a result of actions based on attention to environmental factors, mainly the local climate and based on the use of renewable energy sources that render the building independent of fossil energy sources;
- solar orientation – as a development of the energy-saving postulate; it involves the maximum use of energy and sunlight by an appropriate location of the designed building in relation to the sun;
- access to public transport – as an indirect architectural issue relying on the appropriate selection of location for the designed building with a focus on reducing the share of individual transport in order to save energy and improve air quality.

Wines' postulates shift the focus of pro-ecological architecture goals to pro-environmental aspects. With a certain degree of optimism, though not uncritically, Wines assumes, the possibility to contain the current pace, at which the construction sector is developing. His postulates emphasize the ecological attitude towards the choice of building materials and towards the integration of the building into its natural environment. The approach described above is closely linked to the philosophy of green architecture, or even further, reflected by the concept of vernacular architecture, (native architecture), which is shared by Kean Yeang. Yeang [8], [12], an Asian architect who authored the concept of bioclimatic architecture, believes that green design should integrate the object with the biosphere and not only reduce the negative impact the building exerts on the natural environment, but also act as a stimulator to the environment.

Richard Rogers, an English architect, stresses the ecological goals differently, paying attention to not only environmental and energy-related aspects but also to social and economic aspects [8].

In his research on the sustainable architecture, Michael Hopkins, another English researcher, goes against Wines' assumptions and accepts the struggle with the growing intensity of urbanization. He also emphasizes the need for the contribution of research with the use of advanced

software techniques in order to generate multi-functional, often technologically complex, building materials and components, which he seems to perceive as more "ecological" than monofunctional local or low-processed materials. His research focused more on the means of achieving the objectives of pro-ecological architecture, rather than on defining the most crucial goals in the northern climate. However, it indicates quite clearly the priority of energy-related goals. Moreover, the research gives the priority to ensure a healthy and comfortable microclimate environment in buildings, an idea which was not emphasized in Wines' postulates [13].

The issue concerning the provision of a healthy physical environment encompasses a wide field of activities intended to meet the needs of humans (building users) in both physical and psychological terms. The definition of the term "pro-ecological architecture" presented in Poland at the conference held in Kazimierz (April, 13-16th 1989) emphasizes that "architecture understood in this way is not limited to creating only dead and empty structures submitted to the investor, but incorporates creating optimal health and aesthetic conditions for people to stay in during the required periods and to perform certain activities there" [14].

Thomas Max Fischer lists a healthy internal environment among the five main goals of pro-ecological architecture. He enumerates the issue besides concepts, such as energy efficiency, ecologically friendly materials, environmental form, and good design, which he understands, among other features, as creating a structure properly fitted into the urban context, pleasant and beautiful [15].

"Health", as defined by the World Health Organization, is understood as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." [16] Therefore, the definition refers to more than a generally recognized condition of a lack of illness [17].

Among the key goals of shaping pro-ecological human-friendly architecture, special significance is given to creating a healthy physical environment related to microclimatic and lighting conditions inside the building. Such a comfortable environment relies on:

- minimizing internal pollution and threats to users (including ensuring an adequate quality of indoor air and securing a harmless level of air ionization, elimination of the radioactive radiation of partitions or elimination of the intensity of electric and electromagnetic fields;
- creating comfortable conditions regarding the microclimate and lighting of the building interior spaces (providing thermal, visual and hygienic comfort to the users of the building interiors).

The goal to ensure healthy and comfortable use of the building can be understood more broadly, as not limited to the internal environmental issues. Grażyna Schneider-Skalska emphasizes the goals associated with providing the user with contact with natural elements, the creation of explicit spatial and functional structures that could enable the implementation of a healthy lifestyle and creating social spaces that provide conditions for achieving social cohesion. She argues that the quality of the immediate environment is the second most important determinant of life quality that comes right after family happiness. Moreover, she maintains that the presence of natural elements and spatial structure in line with expectations can clearly help improve life quality, as it serves the goal of the improvement of the health and well-being of residents [18]. Kobylarczyk, on the other hand, notes that not only does the proximity of natural elements determine the way space is used, but it also directly affects the psycho-physical health of people [19].

3. Distortions of pro-ecological attitudes

The multiplicity of issues related to pro-ecological goals that fall into the chief concept of sustainable development results in the division of these goals into several issue-related subgroups. This can lead to some misunderstandings, as well as to an incorrect or incomplete understanding of the term "ecology" in reference to architecture. One such approach to the concept of sustainable development is noted by Edwards, who states that saving material and energy often makes sustainable design gradually synonymous with the design of energy-efficient buildings. Unfortunately, such an approach is frequently observed in Poland. Aspects related to energy saving may somewhat obscure the humanistic aspect of pro-ecological architecture, as understood in broader terms. It seems that such fragmentary approaches to the concept of ecology sometimes fail to take account of or at least fail to stress the issues related to shaping a healthy and comfortable environment in which the building user resides. The emergent, often an uncritical fascination with the concept of passive buildings, which is based on the objective to minimize heat consumption (15kWh/m2a), may be seen as an example of such an attitude. Thereby, the issue related to the comfort of internal space use, which results from the need for mechanical ventilation and the requirement to maintain tight enclosure of the building as a potential source of energy losses, is either completely disregarded or receives insufficient emphasis.

In the humanistic context, attention is also paid to the issue of applying new, energy-saving, at least in assumption, solutions, in a way in which these activities are resultant of non-aesthetic factors. This method often leads to randomness, mismatch, violation of the principles for shaping architectural forms (e.g. aesthetically controversial forms of solar chimneys or certain implementations of solar installations). Moreover, the criticism concerns the architecture of the abovementioned passive houses, in the shaping of which the aesthetic aspect becomes oftentimes depreciated in favor of allegedly more vital premises in the field of energy and economy. The clash of humanistic and environmental priorities, including energy priorities, may also lead to a distorted dominance of the former. Striving to create the most convenient living conditions, whether in the sense of usability or in the aesthetic sense, is likely to lead to the creation of buildings of an unreasonably large assumption scale, to disturbance of the ecosystem balance in the immediate surroundings, irrational formal-aesthetic solutions in reference to energy, etc.

3. Conclusions

The above considerations lead to the conclusion that the modern model of the ecological building should be based on balancing the pro-human and pro-environmental goals, both of which were discussed in previous chapters. It should be emphasized that this holistic view should refer to design practice. In science, the atomization of individual problems for their accurate explanation and systematization is most desirable, provided, however, that they are perceived in a broad context (e.g. using the system method to define the system and its environment).

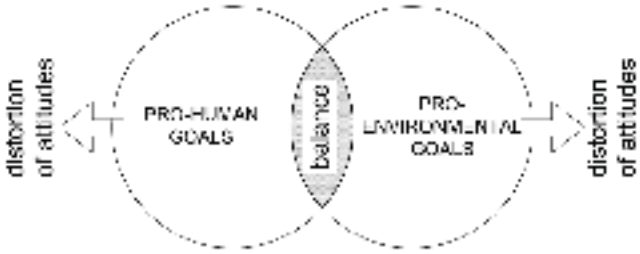

Fig. 3. The goals of pro-ecological architecture: balance and distortions (own study)

As far as the humanistic goals are concerned, the concept of creating a healthy and comfortable environment for residential functions, working functions, and other purposes should be given key importance. This applies to both the internal environment and the relationship of the building with its environment on a micro-urban scale. This chief idea comprises broadly understood functional-usability issues (e.g. ergonomic, quality of the microclimatic, acoustic and visual environment, psychological and social context of shaping space), as well as aesthetic issues. It should be noted that these goals do not differ from the "traditional" understanding of good architecture. The difference lies in the fact that the two definitions should be juxtaposed with pro-environmental goals, whereas their coexistence cannot take place at the mutual expense or compromise solutions must be arrived at.

Pro-environmental goals are associated with the chief idea of respecting our planet's natural resources. It is an objective and a never-changing concept, regardless of the geographical, social, and cultural conditions, in which the object is created. However, the concept happens to be of a very general nature, and thus requires adaptation to specific location conditions. It seems that specific environmental objectives are most precisely defined by Wines. It should be assumed that it is acceptable, or even rational, to emphasize some of these goals (e.g. respecting energy and water) to a varying degree, depending on local conditions and related environmental issues.

The goals that go beyond the concept of architecture as such but constitute its integral component may be seen as a complement to the ecological goals in the contemporary architecture described above. Such goals encompass, for instance, economic, philosophical and ethical objectives, defined either in part, directly, or in a pro-environmental context, by Edwards in his four postulates quoted above.

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Orginal Article

Selected factors that impact low-energy buildings (NZEB)

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Abstract: The Directive 2010/31/EU introduces a new building standard (NZEB) in all member states of the European Union from 1.01.2021. In Poland, a low-energy building has been defined. The design, construction and use of such building is a complex process and requires knowledge of many aspects concerning building materials, general construction, building physics, installations, renewable energy systems and architectural design. Implementation of the current technical requirements in this area encompasses examining many parameters of an entire building but also of its external walls and joints. Defining them according to the applicable legal regulations and relevant standards evokes many questions and uncertainties regarding calculation procedures and interpretation of physical aspects. On the basis of conducted calculations and analyses, the authors have started a discussion on calculation methods in this field, proposing changes in legal regulations and calculation procedures.

The paper describes selected factors influencing low-energy buildings: physical parameters of building envelope elements, support of modern ventilation systems, energy performance parameters. The calculation part of the work concerns the analysis of physical parameters of the elements of low-energy building envelope and energy performance parameters of a buildings with consideration of energy saving and thermal insulation criteria. Formation of material systems of external walls and building joints requires taking into account innovative insulation materials and specific parameters of the air inside and outside of a building. The use of professional software for calculations and analyses provides reliable results.

Many coherent factors such as: architecture of a building, structural and material solutions of the external walls and their joints (elements of the building envelope), type and efficiency of the ventilation, central heating and hot water systems, use of renewable energy sources, integral management of the building in the field of energy production help to obtain optimal parameters of energy performance of the building and reduce emissions of CO_2 to the atmosphere.

Keywords: low-energy building, physical and energy parameters, legal requirements

1. Introduction

According to the national plan for increasing the number of buildings with low energy consumption [1], a low-energy building is a building that meets the energy saving and insulation requirements of the technical and operational regulations referred to in Article 7(1)(1) of the Building Law [2], i.e. in particular in Section X and Annex 2 of the Regulation [3] binding from 31 December 2020 (in case of buildings occupied and owned by public authorities from 1 January 2019).

To ensure that the amount of thermal energy required to use a building for its intended purpose can be maintained at a reasonably low level, two methods are proposed to meet the requirements of newly designed buildings:

- The first method consists in designing of a building with respect to the demand for non-renewable primary energy per unit of surface area with controlled temperature of the air in a building, residential unit or part of the building forming an independent technical and operational unit – EP [kWh/(m^2·year)],
- The second method consists in designing the external walls of a building, so that the values of heat transfer coefficients U [W/(m^2·K)] of external walls, windows, doors and installation technology meet the requirements of thermal insulation. Maximum values of EP_{max} and U_{cmax} (U_{max}) coefficients are specified in regulation [3]. In case of newly designed buildings, two requirements for energy saving and thermal insulation must be met simultaneously.

The paper presents an analysis of the influence of selected factors on the fulfilment of requirements of a low-energy building.

2. Identification of factors that influence low-energy buildings

Rational (optimal) energy demand of a building is based on the analysis of basic parameters regarding energy savings:

- EU – annual demand for usable energy, taking into account the objectives of heating and ventilation, domestic hot water and cooling and internal heat gains which depend on the type of space and a building, from sunlight to glazed areas – determined by the method of monthly balances for individual indoor and outdoor air parameters [kWh/(m^2·year)],
- EK – annual final energy demand for the heating system, domestic hot water heating, cooling, built-in lighting (not applicable to residential buildings) and technical system (as auxiliary energy), including the average efficiency of the systems – determined on the basis of the components of the usable energy demand [kWh/(m^2·year)],
- EP – annual non-renewable primary energy demand for the heating system, domestic hot water heating, cooling, built-in lighting installation (not applicable to residential buildings) with the addition of auxiliary energy use for the systems, taking into account coefficients of the input of non-renewable primary energy for the production and supply of the energy carrier or energy for technical systems w_i – determined on the basis of the components of the final energy demand [kWh/(m^2·year)],
- E_{CO2} – specific CO_2 emissions from the combustion of fuels by the heating system, domestic hot water heating, cooling, built-in lighting and auxiliary equipment in technical systems [t_{CO2}/(m^2·year)],
- U_{OZE} – share of renewable energy sources in annual final energy demand [%],

which are essential components of the energy performance to be determined on the basis of the Regulation [4].

Achieving the minimum value of the annual non-renewable primary energy demand indicator EP [kWh/(m^2·year)], the basic energy saving parameter, depends on a number of consistent factors (Figure 1).

The design, construction and operation of low-energy buildings is a complex process and requires many calculations, computer simulations and technical-economic analyses.

Factors that impact low-energy buildings
architecture of the building: location of the building in relation to the directions of the world, compact body of the building (minimum A/V shape factor), size and location of transparent external walls, arrangement of rooms in the building depending on the calculated indoor air temperature, roof geometry, vegetation on the building plot
structural and material arrangements of external partitions and their joints (the building envelope elements): use of high quality and innovative thermal insulation materials (PIR, PUR, aerogels, vacuum, transparent insulations), school of designing of building joints in hygrothermal aspect using numerical programs; minimization of heat losses through external walls in one-dimensional (1D) and two-dimensional (2D) field and the risk of critical surface humidity and interlayer condensation
type and efficiency of ventilation system: hybrid or mechanical ventilation with heat recovery, mechanical ventilation with a thorough heat exchanger, supporting of existing natural ventilation systems – use of solar chimneys, high efficiency of systems – over 70%.
type and efficiency of central heating and hot water systems, use of renewable energy sources: high efficiency of systems – above 70%, support of central heating and hot water systems with renewable energy sources (solar energy, wind energy, geothermal energy)
integrated building management in the field of energy production and system-based energy management in a building – BMS

Fig. 1. Factors that shape low-energy buildings – authors' own study

3. Analysis of selected factors that influence low-energy buildings

The work included an analysis of selected factors that impact low-energy buildings: physical parameters of building envelope elements, support of modern ventilation systems, and parameters of energy performance.

3.1. Physical parameters of low-energy building envelope elements

A building consists of many building partitions and their joints of individual physical characteristics and is subject to changeable indoor and outdoor conditions. In many cases, the analysis of the external walls and construction joints in terms of construction and material, as well as execution technology does not usually raise objections at the design stage. On the other hand, the knowledge of hygrothermal (physical) parameters, related to the exchange of heat and humidity, helps to avoid many design and construction flaws and to ensure the appropriate parameters of the indoor microclimate during use (appropriate temperature, humidity and cleanliness of the air inside a building). Figure 2 shows a scheme for evaluating the quality of the building envelope elements in the hygrothermal aspect.

Additional heat fluxes, due to inadequately or insufficiently insulated bridges, may even exceed the values of basic fluxes occurring in a continuous (solid) partition without thermal bridges. The numerical procedure (with the use of software), required by PN-EN ISO 10211:2008 [5] raises a significant objection; it is unclear and difficult to use it in a reasonable

manner. The value of the coefficient Ψ gives linear (per 1mb) heat losses through the bridge, usually adopted with an assumption that the calculation area at a distance of two partition thicknesses from the bridge edge is extended. Therefore, several bridges frequently overlap in an external wall. In such case, it is not possible to sum up Ψ coefficients for particular geometry, e.g. pillar: window – connecting wall. In publications intended for professional physical calculations, e.g. in [6, 7] external walls, generally the values of Ψ coefficients are given in relation to the whole joint with thermal bridge, participating in heat flow. Determination of quantitative share of individual bridges in total heat losses through a partition requires separation of partial values of coefficients corresponding to branches of the joint within the tested partition. It can be obtained by additional numerical calculations, determining values of branch heat transfer coefficient. Calculation procedures in this respect are described in the papers [8, 9].

HYGROTHERMAL QUALITY OF BUILDING ENVELOPE ELEMENTS

- determination of the heat transfer coefficient U (U_{1D}) of a single flat wall
- determination of linear heat transfer coefficient Ψ of the joint in the 2D field
- determination of point heat transfer coefficient X of the joint in the 3D field
- determination of heat transfer coefficient taking into account linear (2D) and spatial (3D) thermal bridges U_{2D}, U_{3D}
- determination of the minimum temperature on the internal surface of the wall at the place of the thermal bridge $t_{min.(2D)}$, $t_{min.(3D)}$ at assumed temperatures inside and outside of a building
- determination of the temperature factor $f_{Rsi(2D)}$, $f_{Rsi(3D)}$
- determination of the possibility of interlayer condensation

Fig. 2. Factors shaping the quality of external walls and their joints in the hygrothermal aspect – authors' own elaboration

Nowadays, hygrothermal calculations should use the extensive database, which is still to be created or completed in Poland, with the division for the local climate zones and individual towns. Determination of the temperature factor f_{Rsi} ($f_{Rsi(2D)}$, $f_{Rsi(3D)}$) [-] in analysed joint of external walls requires determination of minimum temperature on the internal surface of a wall and in the place of thermal bridge, assuming appropriate indoor θ_i and outdoor θ_e temperature. However, the required value of limiting temperature factor $f_{Rsi(kryt)}$ is determined as a function of temperature θ_i and moisture, φ_i, and the space it concerns. These parameters (indoor temperature and moisture level in the area) determine the value of the temperature factor $f_{Rsi(kryt)}$, the decisive limit in assessing the correctness of the joint design solutions. According to PN-EN ISO 13788:2003 [10], the temperature factor $f_{Rsi(kryt)}$ is calculated or adopted depending on the type of ventilation used in the building (gravitational ventilation – dominating in residential buildings or mechanical ventilation, being often a component of air conditioning systems, helping to shape freely the properties of the interior microclimate).

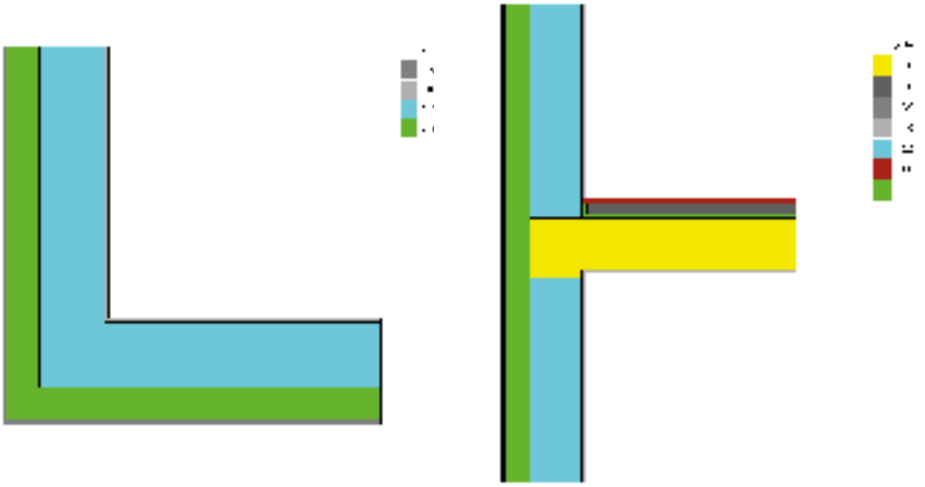
Taking into account real two- and three-dimensional (2D and 3D) heat transfers occurring in external walls may lead to significant differences in values of thermal parameters (heat transfer coefficient U, transmission heat loss coefficient H H), which define the external walls of the same building. External walls with a large surface of windows openings or with some thermal bridges which are difficult to limit (balconies, lintels, corners) may have high U-values and pose a risk of moisture condensation on the internal surface of the partitions.

For the purpose of calculations, the joints of the external two-layer wall considered in four calculation variants were selected:

- Variant I: 24-cm thick cellular concrete block of λ=0.17 W/ (m·K), 10-cm thick polystyrene boards; 15 cm by λ=0.04 W/(m·K),
- Variant II: 24-cm thick cellular concrete block by λ=0.17 W/(m·K), 10-cm thick polyisocyanurate (PIR) panels; 15 cm by λ=0.022 W/(m·K),
- Variant III: lime and sand block 24-cm thick by λ=0.55 W/(m·K), polystyrene plates 10-cm thick; 15 cm by λ=0.04 W/(m·K),
- Variant IV: lime and sand block 24-cm thick by λ=0.55 W/(m·K), polyisocyanurate (PIR) boards 10-cm thick; 15 cm by λ=0.022 W/(m·K).

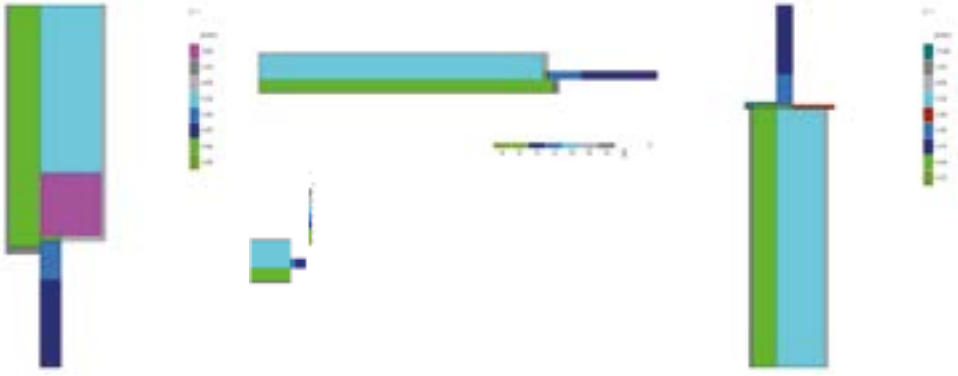
The calculations of physical parameters were performed with the use of the KOBRU-TRISCO software [11], based on the following assumptions:

- the modelling of joints was performed in accordance with the principles described in PN-EN ISO 10211:2008 [5] and in the papers [8, 9],
- the heat transfer resistance (R_{si}, R_{se}) was adopted in accordance with PN-EN ISO 6946:2008 [12] for the calculation of thermal fluxes and in accordance with PN-EN ISO 13788:2003 [10] for the calculation of temperature distribution and the temperature factor $f_{Rsi(2D)}$,
- indoor temperature θ_i = 20 ºC (living room), outdoor temperature θ_e = -20 ºC (zone III),
- the values of heat conduction coefficient of construction materials λ [W/(m·K)] are based on the following tables in the paper [9],
- the following joints were selected: connection of external walls in a corner (Z1), connection of an external wall with a ceiling in section through a rim (Z2), connection of an external wall with a window in section through a window sill (Z3), connection of an external wall with a window in section through a lintel (Z4), connection of an external wall with a window in section through a frame (Z5) – Figure 3.



a) connection of the external walls in the corner

b) connection of the external walls with ceiling with a rim



c) connection of an external wall with a window in section through a lintel

d) connection of an external wall with a window in section through a frame

e) connection of an external wall with a window in section through a window sill

Fig. 3. Examples of calculation models of the analysed construction joints – authors' own elaboration

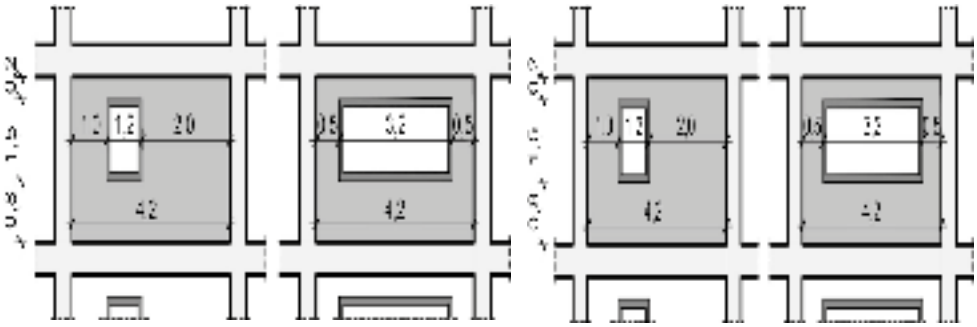
The results of the calculations of physical parameters are presented in Table 1.

Table 1. The results of calculations of physical parameters of double-layer wall joints – authors' own elaboration

Physical parameters of external wall joints		Calculation variants of the joints							
		$I_{(10)}$	$I_{(15)}$	$II_{(10)}$	$II_{(15)}$	$III_{(10)}$	$III_{(15)}$	$IV_{(10)}$	$IV_{(15)}$
Z1	$U_{c(1D)}$	0.24	0.19	0.16	0.12	0.32	0.23	0.19	0.13
	Ψ_i	0.075	0.067	0.060	0.052	0.129	0.105	0.090	0.068
	$\theta_{min.}$	14.37	15.36	15.88	16.78	13.55	15.07	15.80	16.92
	$f_{Rsi(2D)}$	0.859	0.884	0.897	0.920	0.839	0.877	0.895	0.923
Z2	$U_{c(1D)}$	0.24	0.19	0.16	0.12	0.32	0.23	0.19	0.13
	Ψ_i	0.131	0.090	0.075	0.051	0.125	0.086	0.073	0.048
	$\theta_{min.}$	16.67	17.57	17.94	18.55	16.79	17.72	18.07	18.66
	$f_{Rsi(2D)}$	0.917	0.939	0.949	0.964	0.920	0.943	0.952	0.967
Z3	$U_{c(1D)}$	0.24	0.19	0.16	0.12	0.32	0.23	0.19	0.13
	U_w	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
	Ψ_i	0.056	0.062	0.059	0.064	0.136	0.147	0.144	0.151
	$\theta_{min.}$	13.67	13.91	14.19	14.37	11.73	12.11	12.45	12.70
	$f_{Rsi(2D)}$	0.842	0.848	0.855	0.859	0.793	0.803	0.811	0.818
Z4	$U_{c(1D)}$	0.24	0.19	0.16	0.12	0.32	0.23	0.19	0.13
	U_w	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
	Ψ_i	0.081	0.086	0.074	0.079	0.075	0.083	0.072	0.077
	$\theta_{min.}$	14.76	15.29	15.80	16.15	14.90	15.49	15.97	16.34
	$f_{Ri(2D)}$	0.869	0.882	0.895	0.904	0.873	0.887	0.899	0.909
Z5	$U_{c(1D)}$	0.24	0.19	0.16	0.12	0.32	0.23	0.19	0.13
	U_w	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
	Ψ_i	0.052	0.059	0.054	0.060	0.061	0.070	0.063	0.069
	$\theta_{min.}$	13.66	14.05	14.50	14.79	14.16	14.70	15.20	15.56
	$f_{Rsi(2D)}$	0.842	0.851	0.863	0.870	0.854	0.868	0.880	0.889

$\mathbf{U_{c(1D)}}$ – external wall heat transfer coefficient [W/(m²·K)]
$\mathbf{U_w}$ – window heat transfer coefficient [W/(m²·K)]
$\mathbf{\Psi_i}$ – linear heat transfer coefficient [W/(m·K)]
$\mathbf{\theta_{min.}}$ – minimum temperature on the internal surface of a wall in place of a thermal bridge [ºC]
$\boldsymbol{f_{Rsi(2D)}}$ – temperature factor, determined on the basis of $t_{min.}$ [-]

In the second stage of calculations, heat losses through the wall of the ground floor of the building (with a window of different size – Figure 4) were determined including linear thermal bridges according to own calculation algorithms. For calculations, the values of Ψ_i [W/(m·K), specified in the first stage of calculations – Table 1, were used. The results of thermal parameters are summarised in Tables 2 and 3.



