

## Pluralism of goals of proecological architecture

Justyna Kobylarczyk<sup>1</sup>, Janusz Marchwiński<sup>2</sup>

<sup>1</sup> *Institute of Urban Design; Faculty of Architecture; Cracow University of Technology;  
Warszawska St. 24, 31-155 Cracow, Poland;  
j.kobylarczyk@op.pl  0000-0002-3358-3762*

<sup>2</sup> *Faculty of Architecture; University of Ecology and Management in Warsaw, Poland;  
Olszewska St. 12, 00-792 Warsaw, Poland  
j.marchwinski@wseiz.pl  0000-0003-3897-3580*

**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].

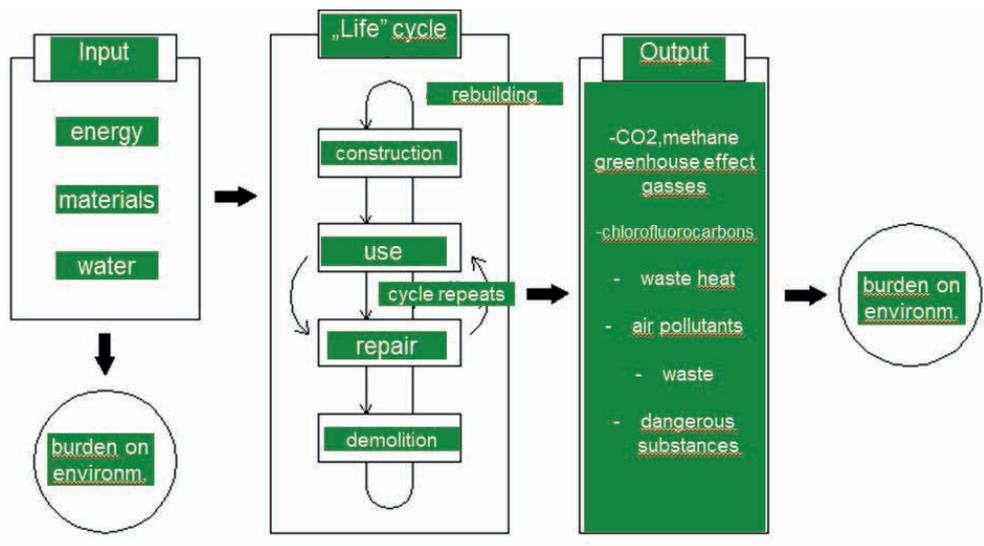


Fig. 1. The "burden on the environment" generated by the life cycle of buildings [2]

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 zoology 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.

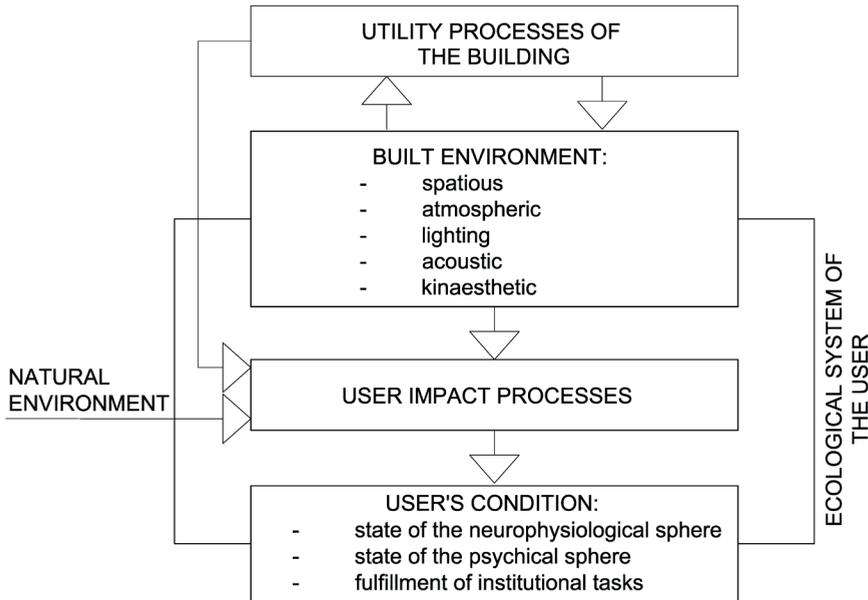


Fig. 2. The ecological system of the user (own study, based on [6])

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/m<sup>2</sup>a), 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).