A – an external wall with a window 1.2x1.5 m **B** – an external wall with a window 3.2x1.5m

Fig. 4. Analysed external walls of the building – authors' own elaboration

Table 2. The results of calculations of heat losses through an external wall of a building, including linear thermal bridges – authors' own elaboration

Calculation variant		Thermal parameters of analysed external walls				
		U_c (U_{1D})	$U_c \cdot A_i$	$\Sigma\Psi_i \cdot l_i$	$H_D = U_c \cdot A_i + \Sigma\Psi_i \cdot l_i$	$U_{K(2D)} = H_D/A_{oi}$
$I_{(10)}$	A	0.24	2.09	0.87	2.96	0.28
	B		1.37	1.14	2.51	0.33
$I_{(15)}$	A	0.19	1.65	0.81	2.46	0.23
	B		1.08	1.03	2.11	0.28
$II_{(10)}$	A	0.16	1.39	0.64	2.03	0.19
	B		0.91	0.90	1.81	0.24
$II_{(15)}$	A	0.12	1.04	0.57	1.61	0.15
	B		0.68	0.85	1.54	0.20
$III_{(10)}$	A	0.32	2.78	0.96	3.74	0.35
	B		1.82	1.38	3.20	0.42
$III_{(15)}$	A	0.23	2.00	1.06	3.06	0.29
	B		1.31	1.31	2.62	0.34
$IV_{(10)}$	A	0.19	1.65	0.76	2.41	0.23
	B		1.08	1.18	1.26	0.30
$IV_{(15)}$	A	0.13	1.13	0.68	1.81	0.17
	B		0.74	1.14	1.88	0.25

A – an external wall with a window 1.2x1.5 m; **B** – an external wall with a window 3.2x1.5m
$\mathbf{U_{c(1D)}}$ – external wall heat transfer coefficient [W/(m²·K)]
$\mathbf{A_i}$ – external wall surface area [m²]
$\mathbf{\Psi_i}$ – linear heat transfer coefficient [W/(m·K)]
$\mathbf{l_i}$ – length of a thermal bridge [m]
$\mathbf{H_D}$ – heat loss by transfer coefficient [W/K]
$\mathbf{U_{K(2D)}}$ – heat transfer coefficient of an external wall, including linear thermal bridges [W/(m²·K)]
$\mathbf{A_{oi}}$ – surface area of an external wall in the axes of walls that are perpendicular to it [m²]

The share of thermal bridges in total heat loss through external partitions is significant. After taking into account two-dimensional heat transfers (linear thermal bridges), obtained values of $U_{K(2D}$ heat transfer coefficient were higher than U_c (U_{1D}) values in one-dimensional field – tables 2 and 3. Eliminating additional heat losses in the form of linear heat transfer coefficient Ψ_i from calculations is not justified. The methodology of their consideration according

to the Regulation [4] is dubious because its application may result in a significant discrepancy of calculation results for a given building, depending on the approach of the designer (certifier).

Table 3. The results of calculations of heat losses through an external wall and window carpentry of a building including linear thermal bridges – authors' own elaboration

Calculation variant		Thermal parameters of analysed external walls				
		U_c (U_{1D})/U_w	$U_c \cdot A_i + U_w \cdot A_i$	$\Sigma\Psi_i \cdot l_i$	$H_D = U_c \cdot A_i + U_w \cdot A_i \Sigma\Psi_i \cdot l_i$	$U_{K(śr.)} = H_D/A_{oi}$
$I_{(10)}$	A	0.24 / 0.90	3.71	0.87	4.58	0.37
	B		5.69	1.14	6.83	0.55
$I_{(15)}$	A	0.19 / 0.90	3.27	0.81	4.08	0.33
	B		5.40	1.03	6.43	0.52
$II_{(10)}$	A	0.16 / 0.90	3.02	0.64	3.66	0.29
	B		5.23	0.90	6.13	0.49
$II_{(15)}$	A	0.12 / 0.90	2.66	0.67	3.23	0.26
	B		5.00	0.85	5.85	0.47
$III_{(10)}$	A	0.32 / 0.90	4.40	0.96	5.36	0.42
	B		6.14	1.39	7.53	0.56
$III_{(15)}$	A	0.23 / 0.90	3.62	1.06	4.68	0.38
	B		5.63	1.31	6.94	0.56
$IV_{(10)}$	A	0.19 / 0.90	3.27	0.76	4.03	0.32
	B		5.40	1.19	6.59	0.53
$IV_{(15)}$	A	0.13 / 0.90	2.75	0.68	3.43	0.28
	B		5.06	1.14	6.20	0.50

A – an external wall with a window 1.2x1.5 m; **B** – an external wall with a window 3.2x1.5m
$\mathbf{U_{c(1D)}}$ – external wall heat transfer coefficient [W/(m²·K)]
$\mathbf{U_w}$ – window heat transfer coefficient [W/(m²·K)]
$\mathbf{A_i}$ – external wall surface area [m²]
$\mathbf{\Psi_i}$ – linear heat transfer coefficient [W/(m·K)]
$\mathbf{l_i}$ – length of a thermal bridge [m]
$\mathbf{H_D}$ – heat loss by transfer coefficient [W/K]
$\mathbf{U_{K(śr.)}}$ – average external wall heat transfer coefficient [W/(m²·K)]
$\mathbf{A_{oi}}$ – surface area of an external wall in the axes of walls that are perpendicular to it [m²]

3.2. Improvements to modern ventilation systems in buildings

According to the Regulation [3], the ventilation should ensure appropriate quality of the indoor environment, including the air exchange rate, cleanliness, temperature, relative humidity, and the speed of air movement in a room. These recommendations should be fulfilled while observing all applicable regulations concerning the mentioned installation. The ventilation system may be designed as mechanical or gravitational in rooms intended for people, in rooms without windows that can be opened, as well as in other rooms where, for health, technological or safety reasons, air exchange is necessary. Taking into account the amount of energy used in mechanical ventilation systems, it is worth to consider alternative solutions that allow, however, to maintain the existing regulations and provide a comfortable indoor environment. The first issue related to the ventilation system is the amount of ventilation air that should be supplied to the rooms according to the standard PN-83/B-03430/Az3:2000 [13].

The growth of construction industry resulted in sealing of buildings, which worsened the air flow in the rooms, while at the same time the needs of their users have changed. Consequently, their requirements increased and the search for appropriate gravitational

ventilation system solutions began. Some of the numerous ways of supporting gravity ventilation include:

- Chimney cowls, which primary task is to increase the vacuum in the exhaust duct using wind speeds. At a very low wind speed, the covers and ventilators cause additional resistance to the air flow. Increase in wind speed contributes to an increase of the total pressure. They are affected by the difference in air density and the negative pressure generated in the ventilator casing, which results in higher intensity of ventilation in the facility.
- Double-glazed walls (two-layer walls), which when exposed to sunlight cause an increase in the temperature in the interlayer space. The outer layer additionally serves as a wind screen and an acoustic screen; the air void between the glass layers serves as a circulation channel. The air heated in the interlayer space circulates upwards and goes outside the building. The upward airflow leads out the used, warm air, sucking in cool air from outside at the bottom.
- Glazed atriums and passages are located inside a building. The air heated in the upper part of the atrium is led out through the circulation openings, which are located in the roof section. The created negative pressure causes the so-called chimney effect, which results in sucking air from the lower parts of the building. The air flow in the upward direction causes the fresh air from the bottom to enter the building. This air is brought in through the openable windows in the facade. Glazed atrium is a transverse-ventilation system. The air entering through the windows flows transversely through the rooms. Then, after being heated, it goes up in the atrium space to be led out of the building.
- Solar chimneys are devices that support gravitational ventilation in a building where the convection effect of air heated by solar energy is used. The principle of operation of solar chimneys is similar to that of traditional chimneys. A characteristic feature is strengthening of natural displacement ventilation using passive solar heating. The energy of insolation is obtained in a natural way, thanks to the heat and mass exchange processes. The efficiency of the solar chimney depends on the temperature within the chimney duct. The amount of heat transmitted from the sunlight has a direct influence on the temperature, and this is connected with the incident angle of the sunrays on the surface. Therefore, the inclination angle of the solar chimney is a very important parameter to determine the intensity of natural ventilation. Since the 1990s, research has been conducted on this subject. Scientists have been trying to determine the optimum angle values by various methods. However, it is a very complex issue, as the air flow is influenced not only by insolation but also by other factors such as wind speed and air humidity [14].

3.3. Energy performance parameters of a building

When determining the annual final energy demand for a building or a part of a building for the EK heating system [kWh/(m^2·year)], the efficiencies are taken into account resulting from: regulation and use of the heat in the heated space ($\eta_{H,e}$), transfer of heat from the heat source to the heated space ($\eta_{H,d}$), heat accumulation in the capacitive elements of a heating system ($\eta_{H,s}$), the heat generated from an energy carrier or the energy supplied to the heat source ($\eta_{H,g}$). The heating installation in a building shall comply with technical building regulations and take into account technical knowledge regarding energy-saving

solutions. The system to be designed shall be a high-efficiency system. Highly efficient heat sources should be planned, and every effort should be made to reduce losses resulting from the transmission of the heating medium. If there is a heat discharge tank, the accumulation losses should be minimal and the elements responsible for heat regulation and use should be optimally selected. Maximum possible efficiencies can be achieved in accordance with [15], among others, through using condensing boilers, heat pumps with a high coefficient of performance (COP), appropriate routing of the heating medium distribution pipes (compact installation) and their proper thermal insulation, correct insulation of buffer tanks, as well as charging and discharging control selected for their specific operation and use, low-temperature surface, radiator or mixed heating systems, selection of regulation and control technology ensuring the highest efficiency of regulation in a given system structure and usage, use of high-efficiency auxiliary pumps with low power consumption resulting in low auxiliary energy consumption.

The annual non-renewable primary energy demand EP [kWh/(m^2·year)] determines the total efficiency of a building. It refers to the energy contained in the sources, including fuels and carriers, necessary to cover the final energy demand, taking into account the additional investment to deliver this energy to the perimeter of a building. The value of non-renewable primary energy input factor for generating and delivering an energy carrier or energy for technical systems shall be taken from the data provided by the supplier of that energy carrier or energy. Low values indicate little need for non-renewable primary energy EP and the determination of the energy class of the building.

Table 4 summarises the energy performance parameters of three analysed buildings, defined on the basis of the procedures presented in the Regulation [4].

Table 4. Comparative analysis of energy performance parameters of selected buildings – authors' own elaboration

Analysed parameters of the building	Building I	Building II	Building III
The type and destination of the building	Residential, one-family Bydgoszcz	Residential, one-family Bydgoszcz	Residential, one-family Bydgoszcz
External walls of the building	$U_c < U_{cmax/2014-2017/}$	$U_c < U_{cmax/2014-2017/}$	$U_c < U_{cmax/2014-2017/}$
Ventilation system	Gravitational, Ventilation with diffusers	Gravitational, Ventilation with diffusers	Gravitational, Ventilation with diffusers
Rooms area with controlled air temperature (heated or cooled area) A_f [m^2]	121.25	85.50	291.00
Indicator of annual usable energy demand **EU** [kWh/(m^2·rok)]	48.13	76.58	63.15
Seasonal average efficiency of the heating system	0.693 *1)*	0.735 *3)*	0.693 *5)*
Seasonal average efficiency of the hot water preparation system	0.442 *2)*	0.531 *4)*	0.312 *6)*
Annual final energy demand indicator **EK** [kWh/(m^2·year)]	57.43	116.78	143.83
Indicator of the input of non-renewable primary energy for the generating and delivering of an energy carrier or energy for technical systems **wi** *5)*	Bituminous coal (w_i=1.1) biomass (w_i=0.2)	Heating oil (w_i=1.1) biomass (w_i=0.2)	Bituminous coal (w_i=1.1)
Indicator of annual non-renewable primary energy demand **EP** [kWh/(m^2·year)]	70.50	110.95	158.20
Specific emission of CO_2 [t_{CO2}/(m^2·year)]	0.02	0.03	0.06
Share of renewable energy sources in annual final energy demand [%]	9.40	20.00	0.00

1) heat generation efficiency – **0.82** (coal boiler produced after 2000, fireplace), heat transfer efficiency – **0.96** (central heating from a local heat source, located in the heated and insulated building), heat accumulation efficiency – **1.0** (without buffer tank), regulation efficiency and heat utilisation – **0.88** (water heating with panel radiators, central and local regulation, floor heating in the ground floor)

2) heat generation efficiency – **0.65 (**two-function eco-pea boiler), heat transfer efficiency– **0.80 (**central water heating in a one-family house), heat accumulation efficiency – **0.85** (hot water storage tank produced after 2005)

3) heat generation efficiency – **0.87** (low-temperature liquid fuel boiler of 50kW nominal output, fireplace), heat transfer efficiency – **0.96** (central heating from a local heat source, located in the heated and insulated building), heat accumulation efficiency – **1.0** (without buffer tank), regulation efficiency and heat utilisation – **0.88** (water heating with panel radiators, central and local regulation, floor heating in the ground floor)

4) heat generation efficiency – **0.83 (**low-temperature liquid fuel boiler of 50kW nominal output), heat transfer efficiency – **0.80** (central water heating in a one-family house), heat accumulation efficiency – **0.80** (150 l tank)

5) heat generation efficiency – **0.82** (coal boiler produced after 2000), heat transfer efficiency – **0.96** (central heating from a local heat source, located in the heated and insulated building), heat accumulation efficiency – **1.0** (without buffer tank), regulation efficiency and heat utilisation – **0.88** (water heating with panel radiators, central and local regulation)

6) heat generation efficiency – **0.65 (**solid fuel two-function boiler), heat transfer efficiency – **0.60 (**central water heating in a one-family house), heat accumulation efficiency – **0.80** (hot water tank produced in the years 2001-2005)

Precise determination of the energy performance of a building requires comprehensive knowledge of many technical issues and calculation procedures in this area. The value of the EU coefficient depends mainly on the energy balance of a building (heat gain and loss analysis). Whereas the value of EK coefficient depends on the value of EU coefficient and average seasonal efficiency of heating system and hot water preparation. As a final result of the calculations, after taking into account the ratio of the input of non-renewable primary energy for the generation and supply of energy carrier or energy for technical systems w_i, the EP coefficient is obtained. To meet the requirements for achieving the standard of low-energy building in terms of the EP-value (e.g. for a one-family building, less than 70 kwh/(m^2·year)), it is necessary to design the building envelope and joints that ensure minimum heat loss by transfer ($U_c \leq U_{cmax}$), to select appropriate components for central heating, hot water, ventilation, cooling (with particular emphasis on efficiency) and to use a renewable energy source. Detailed analyses concerning the influence of thermal quality of external walls of a building on their energy demand (EU, EK, EP) are also described in detail in the paper [16].

4. Summary and conclusions

The design, construction and use of low-energy buildings is a complex process and requires knowledge of a wide range of issues in the field of building materials, general construction, building physics, building installations, renewable energy systems and architectural design.

Proper design of the building envelope (external walls and building joints) consists in meeting the hygrothermal requirements specified in the regulation [3]. In engineering calculations in the hygrothermal aspect, the authors propose to use professional catalogues of thermal bridges. Lowering the limit values of U_{max} heat transfer coefficients without taking into account heat fluxes in the (2D) and (3D) field, i.e. thermal bridges, actually allows greater heat losses through external walls and their joints. Moreover, it is justified to determine the limit values of linear heat transfer coefficient Ψ_{max} at the level of 0,05÷0,10 W/(m·K) depending on the characteristics of an analysed joint.

The humidity requirements according to the regulation [3] should be checked by appropriate calculation methods, and in particular it should be determined:

- Temperature factors of joints in building envelope to confirm the requirement: $f_{Rsi} \geq f_{Rsi(kryt)}$. All joints must be verified by two- or three-dimensional calculation (depending on their type). The mentioned calculations are the essence of realization of the condition of preventing critical surface moisture on the building envelope.
- Volume of annual moisture of the building envelope as a result of diffusion of steam to assess their ability to resist inter-layer condensation.

Analysing the joints of external walls (Table 1), it can be concluded that there is no risk of critical surface moisture because the calculated values of temperature factors f_{Rsi} [-] are greater than the limit value of temperature factor $f_{Rsi,\,(kryt.)}$ [-]. The (critical) threshold value of the temperature factor, taking into account the parameters of indoor and outdoor air, of the analysed calculation variants is $f_{Rsi,\,(kryt.)} = 0{,}78$.

Reasonable (optimal) energy demand for a building consists in considering many factors, among others: minimising transmission heat losses – applies to building envelope elements, limiting heat loss resulting from ventilation while ensuring appropriate parameters of the interior microclimate (temperature, humidity and air cleanliness), designing innovative technical solutions for installations based on renewable energy sources. All these activities and aspects

result in minimizing the energy demand and consumption (during use) and CO_2 emissions to the atmosphere.

On the basis of calculations, computer simulations and analyses, it should be emphasized that an energy-efficient building is a building in which applied design and technical solutions enable it to be used at low energy consumption, while ensuring comfortable hygienic and sanitary conditions.

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Orginal Article

Opportunities and threats for natural building using straw bale technology

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Abstract: In this paper, the possibilities of using straw bale technology in construction, as well as the threats that limit both its development and dissemination, have been presented. This study has also investigated the use of recyclable waste and the role of recycling in natural construction, as well as the impact of CO_2 reduction on pro-ecological activities. The characteristics of natural straw construction have been discussed, and the main features of straw bale technology have been presented. Examples of the implementation of straw bale technology in both Poland and Europe have been presented and the methods of their use have been described. An integral part of this study is an overview of the opportunities and threats of the use of straw bale technology in natural construction. Low-emission technologies using biodegradable materials as well as the possibility of building nZEB and passive buildings are indicated as main advantages of the technology.

The necessity of introducing legal regulations that would enable the development of natural construction using straw bale technology was indicated. Straw bale technology was created as a response to an ecological challenge for sustainable construction and has significant innovation potential.

Keywords: straw bale, natural construction, natural materials, low energy construction, recycling, CO_2 emission

1. Introduction

Straw has been used as a construction material for centuries; it has been used in thatched roofs, for sealing the walls of wooden structures, for filling half-timbered buildings and also for the production of clay-straw bricks [1]. At the end of the nineteenth century, a new application was found for cubes of compressed straw; known throughout the world as straw bales. American settlers in the state of Nebraska were the first in the world to use straw for construction purposes. In Europe, the oldest house that was built using straw bale technology

dates from 1921 and is located in France [1]. The possibilities for the use of straw cubes are extensive, from filling wooden constructions (Infill) and insulating existing buildings, to the prefabrication of wooden-straw panels.

Straw is a byproduct of farming, i.e. it is agricultural waste from grain threshing; it is obtained in a renewable manner on an annual basis. Every year in Poland 25 million tons of this raw material are produced, which would potentially allow for the construction of thousands of ecological, energy-saving buildings. Realistic straw surplus forecasts indicate that there will be a slow reduction in the surplus to around 10 million tons in 2030 [2]. At present, a lot of attention is focused on the design of buildings with reduced primary energy demand and a low operating cost [1].

A straw cube, the equivalent of the English term 'straw bale', is created by mechanical compression of straw through a square baler and it is then tied with string or wire. Depending on the type of press used, it is possible to obtain cubes of different sizes; three groups of cube size are distinguished:

- small – height 35 cm, width 50 cm, length 50-120 cm,
- medium – height 50 cm, width 80 cm, length 70-240 cm,
- jumbo – height 70 cm, width 120 cm, length 120-300 cm [3].

In order to construct walls, small cubes are most often used due to their light weight and the possibility of manual positioning, negating the need for heavy equipment [1]. Table 1 presents selected parameters of compacted straw bales.

Table 1. Selected parameters of a straw cube with dimensions of 40x47.5x100 cm

1	volume, V	0.19 m^3
2	unit price	2-5 PLN/unit.
3	straw consumption standard	5 cubes/1m^3
4	thermal conductivity coefficient, λ *(for cubes of pressed straw with a density of 85-115 kg / m3 and a heat flux direction parallel to the fibres)*	0.080 W/(mK)
5	thermal conductivity coefficient, λ *(for cubes of pressed straw with a density of 85-115 kg / m3 and a heat flux direction perpendicular to the fibres; this arrangement does not apply to straw bale technology*)	0.052 W/(mK)

2. The importance of using straw bale technology in the construction industry

2.1. Recycling and sustainability for the construction sector

According to the Central Statistical Office, in Chapter 2 'Use of recyclable waste' of the statistical analysis 'Material management' 2017, recyclable waste is a useful waste material that is generated during production processes, as well as waste products and pre-sorted municipal waste fractions (without processing) that are not suitable for direct use in industrial processing. These days, both ecological and economic aspects have had a major impact on the growing interest in the use of waste products. This is closely related to environmental protection, i.e. limiting greenhouse gas emissions and water pollution, and, to a large extent, limiting energy consumption during production. The Central Statistical Office of Poland emphasizes that it is observing clear trends in the recovery of materials and their use as an environmentally

friendly secondary raw material [4]. In light of the quantitative data that was presented in the literature, the search for building materials that can contribute to the sustainable development of construction is an important goal, which has also been set out by the European Union Regulations in the field of pro-ecological activities.

In the light of the direction of the legal changes that have been implemented by the European Union, in particular the Regulation of the European Parliament and of the Council No. 305/2011 on the conditions for introducing construction products, growing pressure to reduce energy consumption in the construction market, transport and the industrial production of materials can be observed. From April 24, 2011, certain provisions came into force, including article 1, point 55 'The basic requirements for buildings relating to the sustainable use of natural resources should take into account, in particular, the possibilities of recycling buildings and their demolished materials and parts, the durability of buildings and the use of environmentally friendly raw materials and secondary materials.' From July 1, 2013 Annex I of the Regulation came into force, which in point 7 contains a provision on the sustainable use of natural resources. Construction works must be designed, constructed and demolished in such a way that the use of natural resources is sustainable and ensures the following:

- the reuse or recycling of construction works and their materials and parts after demolition;
- the durability of buildings;
- the use of environmentally friendly raw materials and recyclable materials in the construction of buildings [1].

It should be emphasized that the construction sector in the countries of the European Union is responsible for the consumption of up to 40% of the energy produced in the EU, which makes it the main source of the extensive carbon dioxide emissions into the atmosphere [5]. In the light of the regulations and directions that have been laid out by the modern economy, environmental problems have reached the scale of a global threat, which is the main reason for the increased interest in natural construction. Construction using straw bale technology utilizes plant-derived materials without burdening the environment in the production process and thus makes then suitable for sustainable construction.

2.2. CO_2 reduction as a determinant of pro-ecological activities

Carbon dioxide is the main driver of the greenhouse effect; the need to reduce global energy consumption and greenhouse gas emissions is the main reason why technologies that reduce CO_2 emissions to the atmosphere are being sought. CO_2 is a byproduct from the process of producing electricity and heat caused by the combustion of fossil fuels [6]. The main activity that aims to achieve a reduction in CO_2 emissions to the atmosphere is increasing energy efficiency in the construction sector. The policy and activities of the European Parliament aim to reduce carbon dioxide emissions by 90% compared to 1990 levels. EU Directive 2010/31/EU from 19 May 2010 on the energy performance of buildings [7] states that there must be a reduction in the energy consumption in buildings in the countries of the European community. It also states that by December 31, 2020, all new buildings should have almost zero energy consumption, and from December 31, 2018, buildings intended for use by public authorities and owned by them must also meet this stipulation. Therefore, changes were made in Poland to the regulations on the technical conditions to be met by buildings and their locations, which represent the maximum allowable values of heat transfer coefficients for building partitions and the maximum allowable values of non-renewable primary energy indicators for newly designed buildings [8].

The environmental effect of construction activity has an impact on the reduction of raw material resources, including energy carriers and space [5]. Considering the above-mentioned issues and the fact that there is a threat of the depletion of energy resources throughout the world, it is necessary to adopt all the actions that are aimed at improving the spread of pro-ecological technologies, which includes straw bale technology.

3. Characteristics of natural straw construction

Contemporary natural construction refers to traditional, historic technologies and is based on local materials that do not require intensive processing. The essence of natural construction is to reduce the negative impact of the construction industry on the natural environment without affecting the comfort, durability and aesthetics of the building. The basis is the use of human labour, without the use of advanced, and thus energy hungry, devices and machines [1].

The main features of straw bale technology include:

- lightly-processed material – clean straw without the addition of construction chemicals;
- 100% renewable raw material – organic, local material;
- the coefficient of thermal conductivity λ for cubes of pressed straw with a density of 85-115 kg / m3 and a direction of heat flux parallel to the fibres is 0.080 W / mK [9]; for comparison, the value of the λ coefficient for aerated concrete blocks 24 cm is 0.21 W / mK [10];
- the heat transfer coefficient U for a wooden wall filled with 50 cm thick cubes of straw is 0.16 W / m2K [9]; the value of the heat transfer coefficient depends on the width of the straw cube and its arrangement, which ranges from 0.15 to 0.20 W / m2K;
- good sound insulation – sound insulation index RW, R = 43 dB for a 36 cm thick wall, plastered on both sides [11];
- minimizing construction waste – biodegradable materials [5];
- good fire resistance of plastered walls (according to British tests 135 minutes or REI 120, according to German tests F90 or REI 90) [12];
- high vapour permeability – prevents the accumulation of moisture inside the walls (diffusion-open walls; straw is a vapour-permeable material, characterized by a coefficient of water vapour diffusion resistance of $\mu = 2$ [11];
- a healthy microclimate – the interiors are characterized by moisture regulation, heat accumulation, they bind harmful substances and are anti-static [13].

A building built using straw bale technology displays a combination of durability, with respect for the natural environment, and simplicity with the functionality that is mainly used in single-family housing. The method used to shape the building is determined by the geometry that results from using straw cubes. When designing both the functional and utility system in the case of straw bale technology, the modular distribution of the axes of the structural walls, in relation to the size of the straw cube, should be taken into account.

The supporting structure of such a building is made from wood and filled with straw cubes, most often produced by local factories. The outside of the building is finished with lime plaster, while the inside is covered with clay plaster. In the case of the "straw house project" by architect Michał Koziej, the gable walls and eaves were protected with wooden cladding, the purpose of which is to protect the external plaster against adverse weather conditions. Some applications of straw bale technology in construction site are given in Figs 1, 2 and 3.

Fig. 1. Implementation of the 'straw house' project 2014/2016, Koziej Architekci office (source [14])

Fig. 2. Implementation of the 'ASZ Dom' project using prefabricated EcoCocon panels, Koziej Architekci office, source: www.koziejarchitekci.com [14]

Fig. 3. Walls made of EcoCocon straw panels. Vastu Home – Bulgaria house design, source: www.ecococon.lt

4. Opportunities and threats in straw bale technology

The development of technology for the production of building materials has always focused on modern solutions that use the latest discoveries in a given field. Progress is the natural consequence of technological revolutions, which are not in short supply in the 21st century. Natural construction requires a new outlook and the adaptation of production, design and implementation solutions to the requirements of modern, innovative construction products. The current state of knowledge indicates that there are opportunities for natural construction using straw bale technology, which are as follows:

1. it is a low-carbon technology that reduces carbon dioxide (CO_2) emissions; straw production is a low-energy process, compared to the production of other building materials and reduces greenhouse gas emissions; 1 kg of straw absorbs 1.36 kg of CO_2; 1 cube of dimensions 40x47.5x100 cm, a density of 121 kg / m3 and a weight of 23 kg absorbs 31.28 kg CO_2[1]; at the beginning of the process, the production of straw cubes requires the development of plants that have the ability to absorb CO_2 in the growth cycle, which in turn translates into negative carbon dioxide emissions [15];
2. the possibility of constructing nZEB and passive buildings; it has very good thermal insulation parameters for the building's walls [15]; a 50 cm thick wall has a heat transfer coefficient of U = 0.16 W / m2K;
3. it has very good acoustic parameters [15];
4. recycling of buildings made of biodegradable materials; after the use phase of the building, the straw can be processed or biodegraded and can also be used as a raw material to produce energy; in case of the use of prefabricated panels, e.g. ModCell, it is possible to disassemble the building and reuse them [12];
5. opportunities for agriculture and rural development; involvement of the local population and the integration of future residents in the construction process; support for regional suppliers, which in turn will develop the local labour market;

The organic nature of straw, under favourable conditions, demonstrates threats to natural construction using straw bale technology; these primarily include:

1. protection against rot and mould; susceptibility to rot increases with the occurrence of certain thermal and humidity conditions [12]; the design of the connection of the foundation wall with the wall of each storey is particularly important, this will protect against moisture and the migration of moisture from the foundation level; it is also important to ensure the air tightness of the surface layers in order to minimize oxygen access to the partition, as this would significantly accelerate the degradation processes [9, 16];
2. the heterogeneity of the raw material for the production of straw cubes, this determines the technical parameters of the straw cat; such as making cubes with good quality straw without signs of mould growth, or infected with diseases [9, 17];
3. difficulty in selecting a computational model that correctly describes the thermal and humidity phenomena that occur and the choice of the material parameters for numerical analysis; to avoid the risk of adopting parameter values that are too optimistic in the calculation model [9];
4. limiting moisture penetration; it is necessary to properly select the plaster using the principle of greater diffusion resistance on the inside of the partition; the external

plaster should be characterized by high vapour permeability (sd ≤ 0.5 m) so that moisture could migrate outside in the event of water vapour entering the structure; the internal plaster should have a vapour barrier layer (sd ≥ 0.1 m) in order to limit the penetration of moisture inside the partition; these requirements will be met when 3 cm thick internal plaster (sd = 0.3 m) and 3 cm thick external plaster (sd = 0.45 m) are used [9, 11];

5. the threat of bad weather conditions during construction; the partitions should be protected by using eaves or ventilated external facades [9];
6. low social awareness of straw bale technology;
7. fire resistance; clean straw is flammable, however, in the production process of pressed straw cubes or prefabricated panels, the fire resistance increases; ModCell prefabricated panels have a fire resistance certificate for 2 hours; in the laboratory of the University of Bath, panels were subjected to a fire test which lasted for 2 hours and 15 minutes (temperature 1000°C); after 90 minutes, the lime plaster covering the panel was destroyed; carbonization of the exposed straw occurred after further 45 minutes [12];
8. difficulty in assessing the degradation of the straw within a cube during the lifetime of the building; the humidity level inside the partition was tested using sensors located in the wall to record the changes in the humidity levels that occur during the lifetime of the facility [15]; studying this phenomenon is important because of the adverse effect of moisture penetration on the straw;
9. protection against rodents; straw has little nutritional value and is not of interest to pests, and the use of plaster layers significantly reduces the ingress risk of harmful organisms [12].

5. Conclusion and forecast for the future

The direction of the future development of the construction market lies in innovative pro-ecological activities; these take into account energy consumption, recycling processes, durability of buildings and building life cycles [18]. Technologies are being sought that guarantee that the growing demand for materials that are hygrothermal, future-proof and at the same time biodegradable can be met. The natural environment must be cared for and this drives innovation; this presents a challenge for modern natural construction. Although some of the perspectives that have been indicated, e.g. the production of load-bearing panels [19] have been implemented, they are still lone initiatives that have been targeted at local recipients and do not constitute a coherent development policy. It is also necessary to introduce legal regulations that will drive the development of this promising branch of natural construction.

As a result of this study, the following subjects can be highlighted as the most important and up to date perspectives for the development of straw bale technology:

- the development of technology for the construction of prefabricated load-bearing panels,
- standardization of solutions (repeatability of both the properties and technical parameters of the straw cubes) [20],
- cataloguing of the basic design solutions,
- making the construction process independent of weather conditions,

- information and educational campaigns, including cooperation with research institutions,
- a study of the earthquake resistance of straw cubes, as well as their absorption of seismic vibrations,
- implementation of the technology for multi-family buildings, collective housing and public utilities,
- monitoring existing buildings [21].

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Analysis of the structure of housing in Poland in the years 2009-2018

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Abstract: The article presents an analysis of the housing situation in Poland against the background of European Union countries that took place in the last decade, i.e. in the years 2009 – 2018. The average number of dwellings per 1,000 inhabitants was analysed, the relationship between the number of dwellings and their area was determined, and the increase in the number of dwellings completed over the period was determined divided into flats: individual, cooperative, company and communal, as well as flats intended for sale or for rent

Keywords: housing in Poland; dwellings per 1,000 inhabitants; real estate

1. Introduction

On the one hand, the apartment is a designed and structurally separated premises, on the other hand, it is a space necessary to ensure security, privacy and appropriate conditions for the learning and life of its inhabitants. Changes in demographics and culture significantly affect the preferences in choosing an apartment. However, the lower number of births and ageing population recently observed in many countries do not reduce the demand for new housing [1]. On the contrary, in tandem with the increasingly common phenomenon of housing alone, not only an increase in the demand for the number of apartments is observed, but also a larger residential area [1]-[2]. Lifestyle changes, including work at home, and increased proportions living alone, in younger ages in particular, change the preferences for the space being designed [3]. In Poland, despite various forms of government support, including tax breaks, facilities for lending or de-agricultural land, the increase in the number of apartments built annually is very slow [4].

Poland has been facing the problem of satisfying the housing needs of citizens for years, although character and scale of this problem has evolved over time [4]. In the 1950s, the housing deficit was enormous – there were on average 2.5 apartments per 1000 inhabitants. In the 1960s, the average flat area per inhabitant did not exceed 11m^2 and the flats were characterized by a uniform standard, architectural minimalism and economy in the use of space. In the mid-90s, there was although a predominance of supply over the demand for flats, but it resulted not so much from the excess of flats as from the low income of potential buyers who earned too little to afford a flat buying. Average earnings were the equivalent of approximately 0.6-0.7 square meters of usable floor space of a new apartment. In 2007, according to Urban Development data in Poland, there was a deficit of 1,400,000 flats [5].

At present, one can therefore wonder if the housing conditions of Poles have improved in recent years. What is the housing situation in Poland compared to other European Union countries? How is the share of individual forms of housing changing? These are the questions that we will try to answer in this article.

2. Structure of housing construction

2.1. Housing construction in Poland and standards in the European Union

The European Union standard assumes that an apartment or house should have one common room (it can be a living room or dining room), and moreover [6]:

- one room (bedroom) for a couple forming a household,
- one room (bedroom) for every single adult,
- one room (bedroom) for two same-sex children between 12 and 17 years old,
- one room (bedroom) for a person between 12 and 17 years old, if not included in the above,
- one room for two children under 12 years old.

Eurostat data for 2016 (Fig. 1) shows that Poland is in the fifth position in terms of overcrowding (40.7%) just behind Croatia (41.1%) and Bulgaria (42.5%).

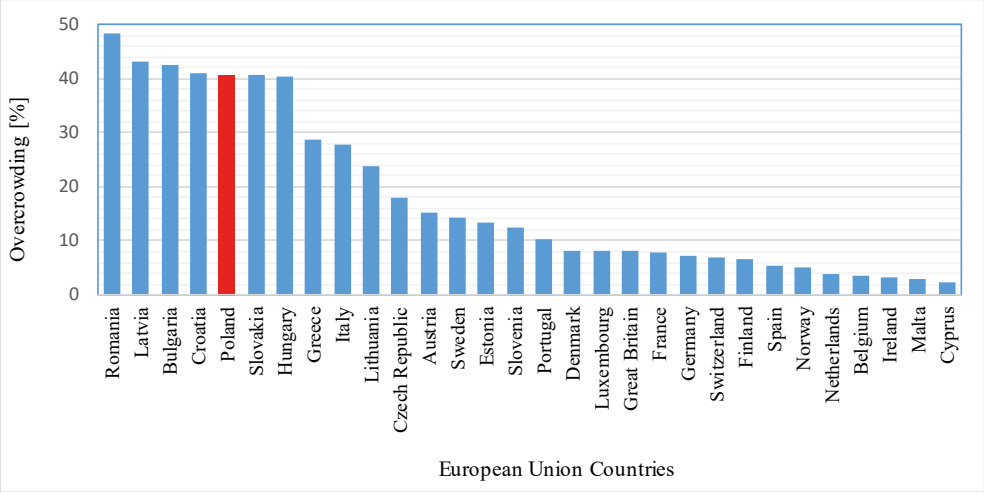

Fig. 1. Level of the overcrowding in the European Union countries in 2016 *Source*: [2]

Romania is a disgraceful leader in this field (48.4%). The lowest overcrowding rates are recorded in Cyprus (2.4%), Malta (2.9%), Ireland (3.2%) and Belgium (3.7%). An analysis of Eurostat data for 2016 shows that the average overcrowding in the European Union for 28 countries is 16.6%. This means that in Poland overcrowding is nearly 2.5 times higher than the European Union average. Comparison of the above data with the data from 2006 [7] shows that the level of overcrowding in Poland has decreased by 13.4% over the past 10 years.

The data of the report [8], which analyses the housing market in European countries, shows that in 2018, the countries with the largest number of flats were Germany (over 40,000,000 flats), France (about 350,000 flats) and the United Kingdom (about 2,800,000 flats), which is shown in Figure 2. In Poland, the state for 2018 was 14,600,000 apartments. The figure shows the number of available apartments in relation to the number of inhabitants. The degree to which available flats meet the needs of the population is also indicated (gray line). The analysis of the drawing shows that Portugal best meets housing needs (58%).

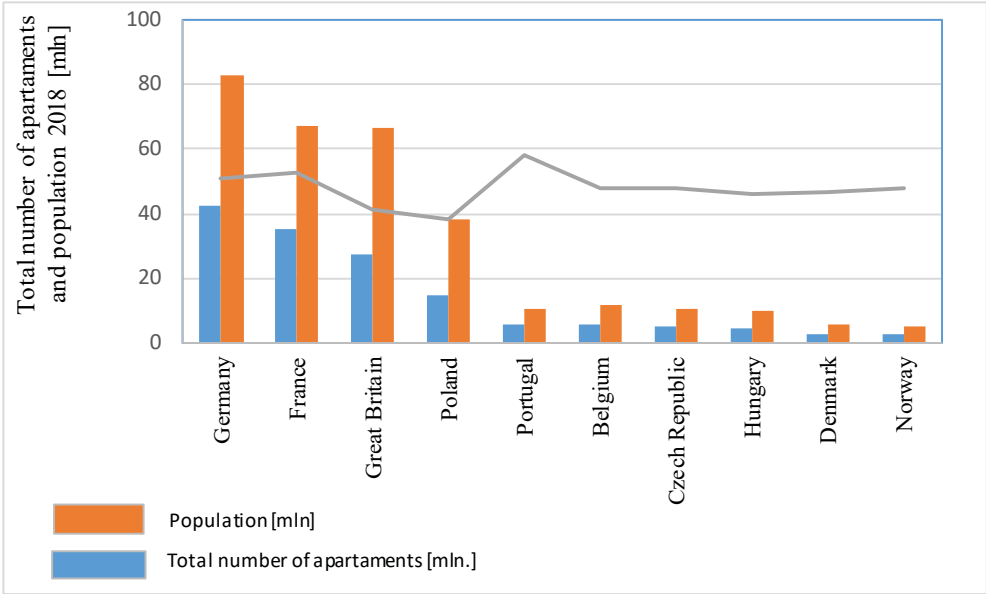

Fig. 2. Number of apartments in Number of apartments in relation to the number of inhabitants selected European Union countries in 2018 *Source*: [8]

A popular measure of the level of satisfaction of housing needs is the number of newly completed flats per 1,000 inhabitants [8].

Newly built apartments are an important element affecting the living conditions of the population, determining the social status of citizens and their standard of living. Figure 3 shows the number of newly completed flats per one thousand inhabitants [8]-[10] in selected European Union countries, including Poland.

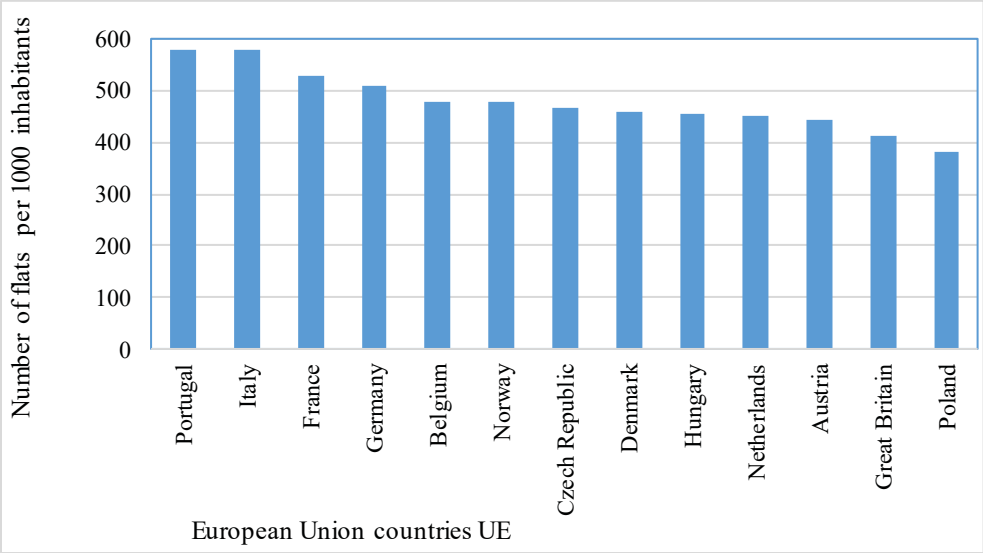

Fig. 3. Average number of apartments per 1000 inhabitants in selected European Union countries in 2018 *Source:* [8]-[10]

The analysis of the data shows that Poland cannot compete with such European Union countries as Portugal, Italy or France, where this indicator is the highest. On the other hand, we are pleased that in Poland the number of flats completed per 1000 inhabitants is increasing every year, as shown in Figure 4.

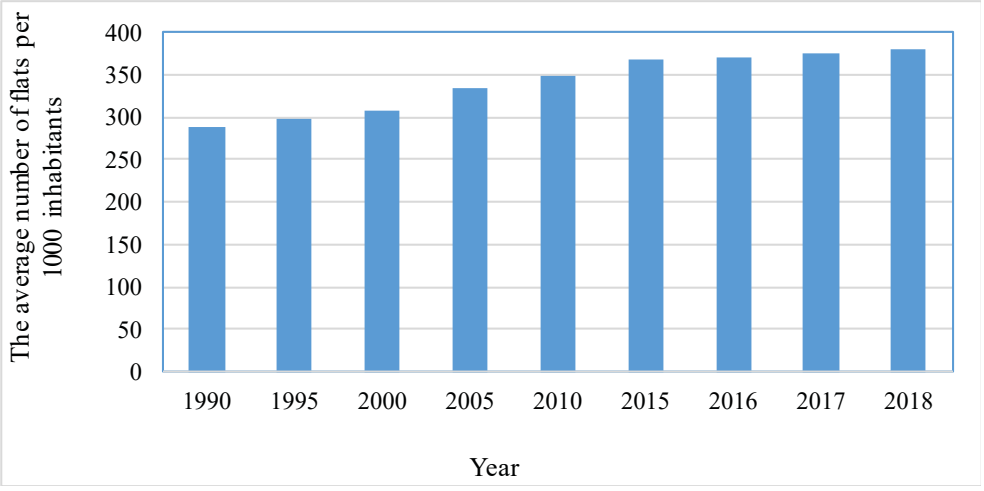

Fig. 4. Average number of apartments per 1000 inhabitants in Poland *Source*: [8]-[11]

The presented data show a steady increase in the number of flats in Poland in subsequent years (Fig. 4). In 2017, the average number of flats per 1000 inhabitants increased by 30.24%

compared to 1990, and by 22.68% compared to 2000. A slight increase in the number of apartments was recorded during the last year, i.e. 2018 compared to 2017 – only by 1.25%, which is worrying. Let's hope, however, that the upward trend will continue in the coming years, and maybe even increase significantly.

2.2. Housing construction in Poland in recent years

To get a more detailed picture of the housing situation in Poland, the number of dwellings completed in 2009-2018 was analysed and compared with the base year 2003 [9]. Additionally, the relationship between the number of flats and their area was analysed. The total number of dwellings completed (in thousands) and area (in millions of m^2) is presented in Figure 5.

According to the data presented in Figure 5, in the 2018 year 185,170 apartments with a total usable area of 1,677,000 m^2 were commissioned. Compared to the previous year, the number of dwellings increased by 6828 (3.8%), and the area – by 168,400 m^2 (1,0%) [7]. In 2018, the largest number of completed dwellings out of all eleven years can be observed. Interestingly, in 2018, compared to 2003, an increase in the number of completed apartments was observed (13.86%), but their area decreased (by 11.27%).

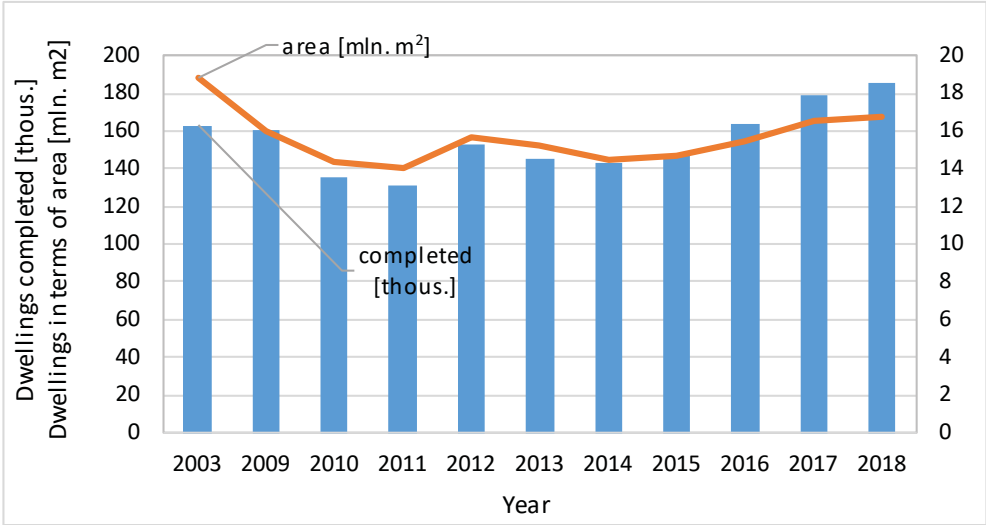

Fig. 5. Total dwellings completed (in thousand) and in terms of area (in millions of m^2) *Source:* [9]

Additionally, on the basis of data from [8]-[10], it is possible to analyse the share of individual types of flats in the total number of flats completed in Poland in the last ten years (Fig. 6). In this case, 2003 was also adopted as the base year, which allows us to show the nature and rate of change. The number of dwellings completed was analysed, taking into account the type of ownership: individual apartments, flats for sale or rent, cooperative and other flats.

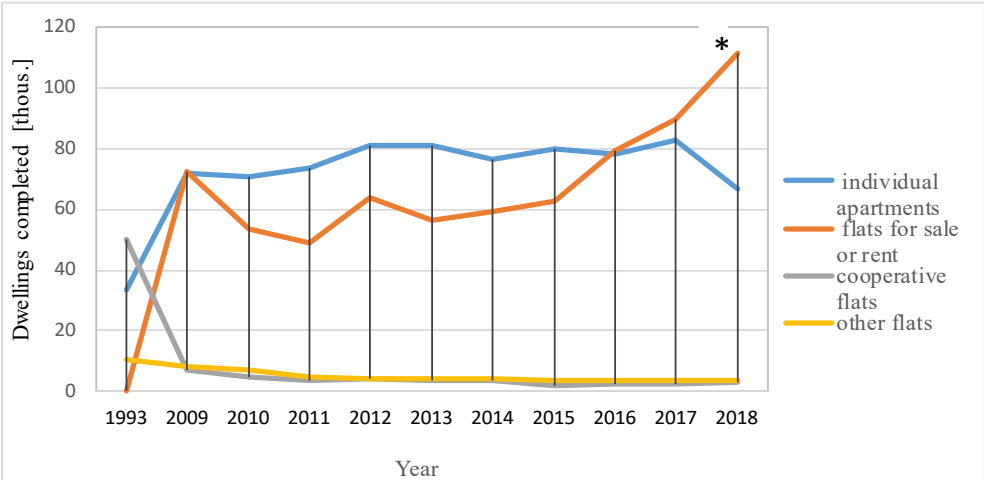

Fig. 6. Dwellings completed (in thousands) divided into: individual apartments, flats for sale or rent, cooperative and other flats (*note: from January 2018, data on the effects of "individual housing" implemented for sale or rent were included in the form "housing for sale or rent"; for 2016 and 2017 the data have been calculated *Source:* [8]

Based on the analysis, a significant increase in the number of dwellings completed for sale or rent was observed. In 2009, compared to 1993, there was a significant increase in apartments built by individual investors. This level is still maintained. On the other hand, the share of flats sold as cooperative flats decreases from year to year. The number of cooperative apartments completed in 2018 compared to 2009 decreased by 58.6%. Also, the number of other flats: municipal, rent and company-owned is decreasing year by year. The article also presents the analysis of data on dwellings completed in new, non-new, collective housing and non-residential buildings (Fig. 7).

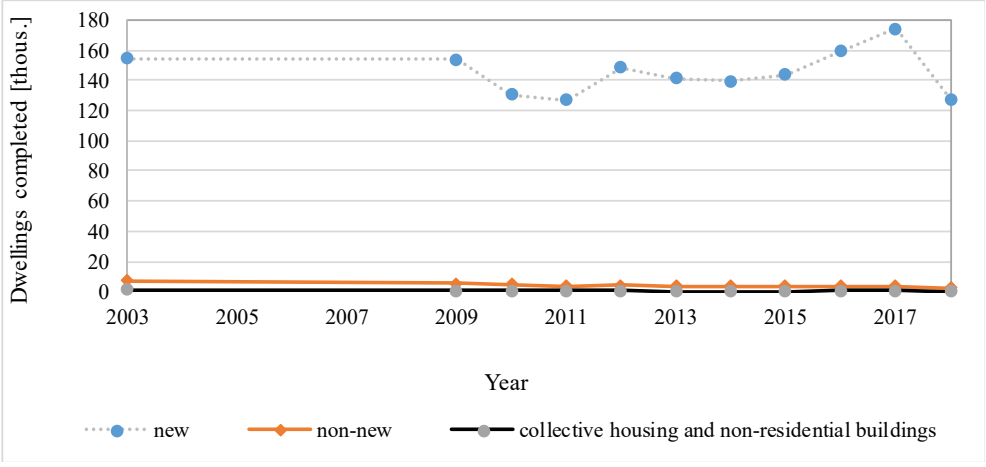

Fig. 7. Dwellings completed for use in new, non-new, collective housing and non-residential buildings *Source:* [8]

In 2017, the largest number of dwellings completed in new buildings was recorded – 174104. In 2018, it fell by 74.34% the number of apartments completed in the so-called collective housing and non-residential buildings. The number of flats completed in non-new buildings also decreased by 68% compared to 2003.

3. Summary

Based on the analyzes, it can be concluded that the housing conditions of the Polish society are systematically improving. Unfortunately, the pace and extent of this improvement are not satisfactory. According to data from the end of 2018, housing resources for the entire European Union amounted to 249.7 mln dwellings, of which 14.6 million is in Poland.

The indicator of the number of dwellings per 1000 inhabitants, which is a statistical measure of the availability of flats, increased between 1990 and 2018 from 349.6 to 380.7. Compared to 2017, this indicator increased by 1.25%. The goal of the government's housing policy is that by 2030 Poland will achieve an index of 435 apartments per 1000 inhabitants.

From year to year, the number of completed apartments is growing faster than their area.

Of all dwellings completed, approximately 6 052.8 thousand dwellings were located in buildings that were managed. Almost half, i.e. 49.0%, were flats of natural persons in buildings covered by housing associations, 33.5% – flats owned by housing cooperatives, 13.9% – communal flats, 1.7% – social housing associations, 1.1% – company, 0.5% – the Treasury and 0.3% – other entities [5]. The increase in the number of individual apartments and flats for sale or rent is clearly visible. The share of dwellings completed in the cooperative form of construction is decreasing from year to year.

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Orginal Article

Reviving degraded monuments of fortification architecture – a potential for the development of small historical towns

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Abstract: This article proposes a strategy for the revival of degraded monuments of fortification architecture as a source of the future small historical towns development in general and the improvement of their inhabitants life quality. The recommendations on how to adapt them to cultural and tourist clusters are discussed in detail in the project of Klevan Castle revival.

Keywords: revival; degraded monuments of fortification architecture; castle; cultural and tourist cluster

1. Introduction

Small historical towns have a tremendous historical value to the cultural heritage, they contain numerous architectural and urban planning monuments of national and local importance. However, in most cases, they have been neglected over the years and are currently in a state of delapidation. This is caused by their misuse or non-use at all. Further ignorance of this problem may lead to their complete destruction; a loss of authentic buildings and urban planning dominants.

Among the most neglected are the monuments of fortification architecture, which have a certain interesting feature. Despite their state of preservation, the «spirit of the place» feels very strongly about them and therefore they always inspired interest in themselves. They also form the historical, cultural, and architectural (as its material component) potential of almost every historical small town. Moreover, they can become an incentive and a source of the town's future development as a cultural and tourist centre.

This brings the following questions: How to revive abandoned and degraded architectural monuments and, above all, castles and fortresses, which are now unused and and in the constant process of decay? Will their conservation and museification be sufficient to activate and involve them in modern urban life? What functions should be assigned to each town to preserve them physically and to enhance their historical, cultural, and socio-economic value? How, in general, should the historical potential of a small town be properly used for the prospect of its further development, attraction of tourists and investors, and improvement of the well-being of local residents? Although these issues remain relevant, they require detailed study.

2. Purpose of the article

To show the strategy of reviving abandoned monuments of fortification architecture (using the Klevan castle as an example) to transform them into centers for the preservation, promotion and development of urban culture and traditions, and sources for the future development of a small historical city as a whole.

The issues of preservation and modern use of monuments of fortification architecture are covered in great detail in research works of M. Bevz [1], M. Dyomin [2], M. Orlenko [3], L. Pribega [4], P. Rychkov [5], O. Rybchynskyi [6], P. Glen, K.Krupa [7] and others.

The existing documents for the preservation of the historical and cultural heritage are DBN B.3.2-1-2004 «Restoration, conservation and repair works on cultural heritage monuments» [8], and are presented in the «Collection of regulatory acts of the field of cultural heritage protection» [9].

3. Basic material

The analysis of the current state of development in small historical towns shows a rather difficult issue with the preservation and modern use of architectural monuments and historical buildings and, above all, monuments of fortification architecture. These monuments have sustained significant destructive changes over the years, which substantialy affected their value. There is a number of cases where the misuse or non-use leads to a complete destruction of the monument. Also, using them incorrectly can lead to unwanted changes, both in individual buildings as well as in historically established urban environment. The lack of funds leads to the fact that numerous monuments remain unremarkable and unfit for use, in decline and degradation. The inappropriate modern function, under which some of the monuments are adapted, constitutes yet another problem. This usually results in the loss of individual elements of the building, or in significant unwanted completion. Both lead to undesirable changes and loss of the architectural value of the monument.

Another issue is the poor quality of the existing urban environment, that does not facilitate its activity. Absence or small number of places with optional urban functions related to culture, leisure and recreation. Absence of equipped and functionally filled places for long comfortable stay. In addition, there is a poorly developed tourist and service infrastructure. A person comes to the city to look at architectural monuments, and after a few hours he must leave it because of the lack of places to eat and stay. This causes low interest in visiting and investing in this town. And, as a result, it is losing potential finance for its development.

Therefore, in order to correct the situation outlined above, a comprehensive approach to carrying out restoration and reconstruction transformations should be taken, which would cover not only abandoned monuments, historical buildings, or spaces, but also the historical

urban environment as a whole. At the same time, architectural and town-planning (planning, volume and spatial, architectural and figurative, functional) as well as ecological questions must be answered. Moreover, the social-economic component of the complete process of the town's degrading monuments integration into the modern city life and their influences on further development of the small historical town in general have to be solved.

The following strategy for solving the issues outlined above can be proposed:

- increasing the architectural value of monuments and surrounding territory with the promise of holistic restoration, recreation, revalorization, and regeneration to recover their architectural integrity;
- revival and attraction of the monuments into modern urban life by adapting them to modern and relevant functions, which will preserve their architectural image and will not disrupt volume planning and constructive systems;
- physical and functional filling of the open space which surrounds the monument and together with it forms a whole, with comfortable rest stops and places for a longer stay;
- setting it up for comfortable movement;
- filling the monument and surrounding space with interesting elements of art to increase the activity and socio-economic value.

These proposed strategies were put into the idea of a revival the castle in Klévan as the source for a further development of the entire small town and illustrated in the presented project.

Klevan (Rivne region) is a small historical settlement of the Volynsky region which was first described in a journal from 1458 [10]. Among the existing monuments of the national and local importance is the Prince's Chartoryiski Castle (1475) [11], which is the main urban planning dominant, and at the same time, is the most neglected.

Klavan Castle has a rich historical past. The construction of the castle was started in 1475 during the reign of Mikhail Vasilevich Chartoryiskyi [11]. The works were disrupted by legal disputes over the property of the Klevan lands between princes Chartoryiski and Radziwilly, owners of the neighboring Olyka. It was only in the middle of the 16th century when Radziwilly renounced their claims to the property rights in favor of Prince Ivan Chartoryiskyi and his descendants. Therefore, the construction of the castle was finished in 1561 [5].

The castle had three towers (two stone, partially preserved until our time, and one wooden, which is now completey gone, and stone 2-storey and 3-storey buildings with basements [11]. At present the two-storey west, two-storey and three-storey northeast, and three-storey south buildings have been preserved. The castle was surrounded by man-made moats filled with the River Stubla's waters. A stone arch bridge, spilling over the moat from the north, was used to enter the castle. It has also been preserved to the present day (Fig. 1, 2).

Fig. 1. Klevan Castle.Iconography [12, 13]

Fig. 2. Klevan Castle. Current status. View from the entry bridge. Photos by N. Leshchenko

The function of the castle had changed many times during its existence. After the loss of the original defensive function, almost for a century and a half, up to 1773 [14], it contained Jesuit missionaries, and it was used as a Jesuit board. The castle had a county school, gymnasium, military hospital, spiritual school, children's colony, and boarding school. Its final function was medical and labour prevention. This use devalued its historical, cultural, and architectural value, however it somehow allowed to maintain physical existence and prevented its total destruction.

The castle has not been used since the late 20th century. Just like 200 years ago, during the first long period of the abandonment, it went into a coplete decay (Fig. 3, 4).

Fig. 3. Klevan Castle. Current status. View from the courtyard. Photos by N. Leshchenko

Fig. 4. Klevan Castle.Current status. View of the inside of the west tower. Photos by N. Leshchenko

Two options for returning the degraded architectural monument to active physical and social life were considered. The first proposed transformation is the introduction of the process of conservation and museification. In this case, the destroyed castle would become a museum exhibit and the area around it would be merged into the city park. This will increase its historical and social value by giving the castle a new function and transforming it into the city's green recreational area. However, the preservation of the monument in its existing form and its museification alone will not increase its architectural value. Therefore, first of all, a more active and modern use of the object should be proposed. It will provide a functional content and diversity with would interest different parts of the society, and thus ensure the renewal of its socio-economic value. Secondly, abandoned parts of the degraded castle would be restored and recreated to enhance its architectural value.

Thus, it has been proposed to use a combination of certain restoration and reconstructive transformation methods that will enhance each other 's action and together lead to the revival of the abandoned architectural monument. They are: revalorization – in order to increase the historical, cultural, architectural and socio-economic value of the castle building itself and the surrounding territory; combined with holistic restoration – to restore the existing part of the castle; regeneration – to return architectural and compositional integrity; with recreation of its lost parts and adaptation to new topical functions with preservation of the historical volume-planning and structural system, to attract the modern urban life.

The authenticity of the monument should be preserved as much as possible. It was proposed to allocate a part of the castle, renewed by existing iconography, so that its authentic part [15] could be determined immediately. It is proposed to separate it with some finishing

material, such as smooth plaster (as in iconography), with elements of masonry, which would stand out from the restorated south part of the castle with a glass transition-insert (Fig. 5).

The proposed functional adaptation involves adapting the castle as a whole as the museum and tourist cluster. The castle is to become an urban, cultural, and recreational centre with an active, day-to-day, permanent or periodic, long, and short-term performance.

It will be advisable to hold permanent, and mobile exhibitions, master classes for training programmes, display and distribution of traditional crafts, art festivals, ethno – festivities, city holidays, to organize knight tournaments [15], to create reconstruction of historical events related to the town and castle on its territory. For this purpose, restorated and recreated parts of the castle building and its territory should be arranged for comfortable, long stay, and should be filled with various functions, which complementing and reinforcing each other, would activate and contribute to its transformation into a cultural and tourist cluster.

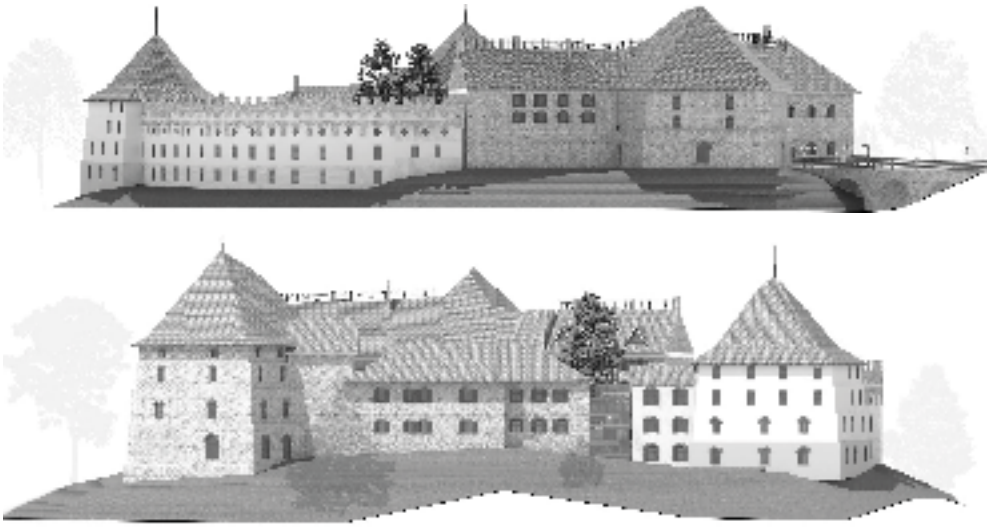

Fig. 5. The project proposal of Klevan Castle revival. East and South views.. Completed: A. Yakovleva, student ITA KNUCA; head: N. Leshchenko, Ph.D arch., associate professor ITA KNUCA

The north-east tower is proposed to be adapted into a tourist and information centre with a gift shop, a lounge, and a lecture theathre. This function will be easy to enter based on the store existing planing and the structural system – the tower is divided into four floors by a flat slab.

In the west and north-east buildings it is proposed to place exhibition halls, rooms for master classes, as well as administrative premises. This is facilitated by the preservation of the existing planning with one-side placement of the premises and the availability of natural light in them.

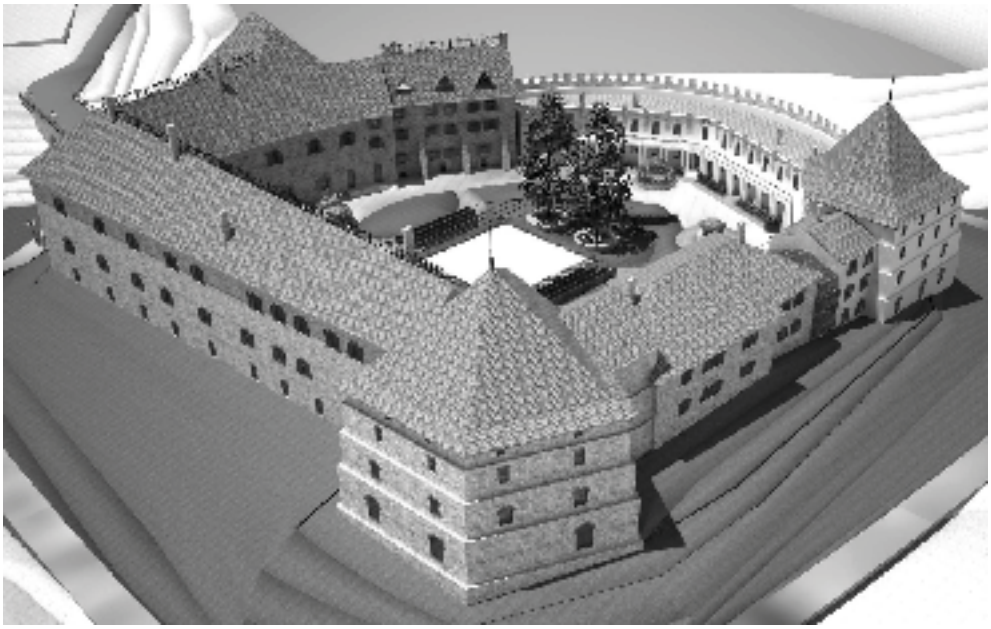

Fig. 6. The project proposal of Klevan Castle revival.General view. Completed: A. Yakovleva, student ITA KNUCA; head: N. Leshchenko, Ph.D arch., associate professor ITA KNUCA

After recreation in the western tower it is proposed to organize a restaurant serving the Ukrainian national cuisine. The restored south building and recreated eastern and southeastern part of the castle are proposed to become a mini-hotel with facilities for conferences, seminars, and a small cinema. On the roof of the eastern building it is proposed to place an observatory. In this part of the castle technical rooms also would be located, These facilities would serve the whole complex.

The courtyard is proposed to become a multifunctional space, interesting to visit, comfortable for the stay and movement. It would combine the recreational, communicative, service, educational, cultural, and art functions. It is proposed that the spot where active periodic, long-term, or short-term event performances would take place. For this purpose it is proposed to create a scene arena for different performances and presentations, open areas for thematic exhibitions, and master classes. The courtyard would become a place for more peaceful, permanent performances in conjunction with a long, comfortable stay premisses, observation platform, open areas for cafes, as well as grass-coated rest areas developed with the use of geoplasty techniques Geoplasty techniques.

In general, the courtyard and castle as a whole should be transformed into a place, where one could tdip into the urban cultural life, get acquainted with local traditions, learn traditional crafts, relax, and socialise.

This would help not only to make the degraded monument and its surrounding territory relevant and interesting, but also contribute to the development of the event tourism, and attract funds to the town for its further development and improvement of the quality of local residents' life. The aim is that the castle becomes the centre of the revival of the small town.

4. Conclusions

In the nutshell, the revival of degraded and abandoned monuments of fortification architecture is a complex process which which pays off with the increase in their value and the quality of their urban environment. It should include various methods of restoration and reconstructive transformations, which complement and strengthen each other's action and help their preservation and transition into a new qualitative level. The purpose of these transformations is not limited to restoring and reviving specific monuments, it is equivocally aimed at improving of the quality of the entire historical urban environment, attracting attention of tourists and investors, and thus developing a small historical town as a whole. and last , but not least, improving the quality of life of its inhabitants.

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Orginal Article

An experimental study of girder-borne sound pressure emission and acceleration

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Abstract: The subject of this paper is an experimental study on girder-borne sound pressure emission. The sources of the excitation are a hammer and a modal shaker. The structure researched is a simply supported steel plate girder of the size: 7.95 m x 1.5 m. The study covers the acceleration and sound pressure level measurements (SPL), and SPL estimation based on the accelerations measured. The correlation factor for higher estimation accuracy in lower frequency bands is proposed.

Keywords: SPL, vibroacoustics, modal analysis, acceleration, noise

1. Introduction

In Poland, there are over 1000 railway bridges with a steel supporting structure [1]. A rapid expansion of modern Computer Aided Design techniques in civil engineering results in designing taller, slimmer, longer and lighter structures. It also leads to the problem of noise generation. Considering noise pollution as a hindrance for the people living nearby, multiple fields of research were created, where the objective is to prevent the excessively high levels of noise generated by the everyday exploitation and self- generated vibrations of the structure. An estimation of the sound pressure level values for the newly designed structures has become an important task for structural designers and constructors. An analytical approach to the sound pressure calculation allows to estimate the noise generated by the structure designed, however due to the fact that analytical models characterise with simple subsystems (e.g. plate, bar), they do not describe complex structures with good accuracy, or are time consuming and extremely hard, if at all possible, to create. This fact works in favour of computer methods. There are numerous works where Finite Element Method (FEM) [2-4], Boundary Element Method (BEM) [5], Statystical Energy Analysis (SEA) [6], or a combination of the two aforementioned methods [7-9], were used for calculation of bridge vibration and sound pressure emission. The task of calculating higher frequency of complex structures needs smaller FEM

elements, which makes the task heavier on computing and is not practical [10]. This results in the need of simpler noise estimation methods that could be used at the stage of designing a newly built structure.

2. Experimental study of girder-borne sound pressure level and acceleration

2.1. An outline of the test subject

The test subject is a welded steel plate girder that has 0.4 m wide flanges and 1.5 m high web. The thickness of the web and flange are 12 mm and 16 mm, respectively. An effective span of the beam in the axis of the supports is equal to 7.2 m with a total beam length of 7.95 m. The girder is designed as a plate girder, with additional braces, as stated in Fig 1. All elements of the beam are made of steel type S355JR, the density of the steel is assumed as ρ=7850 kg/m3, E=210 GPa.

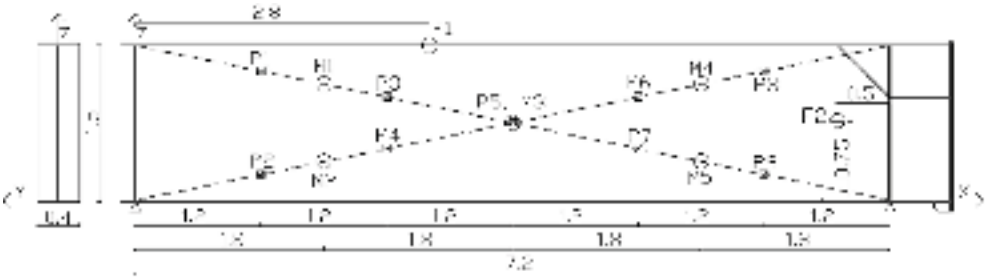

Fig. 1. A cross section and static scheme of the beam with the location of the sensors. M1...M5 and P1... P9 stand for the locations of microphones and accelerometers, respectively, F1 and F2 are locations of force excitation. Distance values are expressed in meters

The structure tested is a simply supported beam, subjected to a dead load, which can represent a bearing part of the bridge structure, or a compound of such structure. The tests were made in Departmental Laboratory of Construction Research at the Faculty of Civil Engineering, Environmental Engineering and Architecture, at Rzeszow University of Technology. The subject of the experimental research was a steel plate girder beam. Dimensions of the beam were pointed out in Fig. 1. The simply supported beam scheme was assumed. Sound pressure measurements were taken in a frequency band 20 Hz – 5000 Hz. A total of 9 accelerometers were located directly at the surface of the plate, further 5 acoustic microphones were located at a 10 cm distance from the object researched, and the locations of the specific sensors were featured in Fig. 1. The grid of sensors was dictated by the plan of further numerical data analysis that involved generation of shapes and its comparison, and FEM model validation, but only a part of all measurements was taken into account in this paper. It was also needed to average SPL measurements.

2.2. A research method description

The purpose of the research was to compare the results obtained from performing the analytical calculation based on the acceleration measurements, to estimate and confront it with

SPL readings obtained from sound pressure measurements. In research, one of the experimental modal analysis methods – the SIMO (Single Input – Multiple Output) method was used. In the SIMO method with an application of the electrodynamic modal shaker and modal hammer interchangeably as a generator of the input signal (Single Input) the possibility for simultaneous measurement in many measuring points (Multiple Output) located on the test subject was provided.

2.3. Force excitation

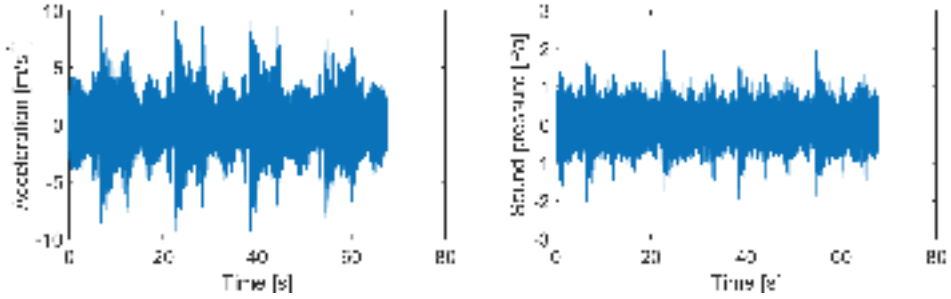

Fig. 2. Exemplary measured signal for sensor P5 and M3, respectively for shaker excited run

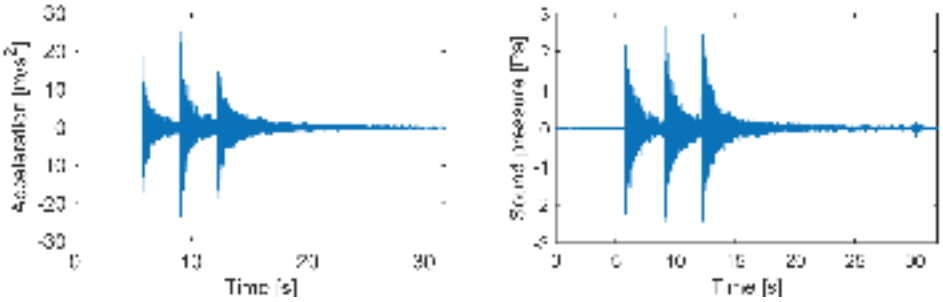

Fig. 3. Exemplary measured signal for sensor P5 and M3, respectively for impact excited run

If An excitation method of the time-varying force was provided with the use of an electrodynamic modal shaker. The modal shaker was made by ModalShop, model 2100E11. The modal shaker was attached to a testing stand by suspending it with 4-steel wires to rigid column with a fixed hanger. The shaker was controlled by the third-party software and hardware, independent from measuring devices to simulate a free run scenario. The excitation point was located on a top flange in point F1 (Fig. 1). The shaker excitation (Fig. 2) was applied with a sinusoidal and chirp type of excitation with different settings. Excitation direction was applied in horizontal direction Y, by a tension bar. The string on one end was connected by a threaded nut, glued to the top flange of the girder perpendicularly to the longitudinal axis X of the beam, and on the other end was connected by a clamp with shakers armature.

The second type of force excitation was the impact excitation, where a modal hammer was used. The modal hammer was used as a regular impulse excitation with soft, plastic, head cover, without a force measuring sensor. The impulse signal (Fig. 3) was generated by applying 3 consecutive hits with approximately 1 second intervals of the hammers head in

horizontal direction Y, perpendicularly to the longitudinal axis X in point F2 located at the web of the girder (Fig. 1).

2.4. Measurement of the response

Vibrations of the beam were measured by simultaneous registration of the acceleration response in 9 points. Measuring points, where piezoelectric accelerometers were located on the diagonal of the rectangle, as shown in Fig. 1. The sensors applied were 1D B&K (Bruel&Kaer, type 4507 B006), piezoelectric accelerometers. The sensors were placed in the horizontal direction Y, perpendicularly to the longitudinal axis X, in the same direction as the excitation was applied.

Sound pressure levels were measured by microphones. The sensors used were 1D B&K, type 4961. Microphones were located with similar pattern as accelerometers with a slightly different grid (Fig. 1). The sensors were placed in the horizontal direction Y, perpendicularly to the longitudinal axis X, in the same direction as the excitations F1 and F2 were applied, located 10 cm from the plate (Fig. 1).

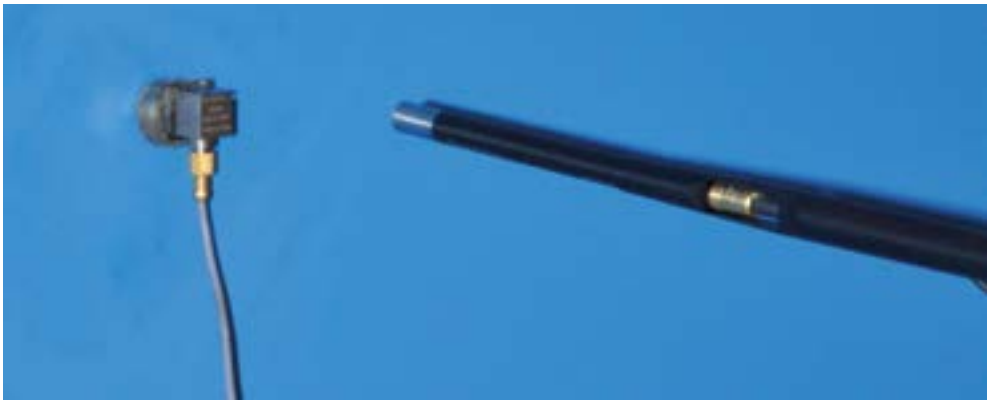

Fig. 4. Photography of M3 and P5

3. Data Analysis

3.1. Calculations

By using an analytical calculation in order to get a rough estimation of the sound-pressure emission, the structure was simplified to the infinite plate model, and the sound pressure emission and SPL were calculated with the formula (1) and (2) respectively:

$$p(x,y) = \frac{v_0 \cdot \rho \cdot c}{\sqrt{1-k_B^2/k^2}} \cdot e^{-j \cdot k_B \cdot x} \cdot e^{-j\sqrt{k^2-k_B^2} \cdot y} \qquad (1)\ [11, \text{eq.}(32)]$$

Tables where:

v_0 – mean square velocity of vibrating plate

ρ – density of the ambient medium

c – propagation velocity of the longitudinal wave in ambient medium

k_B – frequency dependant wavenumber of the plate vibrations

k – frequency dependant wavenumber of the surrounding medium

j = $\sqrt{-1}$

x – distance measured along the length of the plate

y – distance measured perpendicularly to the surface of the plate

$$\text{SPL} = 10\log_{10}\left(\frac{p(x,y)^2}{p_0}\right) \quad (2)\ [11, \text{eq. (3)}]$$

where p_0 is reference value for pressure and $p_0 = 2 \cdot 10^{-5} N/m^2$

In order to calculate the averaged sound pressure emission from the beam, the formula (1) used for calculating infinite plate generated pressure was adopted. The pressure generated by the plate was calculated with the formula (1) for points M3 and P5 with consideration to their position, they were located in the intersection of the diagonals of the before mentioned rectangular plate (Fig. 1). V_0 value was obtained from the integration of the accelerometer's measurements for 1/3 octave bands, and pressure was also calculated for the respective frequency bands [11]. Based on the results of the above calculations of pressure, the respective SPLs were computed with the formula (2).

3.2. Results of measurements

In order to achieve higher correlation between measured and calculated data, frequency dependant, dimensionless, correlation factor lc based on wavelength number of sound propagation in air was adopted into (1) resulting with the formula (3).

$$p_c(x,y) = \frac{1}{\lambda_c}\frac{v_0 \cdot \rho \cdot c}{\sqrt{1-k_B^2/k^2}} \cdot e^{-j \cdot k_B \cdot x} \cdot e^{-j\sqrt{k^2-k_B^2} \cdot y} \quad (3)$$

where:

l_c- wavelength in ambient medium [-]

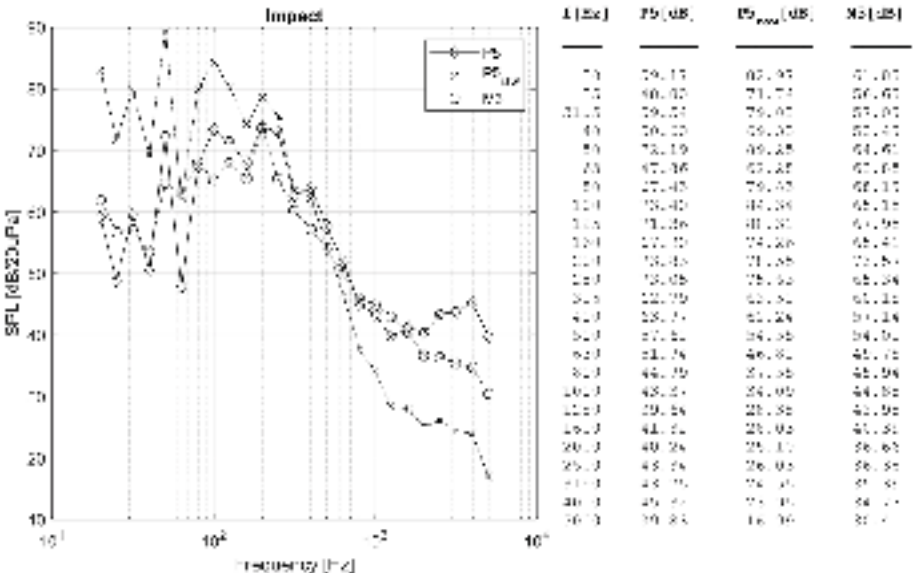

Fig. 5. Diagrams of SPL in 1/3 octave frequency bands for the impact excitation in selected run. $P5_{raw}$ – SPL calculated with formula (1), P5 – SPL calculated with formula (3), M3- measured SPL used as reference data

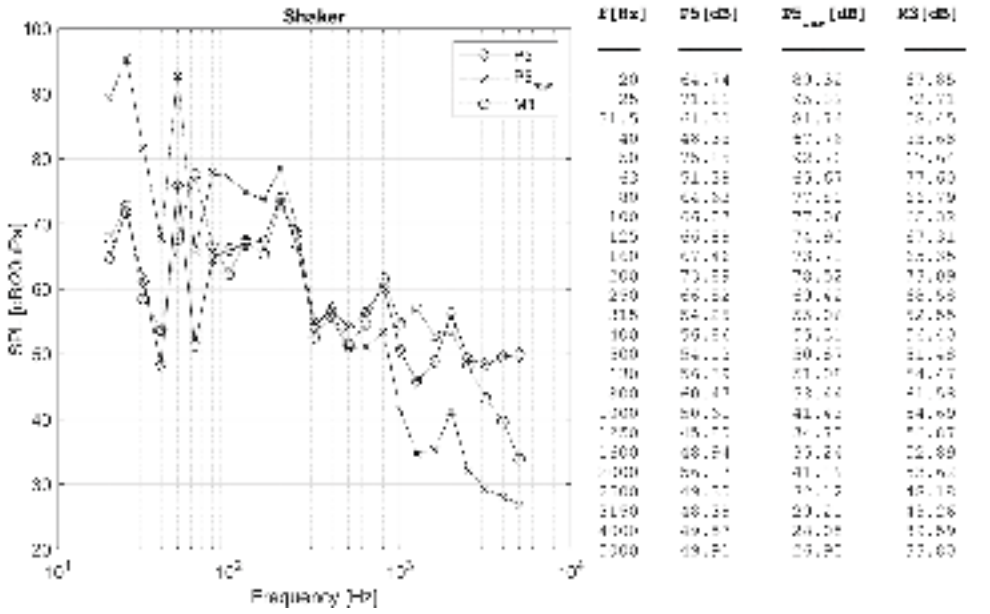

Fig. 6. Diagram of SPL in 1/3 octave frequency bands for the shaker excitation in selected run. $P5_{raw}$ – SPL calculated with formula (1), P5 – SPL calculated with formula (3), M3- measured SPL used as reference data

The SPLs measured and calculated in 1/3-octave centre frequency band are shown in Fig. 5 and Fig. 6. Total of 6 cases for modal shaker excitation and 4 of the impulse types of the excitation were analysed, and 2 exemplary runs were selected. The calculation using formula (1) was performed to get SPL values P_{raw}. Considerable differences in results might have come from the free run scenario, and the lack of force measurements, which could have been used to normalize measured data. Due to the poor correlation equalling even up to 25 dB difference (Fig. 6.), of estimated SPL (P_{raw}) with measurement data (M3) in the whole frequency band, in both cases of excitation, correlation factor dependant on the frequency for formula (1) was proposed. Using this factor allowed to obtain the formula (3) and a better consistence between the estimation and measurement in frequency band of 20-800 Hz for shaker and 20-2000 Hz for impact excitation with the exception of 63 Hz 1/3 octave band (Fig. 5). The Root Mean Square Error (RMSE) equalled to 12.92, and 21.91 respectively. The percentage difference is 41% between the two.

The dynamic response of the girder is derived from free vibrations of the beam. The dominant frequency of web acceleration and SPL generation is in the range of 80-400 Hz when vibrations are excited with a hammer (Fig. 5). The peak frequency of the web acceleration is at 200 Hz (Fig. 5), and three types of calculated results.

The second type of measurement vibrations are excited by a modal shaker. The dominant frequency of web acceleration is 20-200 Hz, which is in agreement with the excitation range covering low frequencies up to 256 Hz., with sudden drop to 40-63 Hz, when vibrations are excited with modal shaker (Fig. 6). The peak frequency of the web acceleration is at 63 Hz (Fig. 6). The plot shows comparison of the referential pressure signal of the microphone M3 (Fig. 1) in 1/3 octave centre frequency band, and two types of calculated results. The RMSE

in this case equalled to 13.77, and 23.87, respectively. That gives the percentage difference at 42% between the two.

Due to the fact that the measurements were conducted indoors, the background noise was neglected. An experimental modal analysis was made using B&K PULSE Reflex commercial software. The software was used only for the registration of raw pressure and acceleration signals. Further data analysis was done with the usage of Matlab software. For every data sample, the respective FRF (Frequency Response Function) were computed [12].

The measurement sampling frequency of 16384 Hz was used to obtain FRF functions in the range of 20-5000 Hz, for both acceleration and pressure measurements, with the frequency resolution of 0.0625 Hz (1/16 Hz). Digital filtering and computation were performed in order to obtain results in 1/3 octave frequency bands.

Exemplary results for the modal shaker excitation are shown in Fig. 2, while Fig. 3 shows the results for impulse excitation. The analysed part of the impact signal started from the first hit to the end of the signal and its free vibrations. The first part of the signal containing only signal and measurement noise got removed from the analysis.

4. Conclusions

The purpose of the research was to compare the results obtained from performing an analytical calculation based on velocity, which is obtained by integrating an acceleration signal to estimate and compare it with referential values, based on the measured sound pressure level. Based on the vibration analysis, a prediction approach of the steel girder was presented and applied to the noise analysis of a simply supported beam. The field test was carried out to verify the analytical estimation. The following remarks can be made.

Considering the impact excitation, the analytically calculated SPLs with the use of the correlation factor corresponds to the girder-borne noise in good agreement in the range of 20-1000 Hz. There is an increasing difference between the values with consideration of the proposed factor, especially in the higher frequency range of 630-5000 Hz 1/3 octave bands when using raw P5 signal.

For analytically calculated SPLs corresponding to girder-borne noise, resulting from modal shaker excitation, the values P5 and M3 are also compatible in the lower range of frequencies 20-800 Hz. The biggest difference between calculated and referential results can also be seen in a higher frequency range of 500-5000 Hz.

The proposed analytical approach, which treats the test subject as an infinite plate, allows a rough estimation of noise generated by vibrating the beam excited by a hammer and modal shaker. For better estimation of SPLs, a correlation factor was proposed, which lead to the improvement of the overall estimation of SPL in the lower frequencies, even up to 1000 Hz. The difference in SPL's absolute values is different due to the nature of the excitation source, and the duration and location of the signal, but it allows noticing the similarities in dynamic behaviour of the beam, even with different types of excitation. FEM model should be created to analyse the problem more thoroughly and get better estimation compatibility.

In further work, it is planned to focus on different analytical method for noise prediction, for which also the creation of an FEM model will be needed. The expansion of the research data with outdoor measurements and different types of excitation with force reference measurement for model improvement should also be considered.

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Explicit and implied significance of contemporary public spaces. Part 1. Spaces of attractions

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„We live in a place that knows only the price of bricks and has forgotten the people who give them value." [1]

Abstract: This text presents considerations encouraged by thoughts and conclusions gained from research on several beach bars and their comparison with other urban public spaces, run in Wrocław from 2018 to 2019. The similarities and differences between the two types of spaces provoke a question about the meaning of what we call „public spaces" today. The question is also asked, somewhat perversely, about the validity of following best practices based on proxemic principles and focused on attracting and retaining people in urban spaces. The paper examines not so much the rules but the purpose, in other words the type of space we receive/can achieve as a result of applying these principles, since people in the urban space (private or public) are only guests, while their choice is reduced to the top-down offer. The above doubt also results from the conclusion regarding the most important feature determining attractiveness of a beach bar space, which in my opinion, is the freedom of behaviour for users. In it we can see deficiencies of the prevailing narrative about our participation in space and, above all, the possibility of choice, or what should be called the limitations of choice – the lack of possession/self-agency. Such a situation, largely conditioned by politics (and economics), reduces public space to the role of a "space of attractions" (*curiosities*), whose action and participation is based on experiencing – on a direct experience. The clash of these two forces – standardization and individualization, erodes the current model of common spaces based on the historical (nineteenth century) one, whose images are transferred only in the form of empty clichés. Thus, the limitation of choices, the need to fall into line and appearances of a community lead to an escape upwards – enclaves for the chosen ones (*omnitopia*) and downwards – niches for the rebellious ones (*heterotopia*), while beach bars represent both ways of escape. Against this background, the purposefulness of expert/ top-down creation of public spaces, carried out in isolation from other essential values and laws, appears problematic.

Keywords: public space, proxemics, have-nothing, matching, giving up

1. Introduction

In 2018 I carried out observations in several beach bars which have been established within recent years in Wrocław. In my research, I assessed the quality of these public spaces and on this basis, I compared them with urban public spaces, which I have been investigating since 2004[1].

Beach bars are a new feature, they are very popular and arouse astonishment[2]. Their good-looking, inviting and lively space that attracts people is a mirror for other urban spaces. Its reflection perfectly shows advantages and disadvantages of both types of space. The research extracted undoubted advantages of beach bars which are imitation-worthy and led to conclusions about similarity of both types of spaces including their operation, as well as about inadequate differentiation of public spaces based on the type of ownership. Public or private, they all impose specific roles on users, leaving small margin for interaction, which in my opinion is a more important issue[3].

This article is an attempt to refer to the role that urban spaces play or rather could/should play for city's communities[4] in today's reality. The considerations challenge the meaning and sense of these spaces and tasks they are to fulfill, even if it were "to break the already open door down". The basic goal is to find and confirm what determines the power of attraction (attractiveness), what is beneficial, but at the same time what is unfavourable and dangerous, what drives people to be together and what hinders it. Therefore, the intermediate goal is to look at the meaning of the word "public" and examine its contemporary significance, with the intention to seek the possibility of what is unifying – what allows and what disturbs us to think of society as a community and a space as a common space[5].

This paper specifically strives to pose questions which lead to explaining not only the reason why people come to public spaces and stay there together and what they gain from it, but especially to show what they do not find/ do not get there. Hence, it is to question the meaning of the so-called "public spaces". The idea was to show what is the true character and role of top-down public spaces and the reason for giving them up in the favour of other (different) choices. Reflections on processes that take place in public spaces allow to indicate what kind of opportunities and (maybe especially) threats they create. The nature of considerations based on questioning imposes an open form. It allows to read public spaces in relation

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1 The basis for observation and evaluation of the examined spaces was the *Place Diagram* proposed by the Project for Public Space (PPS Inc.), which is a framework for evaluation of the "effectiveness" of a given space – it allows to understand how it works [2, p.92].

2 Such astonishment is characteristic of ethnological (anthropological) observation, where everyday life, ordinary objects are taken, are perceived as something worthy of attention despite their "ordinariness" – they are „exotic" for researchers. Beach bars have their exotic connotations due to their place of origin, but also locally, in our conditions, they are not (at least at the beginning) ordinary. The „exotification" which was formerly colloquial, so obvious and therefore not deserving of attention, can be found in the works of researchers such as RochSulima [3, p.9], Wojciech J. Burszta [4, p.13].

3 As Stavros Stavrides noted, public spaces, as opposed to common spaces, "have always been subordinate to and connected to some governing body that allowed their use", were (...) described as spaces managed, supervised and controlled by anybody that regulates their use". [5, p.17].

4 The role of public space, its function,assignment, mission, vocation, position, purpose, participation, task, meaning are analysed by many authors, e.g. Krzysztof Bierwiaczonek [6]. These issues were also collected in the *Charter of Public Space* adopted by the III Congress of Polish Urbanism [7].

5 Common space, as Stavros Stavrides explains, is something more than public space, because „(...) it is created on the basis of a common language as an area of negotiation" [8, p.54].

to the actual possibility of using them in a broad context (implied meaning), not only from the position of the most prevalent, pragmatic and expert approach referring to the proximic principles[6] (explicit meaning).

The study is a qualitative research, similar to research in social sciences (understanding cultural phenomena), which applies intuitive (formulating assumptions) and inductive methods (drawing conclusions). It is to describe the nature of the studied phenomenon involving public spaces in a specific moment in which they currently are. It is a general and abstract comparison that refers to the wide current in culture. The methodology is based on both observations and conclusions from the city space analysis included in previous studies and available knowledge concerning the broadly understood subject. For the sake of argument fluency, references to literature are placed only in footnotes.

The text does not formulate closed answers and solutions. I used questions and polemics as a cognitive method, while its important element is to show the doubts that undermine the commonly accepted "certainty". Considerations carried out in the spirit of *epoché*[7] touch upon what is not fully verifiable and assume putting aside the accepted and used ways of thinking. The paper draws attention to certain disturbing phenomena and processes that take place today in public spaces, and which visibly jeopardise their operation. In particular, it addresses the issue of offering the users the possibility of fully-fledged participation in the space. Although the problem refers to all cities, it is more apparent in more (semi-)provincial ones. Wrocław is only a reference point in the article due to the location of previous studies.

2. Questions / doubts

Space itself can be attractive by focusing on its scenic values, while an effective and encouraging filling (function, equipment, furniture) increases its value and gives reason to emerge, stop there and/or stay longer to meet and be with others[8]. The meeting serves as an opportunity to exchange – pass on goods, money, ideas, knowledge and information to each other. Above all, however, by interacting with others, people give each other less tangible "gifts"[9], such as intimacy, acceptance and tenderness. Interdependence between the quality of space and possibilities and intensity of human and social interaction results directly from our psychological and anthropological (also sociological) conditions[10],the knowledge of which is crucial for success – a social success of a space. This pragmatic, proxemic[11] approach, developed since late 1960s, has led to

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6 Research on proximal principles initiated by Edward T. Hall is largely based on cultural conditions (social distances in space, or the influence of the shape of space/equipment on feelings). In his books *The Silent Language* [9] *Hidden Differences* [10] the various ways of human relations are described.

7 Epoché concerns phenomenological reduction elaborated by Edmund Husserl, who referred to the metaphor of temporarily "taking in brackets" the beliefs and assumptions [11].

8 The significance of space quality in relation to social interactions is analysed by Jan Gehl in a three-level scale from the necessary activities, through optional to the resulting or social activities [12], p.38].

9 The concept of "gift" is one of the basic concepts in anthropology. In Maurice Godelier's new interpretation, apart from exchange, there is a sphere of gift, not oriented to profit or calculating, which is the foundation of society [13].

10 Among many authors who study the perception of social situations, Erving Goffman's books can be mentioned: *Behaviour in Public Spaces* [14], *The Presentation of Self in Everyday Life* [15] in which the rules governing people's behaviours in space and society are analysed.

11 Today, proxemics form the basis of leading practices in public spaces, initiated by researchers such as William Whyte [16] and Jan Gehl. [12]. See also footnote 6.

a shift in attitude in which primacy has been given to man and his needs. A consistent application of proxemic principles allows for a measurable change in the quality of urban spaces, resulting in their revival. The practice can prove different, and Wrocław spaces are certainly still far from the unrivalled pattern of Copenhagen or several similar cities[12].

In my analyses of Wrocław public spaces conducted for several years I have adopted a three-level scale of assessment of urban (public) spaces[13]. It reflects the level of their attractiveness (vibrancy) in relation to how they are created and used (practice), and above all, how they are imagined and understood (sense). At the same time, it shows the degree of care for the quality and operation of a space, which translates directly into the ability to attract people. The first level concerns basic issues – aesthetics, order and safety, the second level concerns sophisticated, unique design which makes a place stand out. The third – last level refers to the social value of places, understood not only in the functional dimension including the issue of proper management, but above all in recognising the full involvement of users in creating a place. While the first level is commonly achieved, the second one is rather rare. However, the degree to which the third level is achieved is not very satisfactory. Of course, some spaces (especially the Wrocław Market Square and its surroundings) are crowded but it happens a little bit on its own, thanks to the tourist character of the places.

While analysing Wrocław spaces, I inevitably focused on official spaces located in the central part of the city, hence the assessment mainly refers to them. For several years now, local/neighborhood spaces of other types have also been created in the city[14], where users have a wider range of possibilities (e.g. in the form of sports activities)[15]. Their local, non-commercial and, above all, accessible and utilitarian status certainly translates into greater identification of residents with these places. However despite public consultations the nature of these spaces in essence is not fundamentally different from those in my considerations. This is because involvement in these projects takes the form of "para-participation"[16], without any actual contribution of residents. Moreover, although they respond to specific needs, they approach people instrumentally – by installing only a set of exercise and play equipment. Such places appear as mere islands in a sea of needs, and to a small extent change the whole situation when all the "unnecessary" elements of living space are eliminated from residential areas[17].

The results achieved in Copenhagen set the direction to follow, while spaces realized there show a particular broader goal as an achievable one. However, seen from the perspective of a (semi-)provincial city, these goals seem to be very distant. This is where the first doubt arises, since it is not possible to implement them in all conditions. The problem is not the methods themselves but a schematic way of applying them, as it does not include a thorough analysis of the place, let alone a reliable public consultation[18]. The

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[12] Undoubtedly, Copenhagen leads the way here, developing the strategy *Metropolis for people: more people to walk more* [17].

[13] The research has been described in the text analysing quality of public space in Wrocław[18].

[14] Mainly based on the so-called "civic budget" [19].

[15] The presence of sports equipment was analysed in a study of beach bars in Wrocław [20].

[16] The limited scope of participation, carried out in a simplified fast (voting) mode and appropriated for propaganda and marketing purposes, should rather be called "para-participation" [21].

[17] The housing development model, in full acceptance by the city authorities, in less than thirty years completely changed the way of indwelling that was still functioning in the 1980s [22].

[18] There are no real bottom-up methods in Wrocław, and decisions are made within the so-called "civic budget" – projects submitted by different actors, sometimes only by "civic" names. However, the consultation is veryformalised in procedural terms [23].

second is based on the experience gained from observing beach bars. It shows that even a perfect (if possible) stimulation (organisation/animation) is not sufficient to achieve/feel something in common – to obtain value for everyone. While beach bars do a lot in this respect, urban spaces by focusing on form and aesthetics are functionally left to the so-called "marketplace action", with an exception of a few events. Once implemented from the top-down, they only change as a result of business adaptation, rarely as a result of bottom-up social interventions[19].

These two doubts raise a number of questions, particularly in the current political and social context, as to whether the path to perfection (in shaping the city space) is the right and necessary one. Is this what we need? Is catching up, adopting the same priorities, implementing the right policies, allocating the relevant, even higher resources enough to achieve the desired purpose? Well, do we really know what the purpose is? Do we even know where we are heading? Do we know what type/shape of city and its space this way leads to? What spaces do we build and what do they give to users (and indirectly to the city itself and its inhabitants)? What is it, what should be the overriding value? Do we notice this value and its essence?[20] These purposely exaggerated questions enable to see the issue from a different angle. They come down to explaining/understanding the contemporary role of these spaces and thus are questions about the meaning of what we call „public spaces". In other words, what is their meaning to people and especially what we gain by using them, but also why they are sometimes not interesting enough to people.

3. Similarities and differences

As a decision to go out in many cases is triggered by a primary social need to be with others and participate in something larger (among people), most choices focus on places that provide conditions for such a meeting to happen. However, today these decisions can also be greatly influenced by other, very different reasons, such as the need for something new, a desire to change the place, a search for different impressions, a direct experience[21].

The example of beach bars used as mirrors of public spaces, (also used to the beach bars themselves), highlights three important issues about the similarities and differences of contemporary public spaces. Firstly, spaces with a wide, attractive offer are inevitably standardized, where all needs are equated to a "typical" range of services. It limits subjectively perceived attractiveness of these places and thus their full social accessibility, while dissatisfied users (e.g. young people) look for other places more suited to their needs. Secondly, urban spaces, with few exceptions, whether public or pragmatically (private), are created and managed top-down. The former ones by professionals, the latter by owners, which leads to the conclusion that

[19] The changes include mainly the change of functions, mostly catering establishments and their operation, e.g. tents in restaurant gardens [24]. One of the most important, otherwise controversial interventions was the one concerning the floor in the Market Square, the so-called "high-hills-way" [25].

[20] Such valuation, which increases the attractiveness of the city, may at the same time cause unfavorable processes such as gentrification, leading to, among other things, pushing poor people out of renovated districts, e.g. Copenhagen – the leader in creating public spaces, thus falling to the sixth place in the *Global Liveability* ranking [26].

[21] Most texts concerning public spaces emphasize their affirmative role for the community of the city [27], its socio-political significance [28], or treating human needs only as manifested behaviours [29], paying little attention to the internal, personal needs of people, resulting from psychological conditions, which I will address in the final part of the text.

they do not belong to the users – they do not belong to the inhabitants of the city[22]. Wherever we go, regardless of the subjective feeling, we are always just guests in the city – we do not feel at home. Thirdly, the three levels of assessment of a space mentioned in the introduction show that its attractiveness is largely dependent on the type of offer, size and possible diversity, as well as aesthetics, design, etc., which also serve well in attracting attention. However, we need to be aware that it is very difficult to achieve a level of attractiveness similar to places that are animated on a regular basis, so to say in a continuous 24/7 cycle (like beach bars), skilful management determines the vitality, spontaneity and dynamics of these places, which for understandable reasons is not available to all spaces[23].

The obvious differences between these spaces result not so much from their form or character, but rather from their formula – from the way they work, which translates into various possibilities of staying and spending time there. Differences manifest themselves in a close relationship between the manager and the space, in individual animation (in activating/ dynamizing and reviving), allowing for easier and more efficient response to needs and constant adaptation to new requirements (at least theoretically). In this field, beach bar spaces (other new typologies of urban space and similar to them)[24] bring something new in relation to urban public spaces. Apart from typological otherness (formula/action), their immanent feature is temporariness – an ephemeral, uncertain status of the place. This gives an advantage, which apart from the possibility of quick changes and adjustments to visitors' needs lies in the undeniable freedom of the place that releases greater freedom of user behaviour[25]. This aspect seems to be important not only for meeting the needs better, but also, in my opinion it is also crucial to explain their success, as it promises much more – promises an unconventional, unlimited, full experience, inaccessible in other places[26]. However, for some reasons – mainly because they are essentially no different from the general scheme of operation, they just bite the status quo of existing paralysis and inertia.

4. Consumption / narration

The main example of this status quo in Wrocław is the historical Market Square – a meeting place (the city lounge) with a representative, touristic character. The basic offer is provided by numerous restaurants and bars, whose gardens encourage people to spend time in them.

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[22] The issue of the possession, or rather expropriation of urban residents from space is the subject of in-depth research by many authors, ranging from Henri Lefebvre to David Harvey and Manuel Castells. KacperPobłocki presents and explains this issue in a comprehensive way [30].

[23] Beach bars, as private spaces, function similarly to restaurants, as well as efficiently managed undertakings. Their outcome and economic success depend on the way they are run and animated. In the public spaces managed by the city (or its companies) as a whole (cleanliness, security), there is no personal responsibility, only individual events are animated [31].

[24] The specificity of beach bars located on the outskirts resembles informal or semi-formal spaces in which unwanted/unallowed activities appear. At the same time, contemporary urban spaces often include various facilities for sports and other activities in their programmes. In my research I analysedSłodowa Island [32, p.103], and Politechnika Boulevard [31], which are such spaces.

[25] I analyse this issue in a text comparing beach bars and other urban spaces [31].

[26] First of all, the lack of territorial limitations, the possibility of free behaviour, which goes hand in hand with the feeling of homeness/familiarness, which for Michel de Certau is in opposition to geometric space, practiced in a „joyful and hidden experience" (from childhood) – i.e. „being different and going through" [33, p.110]. Zygmunt Bauman, on the other hand, by showing how the aestheticization and order of space, in the name of controlling, destroys what is "familiar" and understandable, sees it in opposition to control [34, p.8].

Apart from this offer there are no other options for staying as cultural events are organized sporadically[27]. Despite the undoubted attractiveness and popularity, the Market Square space is not inclusive to a large extent – full participation can only take place on a commercial and mercantile level, which undoubtedly affects the feeling of strangeness in those who cannot afford it.

In principle, what this space offers in creating options to stop and encourage social contact (arousing social value) is constructed correctly. The problem lies in lack of diversity and above all openness. The range of possible activities (actions) in official public spaces is limited (a separate question is whether it has not always been like that) to typical "bourgeois", nowadays "tourist" ways of spending time. Against this background, only "excesses" seem to be exceptional: drunken chanting, brawls, less frequently happenings, etc. Bar owners do much more – commercial functions are combined with opportunities for other activities (sports, recreation, culture) and events are animated on a continuous basis.

In urban spaces there is a clear focus on aesthetics and order, which determine the achievement of commercial goals, but at the same time reduce the sphere of freedom of behaviour. The way a contemporary space works (along with users' attitude) focuses on experiences and is largely based on limited consumption patterns[28], which is wrapped in various stories depicting fulfilment of dreams or just expectations. The prevailing narrative revolves around meeting and the joy of being together, the pleasure of having a meal together, feasting, playing and talking. Consumption drives the vast majority of contemporary public spaces[29] which base their activity scenarios on it, and this makes this narrative so successful. Yet the widespread use of this story reveals an unfavourable side that can be found in the "flattening" of the offer. It is not even the story itself that is to blame but its realization in many repetitive solutions schemes[30] which virtually limit possibilities of other choice and in a way impoverish the space itself[31].

For this reason, space has become a product, by definition ready, finished and offered by whoever is its manager/owner, while users come to a "ready-made" place – they are guests there. They do not build or create anything, they do not share it, and they only use what is offered, given and delivered. People's activity in the space can at most fit into a given framework of a staged offer, allowing only a small degree of choice – our own, independent decisions[32].

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27 E.g. the Market Square is mainly a place for one-off events related to holidays or cyclical events. There are no daily events, only fairs St. John's which last for several weeks make this place more attractive for longer. However, it is difficult to consider it a good solution for the residents [...].

28 The importance of "direct experience" in today's postmodern world is emphasized by Jacek Dukaj [27, p.186]. About the search for "uncommon", the need and desire to "carnivalize and color everyday life" writes Rafał Drozdowski [37, p. 296-298].

29 I especially mean Polish public spaces, which live mainly thanks to food facilities. As the BNP Paribas Real Estate report from 2014 shows, there are practically no shopping streets in Wrocław [38].

30 I am referring to the flattening of the offer, progressing under the influence of the global character of the commercialization of space (including the tourism industry), which acts as a limiting factor – we make choices that are "easy" and the story is treated as a soft cushion on which we fall [39, p.22].

31 Our choices, as Marcin Napiórkowski put it, are governed by cultural patterns formed in the "dominant circulation of goods and images", which become common and, consequently, cause the displacement of local, rare and sophisticated niche services [40, p.17]. This dependence is also visible in beach bars, which (with a few exceptions) are becoming more and more similar to each other.

32 Own, independent decisions, and thus the so-called the freedom of choice for the reasons I wrote above, but also above all, in the light of the latest research investigating the (psychological) causes of human action, is highly questionable – this is perfectly illustrated by the research of Daniel Kanneman [41].

Such decisions first require an act of self-determination, as without it there is no real choice. This is problematic, because by choosing comfort people do not have their own opinion, and thus they lose the right to decide what our urban spaces might look like.

5. Policy / restriction of choice

Reasons for this situation should be sought more broadly and it has its roots in political and economic conditions. It originates from the feeling of being lost in the world that needs to be re-created over and over again from the very beginning, in which we have lost our sense of reference (coordinates). The difficulty of choosing and deciding what to do in such a situation results from shifting the whole responsibility for inefficiency (or resignation) of the system and disappearance of institutions[33] to an individual. Economic and social conditions of late capitalism in the neoliberal edition, with all its ties (economic enslavement) and especially pace of life and multiplicity of obligations create a dramatic gap between needs/necessities and possibilities[34].

And hence, there are consequences for cities and their spaces. In today's reality of intermingling and unclear ownership criteria, and above all similarities between the way cities and corporations operate, all procedures in the "spaces of flow"[35] are alike. They are developed slower than changes and then new needs and challenges arise. There is no flexibility achievable only in small organizations, especially those where someone manages their own property, as well as in grassroots initiatives (but these do not build sustainable systems). Moreover, the network character of decision making is "transparent", i.e. based on cyclicality[36], which favours random compromises and instrumental solutions that do not satisfy real needs. The specificity of a political system with a short term of office lead to showy actions – large-scale monumental and task-based projects.

In urban spaces, these conditions, stretched between global and local, result in standardization – averaging ("flattening") opportunities. Free choice is reduced to choosing options from a given pre-prepared offer. Without user participation the space is programmed and designed from above, it is static – it is a finished object[37]. For this reason, the room for manoeuvre for each of us in relation to public space is becoming limited. On the one hand, urban policy generally aims at mass accessibility of urban spaces (number of people, amount of goods, offer), on the other hand, participation in public spaces does not include everything that is not within "normality", what is individual, what does not accept their "everyday life".

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33 Prof. Małgorzata Jacyno spoke about it in an interview with Tomasz Stawiszyński in the programme *What is normal*, "Philosopher's Hour", 02. 10. 2018 [42].

34 Tomáš Sedláček analyses various levels of economic imbalances, including the issue of the lack of a development limit, against a historical background [43, p.99]. See also footnote 33.

35 In the *spaces of flow* (the space of power, and today also counter-power), which is the material basis of society, there is a unification of challenges and standards. Being part of the flow space means being part of the context of a huge material infrastructure [44, p.14].

36 Networks are based on the diversity of the parts that make up them, making them more flexible than hierarchical structures. Their identity is determined by internal relations, which make the whole dependent on parts on both sides (John Urry) [45, p.277]. However, their relationships are unstable because they are shaped by continuous adjustment within two-way processes of mutual definition (Castells) [44, p.41].

37 This interpretation is presented by Bruno Latour: the space is not created as in an *ex nihilo* modernist approach, but rather as a continuous sequence of transformations – an action that means the constant addition of new dimensions [46, p.5].

If the possibility of choice – the basis for self-determination is limited or even closed, the question arises, where does today's understanding of public spaces lead us? What is the "for all" strategy all about? What does developing, even scientifically supported, knowledge about human behaviour in space mean when people in this place are reduced to its passive users only? Do we not create a machine-like space[38] in this way? Are we not forcibly trying to keep, whatever it means, its original "pure" form, whose prototype was the 19th century park?[39] Or do we have a chance to get out of the impasse of "space-of-using" in favour of "space-of-creating", "space-of-giving", "space-of-cooperating" – common space, our space?

6. What (public) common space?

Definitions, and even more postulates towards public space speak about a community place, finding identity, a place in the group, about congruent goals and views[40]. But does a contemporary public space really "strengthen the idea and the feeling that we have something in common?"[41]or is it just an apparent community? Can we (while being in a public space of the city) speak of a community and a sense of "possessing" (together) something common – not only in the sense of possessing, disposing and being an owner but about the sense of belonging to the group/community that uses the space which it has been given?

In view of tensions of contemporary capitalism, which produces a multitude of those who have no place of their own (has no "anchor")[42], this common possession becomes extremely important – just as it used to be when first public spaces were created. It balances the lack of private space. However, the time of Olmsted's Central Park – a public space for all, although still a binding model and a point of reference for us, is no longer sufficient and even threatened in face of today's challenges. In this nineteenth-century model (a meeting place for city residents), the common space is neutral and acceptable – everyone can use it[43]. Its non-commercial neutrality determines its strength because it gives a sense of belonging – regardless of the level of possession. However, the conventions and norms of the time were decisive for the sense of unity, the common goal, and they imposed situational rigor but also gave safety (protection)[44].

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38 Such a metaphor of the city has its modernist connotations. Ayssar Arida points out that (modernist) "the machine operates in a finite context, stops time, is an instant creation (it is created from a single shot, immediately) without time for society, without memory" [47, p.111].

39 The nineteenth-century model of space, designed by Frederick Law Olmsted, is a model of today's view on democratic public space, [48].

40 Krzysztof Bierwiaczonek [49] carried out a complementary analysis of this issue. It is also treated by the diagnosis of SARP [50].

41 Tom Nielsen examines such a question on the example of Scandinavian countries [51,p.12].

42 Thomas Piketty analyses the causes of the inequalities and unfair distribution that make up today's financial and economic system [52]. See also footnote 34.

43 Parks were a democratic experiment, they were a safety valve and strengthened the identification of residents, because at the time of their creation they were the only alternative – the clear contrast to urban squares and streets, which mainly functioned as exchange spaces, thus having a different, mercantile character [51, p.3]. Contemporary Wrocław parks only duplicate this model, while new typologies combining parks with various forms of entertainment are developed and work today very well in such implementations as, for example, *Superkillen* in Copenhagen, project the BIG, TOPOTEK 1 [53] or Park Spoor Noord in Antwerp, project Studio 03 [54].

44 Goffman draws attention to this relationship [15, p.227]. Contemporary conventions in terms of consumer bonding, as analysed by Richard Sennett, have less binding power, which is the result of the desire to express individuality in fear of impersonality [55, p.548].

Today, the former conventions and norms give way to regulations, thus the situation without the rigour of social rules turns into a formal one. Thus, contemporary public spaces are not community spaces common to all. Apart from selected fragments of the city, and these are primarily non-commercial spaces – parks, boulevards, squares, this idea is only an echo of that time. We will not find it in contemporary urban spaces, which, in contrast to an "inclusive neutrality" (one community), implement "levelling neutrality" (quantity and not the whole)[45]. These spaces are not spaces for a community, but only a place where individuals gather – where the image of a common space (community) is weakened (and even destroyed)[46]. Images of a common community public space are transferred only in the form of empty clichés referring to historical images of the community. These images are not static, they change fast, even regardless of the scene. As the example of beach bars shows, space users expect something more – they expect a variable, extraordinary experience. And it is not just a matter of commercialization, which rather adapts to expectations generated by invisible (levelling) codes of continuous matching processes[47]. The collective image of community spaces is lame because its matrix is created/born outside of us, as a result of uncontrolled network connections and media influences[48].

In a world based on a constant search for direct experiences and immediate satisfaction of needs, communities emerge on a different basis – they are temporary just like identities. Individual human molecules – "social atoms"[49], according to the moment, create different, unstable, social configurations which constantly fluctuate in search of satisfaction. Instead of legible social groups, many different types of patterns – network clusters[50] are created and quickly disappear. Thus, formal social situations are transformed from homogenous to multifocal[51].

Simultaneously, we are dealing with a return to tribalism[52] and *retropic* nostalgia[53] that comes with it, trying to stop time in small, closed bubbles to isolate an ideal lost state. Such pursuit is a part of the network layout, but it definitely divides and even conflicts communities

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45 Quoting Rossi Braidotti, such communities can be called communities of "nomadic entities" [56, p.16].

46 This is very well identified by Sennett, talking about the "impersonal bonds" of the shapeless narcissistic stress (inability to feel, sense of dissociation, people treat social situations as a reflection of "I" [55, p.501, 522, 527].

47 Contemporary transformation processes, based on the flow-of-space logic, only deepen this interdependence. Castells put it, being a part of the space of flow means belonging into a context of a great material infrastructure [44, p.413].

48 Bauman describes the influence of mass media on an individual's imagination in this way: "Powerful and more real than reality, the images displayed on the ubiquitous screens determine the criteria for evaluating the real world and the directions of repair of the personally experienced world" [57, p.130].

49 Urban communities today are like „free atoms" collectivities (Ulrich Beck) [58], with increasingly weaker, more flexible and fluid ties (Bauman) [57]. They are of network nature (Castells) [44].

50 Such groups/formations are "one of many types of patterns occurring in networks, clusters in a rather scattered, freely connected general network structure of city dwellers" (see Wellman B., Leighton B.) [59].

51 According to Goffman, defined formal situations under the influence of an occasion can move from an overall to a multifocal system, which is a determinant of an informal, casual situation [15, p.232].

52 Michel Maffesoli states that only temporary unity is possible [60, p.190], while Bauman, in turn says about *peg communities* that arise from hopeless dreams of security in a world in which individuals are already exhausted by uncertainty [61, p.67].

53 Bauman points to a return to the past, which, due to the instability of the present and the uncertainty of the future, appears as the only sure reference for one's own identity that gives the potential to create the present [62].

even more. This striving to isolate, find and associate with "one's own" group (de facto to escape from the community of the whole), which results from the network character of contacts and relations[54]is a power. It collides with the omnipotent integrating and unifying force, which is an inherent power of civilization processes that affects the life in contemporary cities and thus their space[55].Unnoticeably, in everyday practices, by choosing the same, imposed and culturally produced patterns, taken over without special awareness from the collective imaginary space, the needs are levelled.

Reality is therefore squeezed between two forces: individualization and uniformity. On the one hand, a collection of individuals, separate clients, separate and unique individual needs, on the other hand, there is a levelling "roller" of the same forms and ways of satisfying them. At the same time, the choice was changed into a forced and seemingly independent decision making[56]. In the community of entities – individualities that are an apparent community formed as a sum of various clichés, there is no consensus on a common model of possession (belongings and use). This "non-possession-community" can be seen in various areas, from political to spatial. Urban space accumulates in itself the effects of such a state of affairs, i.e. lack of belonging, awareness, responsibility and (co-)participation. Inevitably, due to no alternative, it is a space replacing the majority (masses) of private space[57].

7. Experiences / attractions

Faced with a clear, inseparable mix of views, ideas and expectations, the public space at the level of the overall community for all (along with the attitude of users themselves) currently focuses on experiences. It becomes and can only be a place (immediately) fulfilling various experiences, various desires – a collection of generally available attractions, *follies*[58], a "space of curiosities"[59] with a different range of influence. Generality and universality limit – all needs are found there, but not everyone finds themselves in it. Universality requires averaging, flattening the offer, because mass orientation is simpler than maintaining a niche[60]. Choice is possible, but multiplicity and variety is apparent and mainly concerns the "signboard" which nuances the offer in sale strategies In the search present in the mainstream offer which manifests itself in matching, a rich offer and a rapid response to needs coincide with high volatility. In the process of following fashions it makes the offer alike and this flattens it, which also translates

[54] "The nature of the objects that make up the network can be very different. They can be human individuals, but also various social wholes: small groups, families, clans, territorial communities, organizations" (Sozański T.) [63, p.28].

[55] The process of unification throughout history and from today's perspective is presented e.g. by Yuval Noah Harari [64, p.39], and in statistical terms by Steven Pinker [65].

[56] This state of affairs in which, instead of having more freedom, we are more fearful and helpless, the Slovenian philosopher Renata Salecl calls the *tyranny of choice* [54].

[57] Rafał Drozdowski points out as the reason "insufficient quality of private spaces and their inability to perform the originally assigned tasks" [37, p.302]. See also footnotes 46 and 47.

[58] Follies (madness, craziness, stupidity) – a name adopted for various types of objects, installation pavilions in public space, based on the project of the park de la Villette, designed by Bernard Tschumi [67]. They are an architectural interpretation of the more open idea of space, "events", 'sudden configuration", "unpredictable other", suggested by Jacques Derrida [68, p.65].

[59] I borrow the metaphor for "space of *curiosities*" from the title of Günther Vogt's book *Landscape as a Cabinet of Curiosities*, which illustrates an approach characterized by offering in the space as many choices as possible – attractions [69].

[60] The erosion of public space and urban life is very well identified by Jeffrey Hou in *(Not) your everyday public space* [70, p.6].

into the quality of space and lack of individual character. A different, attracting instantaneity transforms into the same, boring stability (monotony)[61].

In places located (or which attempt to be located) outside the main mass offer, in the temporary (like a beach bar), a unique atmosphere prevails, which allows moving into a completely different unique world and space. In selecting other, unusual places, one can clearly see an attempt to match one's habitus with another field – a field caught up in the symbolic and imaginary sphere. In this choice, this natural aspiration to change one's position is related to the patterns transferred by culture[62]. For the most part users are interested only in their part of the cake – the *curiosities*. Individual differentiation serves to attract more attention[63] (in special cases, a group of "connoisseurs" – the elite able to notice it) and is effective in so far as it ensures a particular "otherness" and at the same time allows to achieve and even multiply (commercial) success. Some selected elements of these other different/distinctive locations, recognized as attractive in the initial period are sucked in a competitive race[64] and included in the general offer palette, thus losing their special character. Distinguishing (isolating a field) and levelling (gaining a field) is a continuous process, continuously introducing new values and eliminating differences. Certainly, nuancing space loses out to the shock-based surprise and seeking the "wow" effect, while places on the edges are only able to imitate these patterns, yet they always lag behind.

Beach bars (like other, commercially created places for spending time and entertainment) show both individualization and uniformity. They align with prevailing attracting methods and simultaneously stand out from them, for a short time though, because newly emerging beach bars and subsequent seasons blur these differences[65].

8. Giving up / enclaves

This strive to changing position is connected to another side of this movement "pursuit" (after field) – resignation from the "system", giving up what is offered by the top-down proposed official spaces where choices are limited and pauperised. One way of doing this is an "escape upwards'' – to enclosed places of private/group luxury. Isolated from the masses, the enclaves lie outside the commonly accessible spaces. They however produce a certain image, a need-challenge responded by the aspiring part of society. Living (being) in these places – *omnitopias*for the chosen[66] ones who can afford it, de facto means being locked in a bubble.

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[61] Drozdowski claims that the dominant mainstream culture is subject to constant reproduction, absorbing alternative, extravagant ones, which quickly become tamed (tame) and is soon replaced by more "novelties" [37,p.336].

[62] According to Pierre Bourdieu, meaning is found in the common symbolic field that constitutes the group as a whole, dominated by the leading discourse that sets out certain binding social, representative, aesthetic and pragmatic models. The right to control the field and the right to control the discourse, and thus to give the way of its reading, are still in play/fight [71, p.285].

[63] An example of such an approach are expressive, iconic architectural forms such as *the Metropol Parasol* on the plaza de la Encarnación in Seville designed by Jürgen Hermann Mayer [72].

[64] Contemporary public space is perceived mainly by its success, measured by its attractiveness (commercial and marketing, usability), reduced to proven factors and good solutions [73].

[65] In the 2019 season, I noticed that some beach bars have become similar in their offer and especially in their arrangement, which has become more orderly, even more rigorous, like a restaurant garden [20].

[66] *Omnitopia* "enacts a structural and perceptual enclave whose apparently distinct locales convey inhabitants to a singular place". "When you can flow from place to place, experiencing it all as one vast interior, cocooned in your own bubble, interacting with other people and natural parts of the world only as a series of objects, you're in omnitopia" [74].

The second way of giving up participation in official spaces is an "escape down", not so much abandoning the mass offer, as trying to avoid it – searching for an own space (form). In this "escape", places similar to refuges are sought, where the access is not limited only for the "chosen" ones. These may be places with a specific, prepared offer, which is so special that they require, let's call it, courage to go beyond the mainstream and the generally accepted. And beach bars are a good example here (at least some – individually created[67]). Another option for giving up are places which enable satisfying one's own specific, unique and exceptional needs – experiences developed, "invented" and prepared by oneself.

Beach bars try to be these both types of escape from the system – they are elite yet widely available. They are part of urban spaces, while being on their margins. they are popular, they are willingly chosen because of their undoubted attractiveness and opportunities for apparent escape. Instead, the idea of refuge of a commercial character is ambivalent. The owners of beach bars can create an atmosphere of freedom, or rather imitate it (their arrangement imitates a distant, exotic place) however, by necessity, the immersion in them takes place rather in the symbolic and/or psychological sphere, and it only works in reference to images generated in this sphere and ends there [68].

For beach bars work similarly to other spaces[69] – they strive not to be overtaken in the competitive race by coping/adding what has proven successful in others. Although they offer some form of distinctive individualization (and that includes desired reading, familiarization and acceptance by individual users) it does not seem to bring any long-term benefits – only temporary gains are possible. Thus, as a rule, they do not stand out from other spaces/places (sometimes they do not even differ among themselves) and unique places with a climate are the absolute exceptions[70].

A more literal example of enclave ("escape") used to be and to some extent still is Słodowa Island[71] – an informal/semi-formal meeting place for young people. Separated by water, the island's park space allows for free, even extreme behaviour, virtually without control. The lack of rigour (norms) of official spaces is associated with "inconveniences", but these turn out to be an advantage here – the lack of organisation allows for a free choice of places to stay/seat, a constant change of group configuration and a modest food offer for cheap private consumption. There is a clear desire to look for separate, independent places, where the pursuit of certain user groups (mainly young people) to find separated, independent places is clearly visible, where life runs in a different mode, which includes enclaves of

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67 E.g. The beach bar "Forma płynna" ("Liquid form") is located in a wild grove where hammocks are spread between the trees [20].

68 The scale and form of these places is also important here – small places, especially those with less formalised arrangements, undoubtedly allow for a more relaxed, almost holiday-like atmosphere [31].

69 I showed it in a text on comparison of beach bars and other (official) urban spaces [31].

70 The whole history of beach bars in Wrocław shows constant levelling and ordering, elimination of "disorder", in which their new forms, using the initial freshness of the idea and symbolic capital, strive to maximise profit by turning these places into "recreation and holiday combinations", exceptions include "Forma płynna" small beach bars at Paderewskiego Street at Opatowicki Bridge and Trzebnicki Bridge [20].

71 Słodowa Island, functioning since 2009 for some time as a liberated, living place for informal meetings (mainly for young people). In 2013 its accessibility has been reduced (the island is closed for the night, this place is also subject to greater control) and the planned private investments (*Concordia Hub* building [75]) show the strengthening of the formal, controlled order, which threatens to reduce the free, spontaneous character of the island.

a different type – *heterotopias*[72]. The conceptual framework of such places is blurred, but this concept of space outside the generally applicable "system" of official spaces and its practices, is possible only for certain places, demarcated for this purpose only. Therefore, it is not so much a bubble of a spatial enclave, inaccessible to other levels of society, but a niche space – an informal space outside official city spaces. It may be unwanted by the system (perhaps even unacceptable), but for some reasons of disinterest it is still temporarily accepted by it. Alternative spaces ("spaces-of-resistance") will be discussed in the next article, which will be the second part of my considerations.

9. Summary / conclusions

While in contrast to urban spaces beach bars mark themselves with a slightly different formula (program/action), by placing their proposal in a (seemingly) different narrative they refer only to patterns (imagery) promising specific experiences. This promise (something new) is assigned, admittedly, to all kinds of space, because it is differentiated only by an intangible, relative character of experiences. What is different, however, temporarily extended by a new, fantastic, imaginative (imagined) value, is always more valued – it has a greater charm of attraction[73]. The promise is momentary and therefore very uncertain. It does not add anything when referred to the possibility of creating something shared. On the contrary, because it accentuates what is "distant" (isolated), it causes a greater fragmentation/distortion of the unifying status/character of public spaces.

The example of beach bars in Wrocław seems extremely instructive, and the lesson resulting from analysis of their operation can be beneficial. Against a backdrop of urban spaces, beach bars do not seem to be a completely new/different value – they are rather a splinter from the current, static model, which has become a scheme missing some important tasks/goals. However, the reflection of official public spaces in the mirror of beach bars allows to see them in a wider context in terms of their meaning and possibilities. Moreover, their possibilities, as the above text shows, are limited, mainly because of the unified, "flattened" way they operate and offer.

All forms of (official) public spaces offer a choice, spanning between conforming and resignation ("escape up/down"). The first choice – the most common (mass) is a passive, indifferent acceptance of top-down proposed spaces, the second is a resignation from participation in their offer. All attempts of "escape" are illusory, because they take place in a closed circle of processes/mechanisms, based on commercial/network (and thus anonymous and non-controllable) dependencies. Within these processes, each novelty/individuality, after being tested, is absorbed into a unified offer – a "sack" of various attractions spilled out in the "space-object". The "space-of-*curiosities"* is a "space-of-use" – a space of self-oriented individuals (and/or ephemeral temporary communities), and not communities (as a whole). As for the majority a public space has become a substitute for a private space, social and situational security, previously provided by old norms and conventions, is currently governed mainly by forms of consumption. However, the "flattened" offer hardly takes into account the diversity of human expression.

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[72] According to Michel Foucault, heterotopia is a "place-opposition", a kind of utopia in which all the other real places found in culture are simultaneously represented, condensed and reversed. They signify ambiguity, bringing about both desirable and undesirable effects at the same time. This alone can be a deterrent in times when certainty is valued [76, p.24].

[73] The space of a contemporary city is that of a spectacle [77], and even more so, simulations that hide something, signs that camouflage the fact that "nothing exists". [78, p.130].

Within this context, the answer to the question posed in the introduction about purposefulness of expert/top-down creation of public spaces appears to be somewhat problematic. Of course, this is not about denying the idea of a "city for people"[74] and certainly not those good practices in which empathy towards people is more important than the project itself[75]. However, this top-down approach, seen in reference to a broader context (political, economic and social), raises doubts as to whether the "more and better" strategy is the appropriate one. Politics focuses on creating places, but in isolation from other essential values and rights[76]. Public spaces, even those of good/perfect quality, appear to be "toys for good children", while people are treated instrumentally or in the best case indifferently – the space (and its setting) is in the foreground, not the users. In view to the disappearance of institutions responsible for socio-economic security and a whole range of existential problems of modern man, the policy of "beautifying the city"[77] is, despite its many benefits, at least not enough, not to say empty. Especially when proxemic rules are applied in a superficial and schematic way, only to obtain a specific image – when urban space is more of an "image" than a living space for everyone.

Common (public) space, such as the Market Square in Wrocław, is a kind of metaphor that connects the meeting place with consumer attractions. As in the internet world, threats are not directly visible. Gaining some comfort, we agree to gradual (invisible) limitations (this can be called 'enslavement'), which refer to our ability of self-realisation. Meetings with friends over coffee or beer are an attractive form of spending time, but it is actually the only dominant form, we are dealing with some "flattening", which results in the lack of choice, limits experience (and language). And this has wider social consequences.

The main observation that comes to mind is the unquestionable fact of instrumentalization of city dwellers – lack of empathy. Public spaces in today's reality are an "object" ("product"), maybe an excellent one, but only a (systemic) product only indirectly aimed at user-inhabitants. Of course, this does not exclude pride (dignity) and a sense of belonging to the city community (possession), as well as benefits and joy of using these places. However, those who buy and not "other" citizens (especially elder people, who are not present in public spaces in Wrocław) are only welcome. Such a model of space and policy towards them leads to (civil) incapacitation and reinforces the lack of conscious involvement from space users – the prevailing absence of real ownership, the lack of belonging and efficiency, and this feeling is best noticeable especially in young people who are looking for other options[78].

The next text will examine possibilities that are hidden in places such as Słodowa Island and other similar informal spaces of all kinds of bottom-up attempts to escape from the system[79] – experiments testing new forms and literally being in a space. Considerations will concern

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74 This is the name of the Copenhagen strategy [17] – see footnote 12.

75 This approach can be found, for example, in Project for Public Space (PPS) practice, where people and their needs are put above design and aesthetic values [2, p.40].

76 Ultraliberal politics leaves contemporary man completely alone with the fundamental problems of life, eliminating the right to housing, health care, education and leisure. Bourdieu already pointed out the negative effects of this policy in the 1990s [80].

77 Aestheticization is the leading tactic (literally!) of creating public spaces in Wrocław and other Polish cities [18].

78 Alain Touraine indicates that the logic of capitalism and rationality of the free market destroys the subjectivity and agency of actors, who have no other way of "externalizing themselves in any specific way" [81, p. 79].

79 According to SławojŻiżek the term "spaces-of-resistance" refers to places, various forms of struggle for rights open to new opportunities, a new future. [81, p.278].

whether they serve only the interested parties or whether they also have a potential to create the (real) so-called "space-of-creation", "space-of-giving" and a "space-of-cooperation".

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Orginal Article

Explicit and implied significance of contemporary public spaces. Part 2. Alternative spaces

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„People are deeply nourished by the process of creating wholeness" [1]

Abstract: This paper is a continuation of deliberations on the meaning (sense) of public spaces. It refers to unofficial spaces for informal activities, which could be called informal alternative spaces or maybe even a bit exaggeratedly "spaces-of-resistance". Their extremely important features include absence of control and lack of rules, which distinguish them from other spaces. The paramount advantage visitors gain from these places is the ability to give the space a meaning of their own, thus changing the user's position from that of a mere user into the user in possession. It also changes his/her relation to the space which ceases to be only a 'closed object'. It is brought into use, as it is created and linked only for the time of the actor-user's (own) performance. The experimental character of the game leads to a reinterpretation of the meaning (or even necessity to change it) that the space has. Such an approach breaks with the patterns embedded in a collective imaginarium, which promote safe, comfortable behaviours – an unofficial, alternative space must be created each time from scratch, such space is a process. It is not treated as a product, it becomes a space of commitment – it becomes a political space, but as such, it is a challenge and thus it is interesting only for a few people. By meeting each other and being with others we fulfill our basic psychological need, but simultaneously we enter into different roles in a social game in which our own "win" often counts above all. Our private satisfaction can also be valued by a sense of community, collaboration, having something in common, and this obviously can bring benefits to everyone. However, without deeper thought practices that seek and provide best possible conditions for staying in space can lead to a certain inertia, which can turn into "algorithmization" in satisfying space users, specialized only in passive satisfaction of thoughtless users.

Keywords: public space, control, experiment, self-determination, satisfaction, community

1. Introduction

This text is a continuation of considerations on possibilities and meaning (sense) of public spaces, which were triggered by my research on beach bars in Wrocław, conducted in 2018-2019[1]. Comparison with official public spaces led to a question not only about their form and their attractiveness, but first of all about the role they play – their community dimension. The conclusion in the first part showed the difference between their assumed/postulated affirmative meaning (ideology) and the practical side of their everyday operation, which in the current system produces a flattened offer, based on 'proven' and repetitive attractions. The city space thus becomes a space for using attractions ("space of *curiosities*") in which available choice is limited. The key challenge here is the incapacitating lack of possession (disposition and belonging) – causality and empowerment of contemporary city residents, who are forced to accept/adjust or resign/avoid the "system"[2]. By analysing two paths of such resignation/withdrawal, I pointed to the illusory nature of standing out, which de facto only reinforces undesirable results of the current status quo.

One of the questions about these considerations asked in the first part of the article is particularly interesting, as it refers to the future. It refers to advisability/rightness of the approach to create a space that follows the leading practices[3], which are used instrumentally when confronted with the current political and economic conditions, particularly with regard to main stakeholders, that is space users. Good practices are reduced to (aesthetic-)quantitative tasks and top-down (political-)expert projects. Moreover, in a broader systemic context, without solving several of today's pressing social (or perhaps more economic) problems, even best practices will lead to creating places for most (collectivity) but not all of them (community).

This text is an attempt to answer the question on what these needs are based on and how they are satisfied. Public spaces today focus mainly on providing experiences – direct experiences (aesthetics, offer), while human needs are treated only as a set of external behaviours (entertainment, pleasures). People's personal needs along with the resulting behaviour are influenced by many factors, the most important of which are psychologically conditioned internal stimuli, controlled by the desire to achieve state of satisfaction and happiness To achieve this state humans essentially strive at maximizing freedom and limiting control, in other words, to find/obtain authenticity, thus having one's own place, one's own (fragment) of space.

The second part of the article focuses on the needs of self-fulfilment and self-determination in urban space, which has been called "the escape down" or resignation from official spaces due to the lack of possibility to satisfy their needs. Semi formal public spaces, such as Słodowa Island in Wrocław, have become an exemplary point of reference. The aim of this study is to examine conditions and consequences of such alternative actions, including the issue of the lack of rules/control and the possibility of giving one's own meanings to the space. An equally important aim is to show the relationship between psychological conditions of achieving satisfaction from experiences in space and the possibility of community/cooperation.

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1 In 2018 I was observing dozens of beach bars in Wrocław, which have been established in recent years. In my research I evaluated the quality of their space and on this basis I compared them with urban public spaces [2, 3].

2 I use the term "system" in the text in two ways. First, to describe the current political, social and economic situation, which is the (integral) background for the spaces studied. Secondly, the term "system" is only an auxiliary name both for the definition of official public spaces, but also for all phenomena (procedures, design, implementation, use) within them.

3 The basic point of reference for me is the Copenhagen strategy – „Metropolis for people: more people to walk more' [4].

The indirect goal is to recognize the relationship between "games" and roles (old and new) in relation to space, and thus its meaning.

The article is polemical and thus doubts are brought to the foreground. They are not so much to challenge as to test some "obviousness" regarding the so-called "good practices" and shaping public spaces in general in the current, particularly simplified, schematic form. The work methodology uses study results from many years of observing urban public spaces (including beach bars), as well as numerous references to the subject literature (which are contained in footnotes). It is founded on questions, which, however, do not imply just finding a direct answer. The argument is conducted in the form of considerations developed around the individual and community sense of urban meeting places. This imposes a certain openness of form, allowing to present reflections on processes occurring in public spaces, indicating possibilities but also the existing threats. Similarly to the first part, the study is a qualitative research modeled on social research conducted in order to understand cultural (and social) phenomena – processes occurring in these spaces and in society in general.

2. Informal spaces / absence of control

In the space of Wrocław there are various unofficial/semi-official – informal, forbidden spaces for niche activities[4], various small manifestations of ad hoc/bottom-up activities within the so-called "tactical urbanism"[5], which can be called alternative spaces or maybe even a bit exaggeratedly "spaces-of-resistance"[6]. Examples include informal/semi-formal meeting places such as Słodowa Island[7] examined in the first part of the article, where in 2009-13 (and to some extent today) young people have their get-together point and "party" in groups according to their rules. Such places also include illegal "spots" for skateboarders on Świdnicka Street and by Renoma department store, bmx riding trails which the riders built themselves at Kilimanjaro Hill and by the railway track next to Agrestowa Street[8]. These are also places taken over by graffiti artists in the underpass under the viaduct in Dyrekcyjna/Pułaskiego Streets, under the flyover on Społeczny Square and Owsiana Street. There are some semi-formal, alternative yet more "ordinary" spaces, such as popular group barbecue spots by the river[9], which have also been organized by the interested parties themselves and thus have a modest form. There are various actions, too, for example creating gardens in parking spaces or flash mobs: reading books (IFLA) in the Market

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4 Various places where young people can spend their time in Wrocław, such as places for skateboarders, bmx riders and the like were described by Magdalena Mayer [6]. I examined such places in opposition to the public spaces of the city – meeting spaces for young people, e.g. places where stickers on walls are painted, in 2004-2007 [6].

5 *Tactical urbanism* is "above all an activity. Also known as *DIY Urbanism*, *Planning-by-Doing*, *Urban Acupuncture*, or *Urban Prototyping*, this approach refers to an urban, organizational and/or civic approach to building neighborhoods using short-term, low-cost and scalable interventions to initiate long-term changes" [7].

6 Sławoj Żiżek identifies possibilities of adapting/using spaces where usefulness ends ("spandrel") and where we meet spaces in reflection ("parallax") [8, p.278]. Stavros Stavrides, on the other hand, points to many wastelands where informal, liberating activities may appear [9, p.236]..

7 Słodowa Island functioned from 2009 to 2013 as a free, vibrant place for informal meetings (mainly for young people). Regulations introduced (closing at night) and the new offer (floating pubs) strive for greater control (and order) [10].

8 Usually these are places organized by the interested parties themselves and information about them spread through social networks [11].

9 The largest number of barbecue places is located in the city meadows by the bridges, where there is no infrastructure [12].

Square, a festival of colour and the Park(ing) Day[10], whereby such actions are incidental and above all organized (called) by a group. These informal places have a conspicuously different formula and contain a certain imagined (symbolic) triggering power. They allow for something different to erupt, something outside the scheme and normally unavailable due to lack of offer for these groups and "rigours" (legal regulations) in (official) public spaces[11]. In these informal places users find a space for their chosen and thus limited action/activity[12].

All these places, however, are only seeming about something "less", as in reality it is about so much more – the absence of control. A state without control is more than a variety of *curiosities*. It satisfies (other) needs, much more important than any other even most comprehensive offer because it carries a specific and strong symbolic message – an imaginary promise to realize one's own personal possibilities. It is a promise of different experiences, which in such place depends much more only on users – these are experiences that they create/develop (at least in part) themselves[13]. It is no longer about the possibility to appear and stay in a (n urban) space. In contrast to a one-off matching and using the pre-prepared top-down offer[14], we are dealing with the adaptation (use) and adjustment of space – people mark their place[15], bring something in and add something from themselves.

Seemingly, if any unique gestures[16] are still possible at all in a world controlled by media[17], then in the commercialized city space only places of this kind can give a real opportunity to maintain at least a minimum self-control and allow to feel that there is something 'mine' out there. It is something that enables to tame – to give one's own meanings – individuation[18].

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[10] These types of events appear relatively rarely, but they are always another, invigorating form of activity [13].

[11] How a modern city "becomes a space of experiencing polyphony and otherness, a space of contradictions experienced in various spheres of life" shows Ewa Kębłowska-Ławniczak in From Concept-City to City Experience [14].

[12] Marcin Bogusławski (after Michel Focault and Alain Tourain) believes that "I" is always shaped in relation with itself but also through resistance with what is outside. Subjectivity is born in resistance to the rules / law [15, p 84].

[13] For Merlau-Ponty, real being in the world is one in which a thinking man in different situations discovers himself as part of the surrounding reality and is always connected to it [16, p.370].

[14] Of course, it should be noted that what can be found there (in places/spaces of "resistance") is also a kind of offer, but organized by the interested parties themselves. As Frederico Savini and Luca Bertolini write, many places of bottom-up activity are also transformed into official ones, as part of the positive transition of the so-called „"better world" [17].

[15] Individualised space-marking changes the dimension of urban spaces, and in a globalized reality, "spatial semiotics' takes various forms [18]. Marking one's place in a space is a form of communication – it is a language that people use to express themselves. As Ludwig Wittgenstein puts it, space (world) has for us such a dimension as the scope of our language [19].

[16] I paraphrase the words of Milan Kundera – our behaviour and actions are more or less conscious repetitions. [20, p 13]. In Immanuel Kant's view, our own "gestures" are our way of expressing ourselves, our way of seeing ourselves – our identity and dignity, our individuality, our humanity [21, p.77].

[17] Anthony Giddens [22, p.8] writes about the flood of information increasing the amount and diversity of experiences. In turn, according to Jürgen Habermas, information garbage resulting from the uncontrolled development of the mass media prevents a forum for a real debate, i.e. openness to individuality and otherness [23].

[18] Gilbert Simondon proposed and developed the concept of "individuation" as a process of change of the individual, which also takes place in the environment. The boundaries of living beings in relation to their surroundings are fluid. (See Bogusławski) [15, p.99-100].

This opportunity to interact with space testifies to its true value – the value of the place, which can be influenced by leaving one's own imprint there (even in repetitive gestures). The place that allows one to give one's own meaning without spatial labels, which impose a top-down goal and purpose – after all, official public spaces have always been created for some purpose (were intended for something). Undoubtedly there is a creative element in it, but what is more important is the effort to constantly add new values, search and discover rather than comply.

This striving enables to achieve a different dimension, a dimension of a space defined by the user themselves and expressed in freedom of choice, an option to take another action than the assigned one – another activity of one's own choice. Through this choice, the space becomes tame, it becomes the "space of being" – the "space-of-living"[19]. Thus, the space gives the feeling of the "authentic" because it is created through an effort to define oneself, and that legitimizes calling it "the genuine place"[20], in contrast to places accepted passively, imposed from above, without the possibility of interacting with space and adapting it to your needs, where we are only guests

3. Meaningfulness / lack of rules

In individual actions/operations to meet our needs, we add value to the place through our own (conscious) action/operation – we mark (define) it or take it over while doing this action/operation. The quality of the place is not changed by prohibiting skateboarding on a public square or lighting a private (not always legal) barbecue on a meadow, even when several dozen other people around do it (it may even make it worse). Still, it changes the nature of our participation in this space, subjective self-esteem (personal dignity) of "who-decides-for-one-self"[21]. This decision, this possibility and effort of taking it changes our status/position – the relation with space changes from passive to authentic, open and spontaneous. Own actions are an activity in search of the alternative, ease, naturalness, spontaneity and immediacy, an act of freedom of choice, it can be read as a gesture of breaking with restrictions, willingness to feel independent, to decide about one's participation and role in public space. In this context, instead of dividing into formal and informal spaces it would be more appropriate to separate them into rigorous and free spaces[22].

Therefore, the question arises whether users' desire for the lack of control is in fact a desire to overthrow all rules in a space, a desire to free oneself from dependence – the dreamed-of promised (but illusory) land? This is undoubtedly the case, but it is not so much breaking dependences (control)[23] as the recognition that there are no dependencies in this

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[19] According to Martin Heidegger, building- creating a place does not lie in technical possibilities only in the experiences of being and in questions about the sense ofliving, it means thinking (up endeavour, necessary effort), which is the essence of being. At the same time, I understand Heidegger's "inhabiting" as a (personal) connection with a place – being in close proximity to it (like at home, but not necessarily in it) [24].

[20] In relation to *the place*, the phenomenological and hermeneutic perspective is taking on today in which "writing of your space" takes place, which is a form of annexing the space for oneself (de Certau) [25]. Action (*energeia*), as a kinetic act (action), being inscribed in the experience reveals the possibility (potential), which is something more than what we find (John D. Caputo) [26, p.91].

[21] In public spaces of this value, at best, we can speak of pride in place – ownership, which we share by the mere fact of being city residents but not participating in creation. Paweł Kubicki is analyzing new forms of the middle class in New townspeople in new Poland [27]

[22] According to Erving Goffman, the terms "rigorous" and "free" seem more appropriate because they give equal weight to each of the expressions [28, p.221].

[23] This is a situation that Goffman describes as "self-engagement [28, p. 220].

particular moment and in this place – during this action (operation). Taking over the place does not mean annexing it, but only a temporary "right" (permission/prerogative), a temporary possibility of possessing[24]. This act is not about completely denying applicable rules, but about temporary, for the duration of a given action, suspension during the time of the operation, escaping the scope of their validity – suspending them, changing the rules according to the situation and current needs. An autonomous change of rules, even a momentary one, gives the feeling of breaking up with a given, imposed and binding order in which users are assigned specific roles. Thus, people (actors) choose the "game" they want to play themselves, they also choose the field of play themselves, and even, in a sense, they create it[25]. This is a choice that avoids top-imposed games proposed in spaces where we are only guests. The (social) need for participation and the (individual) desire to limit control are constantly clashing with each other. Getting rid of control and rules, however tempting, is not profitable in the long run because it forces consuming our natural forces, relying on instinct and even resulting in "fatigue and emotional distress"[26], which is certainly not beneficial, especially in the long run.

Users of public space often play the role of passive participants in an organized, dominant "game". They accept its (imposed) rules, although they do not necessarily realize the dependence on them, which is always to some extent limiting and incapacitating[27]. In today's city in which users are only the recipients (both comfortable and subordinate ones) who choose from the available range of impressions – the effects of this dependence can and often lead to a situation of paralysis and inertia. Of course people have always adapted the space to their goals, they have always imposed some rules on it for the games and rituals that take place there, which had to be followed in order to be able to stay there and take part in the assembly (social situation)[28]. In the complex life today, however, political, social, and thus spatial conditions (games) are incomprehensible and so far-reaching that they are often schematically limited only to superficial image purposes. They obscure the starting point, the essence of human relations in space – the essence of (real) human needs in these relations, including the inherent needs to participate in a community. This schematic simplification, often reduced only to aesthetics and order (image), impoverishes the deep sense of common behaviours or rituals (principles and norms) in urban space, even though at the initial stage and/or in good locations it could yield quite good results.

Users of space take up the assigned consumer-stimulated roles, which are to some extent one-dimensional. The lost meaning refers not so much to space as to these social roles. For they are passive and played today inertly, only for their comfort and pleasure. The dominant patterns of the top-proposed and unwittingly assimilated patterns based on mass offer and

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[24] Many areas in the city are not subject to such a strong control as official spaces in central areas of the city or districts, while many so-called wastelands are not subject to any control at all [9, p.86].

[25] According to George Canguilhem, "normativity" is "a state in which man is not afraid of challenges, can freely dispose of his abilities", it is "the ability to discover on one's own the best ways of responding to the situations encountered, especially those that are resistant". (See Bogusławski) [15, p.83].

[26] Elisabeth Gowen points out the need to use natural forces that are not needed in established ritual situations [28, p.231].

[27] Erving Goffman talks about "individual involvement within the situation" and about "idiomatics of group involvement", which is a learned idea, as well as the use of the so-called "Situational covers", the lack of which indicates an "ineffective" commitment [28, pp.43-45].

[28] In Edward T. Hall's view, space is an element of culture –infraculture as an integral part of the proxemic classification system [29, p.131]. Lefebvre space is an objectification of what is social (Jałowiecki, Szczepański) [30, p.314].

generalized forms of activity (food services, walking, fixed/stationary seating, etc.) often cause glut, boredom and dissatisfaction in some users and forces rebellion and opposition, the desire to give up (withdrawal/escape) from such space.

4. Does space matter?

Contemporary urban spaces have taken up new activities, they have become a field of new "games". Their value, symbolism and spatial dimension, despite a different way of reading them, today seem to be just as important as they used to be. However, does the integrity of background and action have the same meaning as in the historical city? Is there any need at all for a space user who drifts between various "attractions" – prepared offers of *curiosities*, since he/she is focused primarily, or perhaps only, on experiences? So what is the user's 's true relation to space? What is the value – the space or the possible/available activities? Is it the place or what happens there that matters? If so, how to value it?[29] The question about what is more important, the space or the game, appears rhetorical, like the question about the chicken and the egg[30]. Yet it is not about any precise answer, but rather about options that arise from this question and what is the nature of the choice. With multitude of different definitions of space (idea/requirements) and inadequacy of existing models (possibilities / practice), and above all due to new conditions in today's world, the question of the meaning of public spaces – common spaces (for all), should be constantly reiterated. Here, apart from resolving eponymous doubts "whether space matters", much more important would be looking at urban spaces from a distance, freeing them from obligations imposed on them – from what should or could be done and what is right. And this is not possible when users are treated in terms of a populist success, in which only top-imposed meanings given by authorities, experts and business matter[31].

The dilemmas related to the meaning of space undoubtedly refer more to those places/situations where there are no rules – unofficial, informal, alternative spaces ("spaces-of-resistance"). Space as a place of embedding developed actions/attractions becomes (merely) something like a resource, a kind of a plane (field) on which they take place more than an insignificant background (as it has always been). The space is useful as long as it allows us to achieve specific goals/needs, otherwise it seems that we can simply resign from it. In a game based on searching, gathering ("collecting") experiences[32], other, always necessary and important (it would seem)

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[29] To answer these questions, Ignasio de Sola Morales proposed the concept of *representation* and *presentation* that explains the relationship between space (form) and user activity (event). Morales identifies the "mnemonic" (space as a metaphor) and "rhetorical" (space as a discourse) approach [31].

[30] As Manuel Castells puts it, social practices are always linked to a space that cannot be eliminated even in today's globalised world. [32, p.423]. However, here I am more concerned with the personal relationship, and thus the significance of space for its user. For many researchers who consider it in relation to aesthetics, function, and identification (identity), public space and its mission is treated as a special being (almost holiness), but "serving" a higher purpose, and thus a little detached from life. In my opinion, such a provision is represented by the *Public Space Charter* adopted by the III Congress of Polish Urbanism [33].

[31] Canguilhem showed that society ("social organism") has no internal purpose, which comes from the "outside". (see Bogusławski) [15, p.97].

[32] This phenomenon in detail (following Richard A. Peterson) is being analysed by Przemysław Kisiel: "contemporary culture, encouraging the viewer to constant searching and choices, definitely favors omnivore-type attitudes' – the viewer is willing to participate in many, and even all possible forms of culture (the „omnivore' viewer) [34].

values of space (its frame, expression, quality, depth, genius loci, and even symbolism and identity) are not so important – they can be created, matched, tailored, reproduced according to the needs/desires of the chosen (created) game[33]and thus, these values seem to be secondary. However, there is always something that attracts, such as a location itself (especially in attractive, well-established places, such as the Market Square in Wrocław).

Users of official public spaces seem to accept the rules of the "game" imposed on them. Their relation to space is subordinate – they use the space and move within it according to given rules as if on a ready playing field. The given field is important because here the space and the "game" are one thing (there is no field without a game). They should behave "as required", anything unsuitable in this place excludes itself[34], so their relationship with the space is subordinate/dependent on it, and at the same time not binding because it is not ours[35] – users are only guests. This situation takes place especially in official (commercially oriented) spaces. Some "games", such as beach bars, may of course leave certain areas of freedom, open up opportunities in which users define their own scope, for example, where there is a variety of zones or even the possibility of selecting a seat and its location. But they will also always be subordinate to the whole "game". This dose of freedom left at least in the possibility to arrange and use furniture affects our relationship with space. The place is more attractive so that it begins to matter for us, because at least in a small part it allows for one's own action.

Complete (or even half-way) exit from the pre-set "game" changes the situation radically – the space becomes more important but in a completely different dimension, as it has to be adapted to one's own game. A user who is both looking for and creating his or her own experiences treats the space as a "material"[36]. It is a fully-fledged "material", although limited to their duration – in so far as they can be used to create/establish his/her own "game". This material exists or rather appears only at the moment when the user carries out his or her activity and in this it is similar to the space with imposed rules. However, the act of imposing or simply adopting rules somehow automatically results in a strong link between an individual action and space – it creates a personal relationship. The user must be in a direct relationship with it, otherwise he/she will not make the takeover. A temporary, one-time possession of this fragment of space occurs through this relationship. At that time it becomes his/her space, which makes him/her feel a bond with it – it is important for him/her, is a "possessed" value[37].

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[33] User experience design has become a very important discipline today, going beyond the provision of goods and services [35]. On the other hand, parametric semiology tested in architecture (and urban design/planning) uses behavioural heuristics to create a space that becomes secondary, which reverses the way of design [36].

[34] Entering the public space (social situation) is always associated with the need to adopt conventions and rules [28, p. 213]. See also footnote 23.

[35] Edward Hall pointed out that this is culturally conditioned – it is different in the west (with some distinction between countries in Protestant and Catholic culture), where especially today the space is literally used, and in the Far East, where people refer to what is common with deep respect [29, p.189].

[36] Space is always treated in a subordinate and possessive way, but I am interested in a special relationship between man and space in which the actor-user does not even notice its presence, but uses it intentionally (he/she does not take it for granted). DeCertau writes about such relations (trajectories) [25, p.93]. A good example is the graffiti painting described by Roch Sulima, who expresses the aspect of appropriating space – it is an anti-structural action, directed against the binding norms and rules [37, p.65].

[37] Marcin Bogusławski points out the need to "capture the subject in such a way that it can be captured in the process of becoming connected with its surroundings. such a subject should be captured as embodied one and involved in the world through a living, motoric body" [15, s.99].

5. Experiment / self-determination

The space created in this way has to be viewed differently. It is a different kind of space than in the historical model of urban space, in which it was (past tense) an integral element, a necessary and indispensable background for every activity of the city community[38]. Formerly, without its specific purpose (program, function and activity) and its spatial configuration (form and symbolism), as well as without social relations (rules, roles and structures) related to it (building it) it would not be understandable, there would not be a unifying identity of the community. In this departing, historical model, in which "games" were/are recorded, the space was/is very well recognizable, and also more strongly bound/binds its users to each other (in a specific game). The more users' goals coincide with the shared, common goal (e.g. a fair)[39], the more the space can be/is the place of the community they are building together. However, when the goals only attract – binding temporarily without integrating users, the communities are apparent, random and temporary ("pocket communities")[40]. This applies equally to formal and informal spaces, for each of them, however, on a different basis.

Within a set of fixed "games"[41], the program is given/constant (although it can and must change to catch up with constant pursuit of changing desires). Yet above all it is always closely related to the space (field/background) and its inherent component elements that follow it. Through this binding the space acquires a meaning (sense), which establishes symbolism and identity at the same time, because it binds together certain social structures that are closely related to the "game" (what and how we do it) and space (where and when). However today, when games/actions do not require a link with any specific place because they look alike everywhere – they originate from globally driven consumption needs/expectations[42], the meaning loses its previous dimension and blurs. In multiplicity of possible meanings emerging from everywhere the symbolic layer changes, even at a dizzying pace, also social relationships and identities will be in constant motion, according to new needs and meanings[43]. The space

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[38] To a large extent, especially in European cities, this model is current, but at the same time it is a thing of the past. Paul Virilio describes such a model as 'structural conditions' and shows that today it is becoming a requirement for 'conditions of construction' [38], and Michel Foucault says about contemporary space that „is a moment of erosion, a fall, a questioning of the basic assumptions and frameworks within which drama can take place' [39, p.49], in turn Jacques Derrida speaks about a varied multiple where the static space changes into an „event' of a sudden configuration. [40, p.65].

[39] In the historical city model, space was closed, shared within territorial boundaries, which corresponded to a specific community of ordinary people. Concurrent objectives included (and as the remains of this model often do today) all the places of (co-)participation in what is common, such as city fairs, religious rituals, festivals, events, etc. [41].

[40] Variability, ephemerality and spontaneity of contemporary city space are identified by many authors, see e.g. Castells [32], John Urry [42], while the temporality of community ties is examined by Michel Maffesoli [43].

[41] Today, games established in the spaces of the historical model relate primarily to consumption. Mixing, complicating and especially making the strategy more flexible in the market system results in a loss of purity of roles, division of functions, etc. (Krajewski) [44, p.41].

[42] This is a situation in which the prepared, unified („commercial', „restaurant' and „tourist') offer of official public spaces results in a lack of choice. Zygmunt Bauman [45, p.83] and John Urry [46] write about the negative effects of this process.

[43] For Pierre Bourdieu, „space is a complex set of symbols (within the framework of the accepted thought system), depicting inequalities, irregularities, imposing multiple spheres of influence, desires, needs and necessity' [47, p.301]. According to Paul Virilio, this immaterial multiplicity is most easily noticed in images that are a visual representation of these different forces in society [48]. Jean

(its form/frames) no longer needs to change, after all decorations (mainly equipment and furniture) change – the space remains basically static. Actually rules understood as modes of behaviour (imposed roles), except for the necessary adaptation (organization, logistics) also remain the same, because they concern a similar, limited "game" (action) all the time. What is offered in space (program/offer) becomes a changing but essentially the same commodity product – contained (and closed) in a "space-object".

In informal alternative spaces, the "game" and thus the scenario and program at the starting point are not given, thus the playing field is susceptible to change and adaptation. When an interested space user takes their own actions (that is, in a way, a "game"), the symbolism is given by them. Social relations have to be developed and similarly, social structures have to be developed later, which is extremely difficult (and usually it works for a short time)[44]. In this new model, the space is not a top-down field (object) – it is a result of an action in a process of constant redesigning. The essence of such space is reconfiguration and constant change[45] – space becomes an infinite experiment[46], and its limits are determined only by our imagination[47] (and conditions of the place). Of course, not everything that looks new, fresh, glamorous and vibrant is like that – in such case repeatable choices[48] (gestures) brought from everywhere around overlap as well. Besides, this model is not acceptable for everyone, because it is not easy – it forces to make an effort (creation/confrontation), it requires courage and perseverance[49].

A good example is the temporary takeover of space appearing in various cities around the world, in which staying is hindered by the authorities, owners of neighboring facilities or

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Baudrillard calls this the precession of simulacra. According to him, we have moved from signs that hide something to signs that hide the fact that nothing exists [49].

44 Usually, this type of activities related to some form of individual and / or group protest (resistance), after a period of spontaneous beginning, gradually dissipate their energy and once completed they are unable to move to something permanent (e.g. Occupy Wall Street movement) [50]. However, sometimes the initial actions are successful, as shown by the authors of the book *Urban Catalysts. The Power of Temporary Use* [51].

45 It is not obvious for an architect, but for an anthropologist (sociologist) it is natural – as Ulf Hannerz puts it, space is „discovering something by chance', and its user is like Benjamin's vagabond [52, p.36]. For Tim Ingold, „the environments are never finished, but are constantly in the making', reversing the normal order of form in relation to process – life is a process in which form arises [53, p.35].

46 Experiencing is an experiment and experiment is experiencing – trying, facing a new, unknown one. I understand the experiment, like Tim Ingold, not in the scientistic sense, but phenomenological – as „being-in-the-world' [53, p.152]. For Bruno Latour, in today's world, which is closed in procedures, restrictive schemes, experiment is a necessity [54]. In relation to space, it is a sign of creativity (self-agency) as the activities proposed by the Spatial Agency [55].

47 Imaginativeness – "creating the possibility of questioning (...) the concepts of copy or model" is analysed by Kristupas Stabolius [56, p.168]. For the need and necessity of imagination (imaginativeness understood as a persistent, constantly repeated attempt at alternative forms of life to exceed the existing order and not to repeat its limitations, is raised by the Canadian cultural scientist Max Haiven [57].

48 Marcin Napiórkowski indicates that repeated, uniform choices are produced in a common matrix of cultural capitalism [58].

49 From a psychological point of view, obviously, any experiment, although it promises pleasure, is difficult, because it requires overcoming the internal psychologically (affective, cognitive and behavioural) conditioned resistance to change before losing convenience and comfort (Oreg) [59]. Even more difficult, as noted by Marcus Miessen, comes negotiation of conditions, discussion and perseverance in forging into something permanent, and especially common [60, p. 118].

developers of housing estates in which these spaces are located[50]. Artistic actions, happenings as well as various forms of expression or even rebellion of residents, such as those that took place during the 1992 riots in Los Angeles in 1992[51], the Occupy Wall Street movement in 2011 or the Kiev tent town at the Maidan in 2014 are also such examples.

Certain areas of activity, and especially their consequential unpredictability do not fit within accepted, familiar everyday practices ("micro-everyday life")[52]. Familiarity with the place and predictability of its offer provide users with certainty of what they can get, and this often ensures above all convenience and comfort of use. The visible superiority of the traditional model in cities clearly proves that people often prefer the quality and comfort of official public spaces along with services they offer over freedom and possibility of creating something of their own. It is also true that the conceptual framework (term/meaning) of "public spaces", i.e. the awareness of what is and can be available and what we as users/participants can imagine, is set and reproduced in a common social *imaginarium*[53]. Jointly developed cultural patterns are formed by a specific time and processes, cumulative rebound assemblies that accumulate the same "ideas" for themselves – the same choices duplicated by us, which translates into the image of common spaces.

Social situations are governed by rules that allow individuals to easily find themselves in a gathering[54]. On the one hand, individuals are tangled with the need to belong and interact with others within the imposed and accepted roles (rituals, manners), while on the other the need to break free from social control and determine their subjectivity (their place and meaning) – the choice between rigor and freedom. As mentioned before, a formal situation, rigorously defined and ordered is more convenient as it does not require a constant mental effort. Unlike a chaotic, disordered but casual multifocal system. Therefore, despite their inertia schematic but simultaneously safe solutions of normative spaces, triumph over spontaneity. On the one hand it is tested only sporadically, on the other it seems to threaten the expected order (community) which gives protection (individual).

Irresistibly a question arises, which is a dilemma of the Western world, about how to reconcile the need to maintain order in public spaces with their dynamics and spontaneous character?[55] In other words, how to reconcile social requirements (community) with individual aspirations and desires?

6. Satisfaction of being in a space

With regard to public spaces, good practices aim at ensuring that people turn up there as often as possible, fill in these spaces and take part in what is happening there. The strongest

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50 In times of deep privatization, such actions became very popular. The series Life Size Cities presents many examples in many cities around the world, e.g. Telaviv, Montreal [61].

51 For Los Angeles, the whole situation was perfectly described by Margaret Crawford [62, p.151-155]

52 Antony Giddens points to the difficulty of finding oneself in a changing reality, which causes a constant need to redefine oneself (subjectivity / identity) [22, p.262].

53 Charles Taylor describes the Social Imaginarium as a way „in which we imagine the societies we live and maintain' [63, p.22].

54 According to Goffman the principles are a characteristic structural feature of gathering [28, p.219]. See also footnotes 23, 26, 27, 34.

55 This question has been analysed since the beginning of civilization, but in the Western world, which is taking the path towards ultra-liberalism, it is a dilemma of a special position. The Tradition of Spontaneous Order: A Bibliographical Essay by Norman Barry shows different voices in the discussion, taking as a reference point the „spontaneous order'[64]. Krzysztof Wielecki analyses its influence on the subjectivity of people [65].

aspiration is to make people stay together as much as possible (interact). The most important goal (and sense) is meeting, meeting others (the need for contact) – 'being together' is our primary psychological need (the need for stimuli/cognitive)[56]. When being together with others we are a part of a group and a space/place at the same time – there we find and settle a part of our identity, joining something shared. We are connected with people and with the space around – we feel (even if only apparent and/or short-lived) the belonging to community (the need for social structures) and, incidentally yet inseparably, belonging to the space (the need for attachment/the need for space)[57]. Striving towards being together, co-existence and cooperation is anthropologically and psychologically conditioned. By fulfilling this important need in a specific place we achieve a state of satisfaction[58] which is connected with patterns of behaviour arising in and taken over from the collectively produced culture (imaginary *imaginarium*).

Spatial factors (and others related to them) that we find there, stimulate our senses and emotions – make us feel good in the place as they correspond to our expectations encoded in the psyche. The appropriate and attractive (for us) features of the space, its quality and the "game" embedded in it alongside the offered attractions make us want to (or not) be there[59]. Still, the reason for our satisfaction (or dissatisfaction) lies above all in the psychological layer and emerges under influence of several stimuli received (consciously and not) by the mind in which the assessment of circumstances is born. Our mind perceives the situation created under the influence of various stimuli as desirable/attractive and suitable for us[60]. Satisfaction with this experience is essentially temporary, and social benefits that determine the (true) dimension of compassion (community) do not necessarily have to be long-term. This place and specific conditions, this spatial configuration and events taking place in it stimulate/impel our sense of satisfaction, pleasure and even sometimes euphoria. If we co-share with others in time it becomes a shared experience – we experience intimacy, connection, unity. Irrespective of the form of this bond we will feel it according to the scale of our own experiences (stimulated by experiences of others).

It greatly matters how much we ourselves can be and are involved in this shared gathering/event, but it is only part of what builds this situation and satisfaction that comes from it. Also our mutual relations and the space around us are only one of many elements – one of many stimuli desired and received by the mind. Our satisfaction is a (random) combination of these factors, related to desires (needs) deeply encoded in the mind and our cognitive matrix. Because of our individual desires, which we are never able to fully control, in a pursuit of pleasure/satisfaction we are more apart than together, and while together we are a group of individuals rather than a community[61].

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[56] Edward T. Hall indicates that culture is communication and space is a special product of culture [29, p.9].

[57] For many, as for Ingold, the process in which we learn/mark space ourselves, and thus transform ourselves („man-in-world') has the other side – it is participation, and thus affects others [66, p.4].

[58] The lack of such contact, as indicated by Eric Berne, leads to threats caused by social and sensory deprivation (craving for stimuli in infants, cognitive hunger in adults) [67, p.8].

[59] This is perfectly illustrated by the works of Whiliam Whyte [68] and Jan Gehl [69].

[60] The philosopher and neuroscientist Sam Harris points out that: "our mind is in constant motion, regardless of the context, and usually strives for pleasure (or its presumed source), avoiding pain' [70, p. 25].

[61] David Riesman in The Lonely Crowd analyses how ties fade, degrade and instrumentalise in modern societies, and are often manipulated [71].

The proxemic approach seeks to reduce the distance and establish close (intimate) social relations – it seeks to build a "culture of contact"[62]. This psychological and anthropological dimension provides the basis for proper functioning of space and it can be found in many official spaces. However, they rarely result from an in-depth analysis and matching achieved by co-determination – from a real *placemaking*[63], in which social needs are decisive. Oftentimes it results from using solution patterns which fortunately attract crowds of people to attractive locations (like the Market Square and beach bars), especially in combination with private business and mainly thanks to it. This raises the key question, is quantity sufficient to prove the meaning of public spaces and common spaces (communities)?

7. COMMUNITY/ COOPERATION

In liberal ideology public space is to be an "agora" to which everyone has access on equal terms. In practice, however, since it is treated as a commodity, most people do not allow it – they do not want everyone[64]. The top-down proposed formula/offer adjusts to the majority, while the majority adjusts to it (standardisation). Simultaneously, in late-modern society hyper-reality liberates the need for "uncommonness", realised in a constant search for new experiences and sophisticated sensations. The individual wants to treat reality and all its content as a material that can be freely shaped (individualization/self-realisation)[65].

Proxemic principles are helpful in creating comfort for customer satisfaction, but not enough to satisfy the wide range of needs for everybody, especially when applied superficially and mechanically for an aesthetic or symbolic effect. When public spaces become a substitute for missing private spaces (lack of ownership), the tendency to create a more capacious and simpler offer is predominant, which involves the process of "levelling down". This state of affairs neither serves the purpose of communal integration (the right-wing aspirations) nor provides opportunities for a shared use place (the left-wing postulate). Only those who are condemned to public space remain there – the "folk class". For them it replaces the missing (non-possessed) private space (also in the dimension of semi-private/semi-public local spaces)[66].

A community is not only created by merging imposed rules (constructed community), as truly common spaces are not a simple result of many (different) aspirations, either. Community/feeling-of-community requires thinking about others[67], responding to the need to unite,

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62 This is how Słownik Terminów Encyklopedycznych (*the Dictionary of Encyclopedic Terms*) defines it [72, pp.231-233].

63 Placemaking rules were defined by Project for Public Space (PPS). I use them in my research of public spaces (Place Diagram) [73, p. 92].

64 Even in the most inclusive vision by Jurgen Habermas, equal rights and obligations for citizens are only a theoretical postulate. A state of equality is only possible if institutional restrictions can be introduced to protect the public sphere against market and policy colonization [21].

65 In this quest, the needs generated by consumption mechanisms are combined with the "narcissistic" search for authenticity by individuals, and autonomy is the path to self-fulfillment. (Riesman) [71, pp. 333-334], while discussing the reaction to the popular iconosphere, Drozdowski states that it can be very easily used as a material for constructing any scenarios [74, p. 271].

66 For several years, local spaces of a different type have also been created in the city. Users had a greater range of possibilities (e.g. in the form of sports activities) there. Such places appear barely like drops in the sea of needs and to a small extent change the whole situation when all the "unnecessary" elements of living space are eliminated in residential places [75].

67 As Jonanna Hańderek writes the concept of community is very much associated with responsibility, which is synonymous with thinking about others [76, p.21].

be together and cooperate (the common cause). Except that when faced with a multiplicity of attitudes and in particular the disappearance of institutions that used to be responsible for them (discussed in part one), cooperation seems neither possible nor necessary today, at least not on a large social scale. It would be more realistic and useful to accept this multiplicity of individual "micro-worlds" entering into various, mainly temporary relations – "micro-communities", in which it is easier to obtain authenticity and obtain real commitment and joint effort.

Public spaces as spaces of attraction (*curiosities*) are places for individuals that replace everyday life (private space), yet are deprived of their freedom/familiarity due to imposed patterns. A simplified set of rules, different from the old conventions, breaks down the whole (community/space) into many independent systems – a multifocal system[68]. The rules resulting from the commercial model steer this system towards individualisation of individuals, which is illusory anyway, because the majority adopts the same patterns.

Experiments in urban space are a search for "uncommonness", but at the same time they are "micro-everydayness" which escapes the illusory, non-authentic structures of the community. Alternative, informal and especially illegal activities are exceptions – they are not solutions changing the status quo of public spaces or the general socio-economic situation. However, they are important for the stakeholders themselves and their "micro-communities", which they build themselves due to the lack of other possibilities (their own spaces)[69].

Regardless of whether the resignation from what is official happens due to the mismatch between the offer and the lack of other options, or whether it comes from the need of self-realisation (experiences/resistance), the decision anyway leads to choosing (sometimes unconsciously) "inconvenience" and accepting difficulties. As history shows, this state of mind promotes openness to others and greater readiness to build what is shared. Difficult situations and individual's weakness/disabilities "trigger" ego weakness, thus reducing isolation[70].

8. Summary / conclusions

Contemporary urban public space is static – it is an object. Its offer is flattened (imposed patterns of activity) and its operation is focused on direct experience (user satisfaction). The choice to participate in it does not necessarily occur in a conscious (thinking) act of embracing (living), and certainly it is not a (consciously) binding act in the spatial dimension, nor in the social community dimension in particular[71]. Actions within informal alternative spaces ("spaces-of-resistance") only seemingly change the status quo in this respect, but they have an incredible potential to politicize such acts. These actions are a manifestation (not necessarily quite conscious yet important) of a disagreement to the absence of choice (possibilities of use) and above all the lack of possession (disposition, belonging). Through its spontaneity and authenticity this attitude is a way to regain subjectivity (dignity).

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[68] Contemporary public space is homogenised, but the order of the social situation is not formalized, with less commitment to the whole – as Goffman puts it, the whole situation is broken down into many smaller outbreaks [28, p. 232]. See also footnotes 23 and 27.

[69] Alain Touraine speaks of communities based on the agency of actors, which, unlike constructed communities, does not objectify social effects [77, pp.32-35].

[70] Richard Sennett in Flesh and Stone identifies this relationship by analyzing urban communities in various historical periods [78, p. 450].

[71] Contrary to what, according to Martin Heideger, space makes „inhabited' or its own – „owned', the residents have no right to the city and its space, which provokes new „urban revolutions' described by David Harvey [79].

It is not important whether it happens as a result of unconscious reactions of participants or within the framework of precisely planned actions, instead the desire for change and the change itself are essential. The space ceases to be accepted as something granted, where users are only guests and are only required to adapt. The space changes its dimension into 'being-in-creating', changes from an object to process and is associated with a continuous change and adaptation – "redesigning", which means political action[72] and that makes it a "common concern". This dimension allows for an authentic openness to others – brings acceptance and willingness to cooperate. It can also appear and appears today in urban spaces[73]. In my opinion, however, it is not a necessary condition, rather a supportive/auxiliary one[74]. Definitely more important is an attitude that gives people the opportunity to get involved – their willingness to interact with others. On the other hand, the space and its physical, especially defined, closed dimension may even interfere[75], mainly because it is secondary to culture we live in – subordinate and imposing, thus limiting.

In this context places such as the abovementioned Słodowa Island where users have more freedom become very promising (thought-provoking) places of "escape down". Based on this example we can see the fundamental difference which determines the choice of these spaces – the difference resulting from the possibility of self-deciding and self-determination. This possibility can affect strengthening of their own position, it can be liberating for the users themselves, but can also change their relationship with the space[76]. Consequently, in these different, "uncomfortable" conditions of naturalness /authenticity there is a chance for a different pattern of relations between people – openness to others, which is crucial for creating something truly common (community) [77].

Informal alternative spaces, which above all are another way of searching for places for own experiences – psychological satisfaction in (own) activity (self-determination), are at the same time experiments which allow to test new layers of imagination and may help to develop a new model, a new dimension of urban spaces – a place "in-between", in a kind of *Thirdspace*[78]. For the time being, these experiments do not significantly influence the change of public spaces and relations occurring within them and thus in society. They do not seem to be able to change the character and mode of operation of these spaces, neither[79]. Will the enclaves – places of

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[72] According to Bruno Latour, only constant „redesigning', which is a permanent part of the process of making a space, causes its socialization – its political dimension [54, p.15].

[73] Such a dimension is shown by the grassroots urban movements, which in Poland are becoming more and more important [80].

[74] In general, it concerns the public sphere, which is not necessarily spatially oriented. An interesting analysis of what conflicts in space and thus blocks cooperation (community) is presented by Marek Nowak and Przemysław Pluciński [81].

[75] I refer here to the space on which various requirements of order are imposed, which in the name of preventing conflicts, blocks freedom and diversity [82, p.40].

[76] Michel Foucault argues that the possibility of change is a constitutive element of the relationship connecting the individual with the environment – the embodied 'I' with his world (Bogusławski) [15, p. 84].

[77] According to Sennett, discomfort, difficulties, suffering as a state of "cognitive dissonance" are helpful in accepting the imperfections of what is different, common, and removing obstacles often results in emptiness, apathy [78, p 446-447]. See also footnote 66.

[78] Edward T. Soya defines *Thirdspace* as "an-Other way of understanding and acting to change the spatiality of human life, a distinct mode of critical spatial awareness that is appropriate to the new scope and significance being brought about in the rebalanced trialectics of spatiality–historicality–sociality" [83, p.57].

[79] As Mara Ferreri points out, common actions within tactical urbanism can also only be „seduction of temporary urban planning in saving the city' [84].

"resistance" be only, as it happens now, a choice for a few or will they become (by assimilation) "normative"[80] – common, accepted form of being/participating in space, and at the same time, will they allow us to activate social interactions? Will official meeting places for people in the city be places like the 'brave new world'[81] just like the whole reality around us, systematically reorganized by algorithmization, and satisfying all our needs yet leaving us in blissful inertia? From the perspective of a (semi-)provincial city like Wrocław these questions seem quite abstract, but they will not be answered there, either. Nevertheless, all the mentioned experiments are very interesting and at the same time important, mainly because they allow us to ask questions that open the way for deeper analysis and understanding how urban space functions and evolves.

In the context of the presented considerations, the issue of community/feeling-of-community seems to be the most problematic, especially when compared to the most recent conclusions on late-modern/post-modern society which point to the need to redefine the perspective of evaluating public spaces as places for community. The finding that we lack the category of "micro-everydayness", in other words the category of "micro-community", is particularly important here. It results in an indication for research to appreciate the "new citizen's" involvement which fully consciously chooses small narratives of individual actors or small groups[82] rather than focus on fragmentation that leads to breaking higher order bonds, which fits into the multifocal arrangement of contemporary public space (and sphere).

As the final conclusion, which would be at the same time more practical, the postulate of legitimacy and the need to create a variety of forms and characters of spaces with varying degrees of intimacy/privacy can be pointed, as well as the postulate of diversity and multidimensionality, openness and flexibility of their programs. It is noteworthy to recall herenew hybrid typologies of public spaces from cities such as Copenhagen or Antwerp[83], which introduce dynamic activities (sport, play, etc.) and combine different forms of use. This combination changes the static character of the space, not only thanks to new devices, but especially thanks to ways of interaction, which strengthen the sense of bond. In Wrocław, apart from a few attempts, there are no such spaces, but there are some bottom-up places which resemble these examples.

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[80] For Canguilhem, "normativity" ("normalizing") is a flexible response, is a challenge to what is found, it is a possibility to take on a challenge or even a risk – it is free to dispose of its capabilities (Bogusławski) [15, p.101].

[81] Alduxley Huxley's *Brave New World* describes an ideal social organization where all needs are met but at the cost of civic inertia. An individual escape from this system is theoretically possible but requires life outside the society – alone [85].

[82] Rafał Drozdowski suggests such a diversion from the ideological approach and normative approach, referring to the "situational specificity" of limited individual and collective efforts" [85, p.301].

[83] I am thinking of, for example, IsraelsPlads in Copenhagen, where sports fields, project: COBE were implemented next to the marketplace [86], as well as Dageraadplaats in Antwerp, where in addition to the restaurant gardens, a playground and sports fields were introduced, project: T.O.P office [87].

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