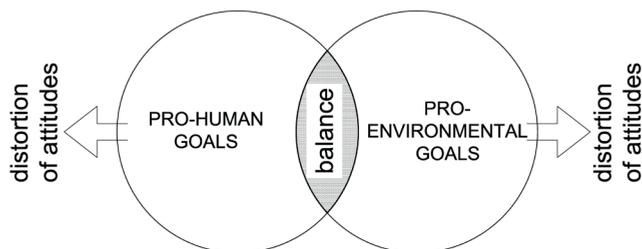


Fig. 3. The goals of pro-ecological architecture: balance and distortions (own study)

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.

## References

- [1] Stawicka-Wałkowska M., “Strategia zrównoważonego rozwoju w budownictwie”, in: *Rozwój zrównoważony w budownictwie (materiały konferencyjne)*, Warszawa 4.10.2001.
- [2] Nikken Sekkei., “Amity with Environment. Toward creation of sustainable cities and buildings”, in: *Sustainable Building 2000 (materiały konferencyjne)*, Maastricht 22-25.10.2000.
- [3] Baranowski A., *Projektowanie zrównoważone w architekturze*, Wydawnictwo Politechniki Gdańskiej, Gdańsk 1998.
- [4] Szulczewska B., “Planowanie układów przyrodniczych w mieście”, in: *Kształtowanie systemu przyrodniczego miasta*, Warszawa 1996.
- [5] Kobylarczyk J., *Uwarunkowania środowiskowe w projektowaniu obszarów mieszkaniowych*. Wydawnictwo Politechniki Krakowskiej, Kraków, 2018.

- 
- [6] Szparkowski Z., "System ekologiczny architektury zakładu przemysłowego", Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1978.
- [7] Marchwiński J., Zielonko-Jung K., "Systematic approach to the evaluation of the solar measures' role in creating the architecture of office and office-industrial buildings", in: *Proceedings of the 2005 World Sustainable Building Conference in Tokyo*, 27-29th September 2005.
- [8] Edwards B., "Sustainable Architecture", in: *Architectural Design* 04/2001.
- [9] Marchwiński J., Zielonko-Jung K., *Współczesna architektura proekologiczna*. Wydawnictwo Naukowe PWN, Warszawa 2012, p.IX.
- [10] Chmielewski J.M., *Teoria urbanistyki w projektowaniu i planowaniu miast*, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2001, pp.289-291.
- [11] Wines J., *Green Architecture*. Taschen-Köln 2000, pp.65-66.
- [12] Yeang K., *Eco-Design. A Manual for Ecological Design*. John Wiley and Sons 2008.
- [13] Dunster B., Pringle J., "Michael Hopkins & Partners. Research into Sustainable Architecture", *Architectural Design*, 1-2/1997, pp.27-31.
- [14] Mikoś J., "Budownictwo ekologiczne", Wydawnictwo Politechniki Śląskiej, Gliwice 1996, pp.49-50.
- [15] Mikoś-Rytel W., "Kontekst zrównoważenia w architekturze", in: *Oblicza równowagi [-Aspects of Equilibrium] (materiały konferencyjne)*, Wrocław 23-25.06.2005, p.352.
- [16] World Health Organisation, "What is the WHO definition of health?". Available: <https://www.who.int/about/who-we-are/frequently-asked-questions> [Accessed: 30 Dec 2019].
- [17] Jones D.L., *Architecture and Environment. Bioclimatic Building Design*. Laurence King Ed. London 1998.
- [18] Schneider-Skalska G., "Kształtowanie zdrowego środowiska mieszkaniowego. Wybrane zagadnienia", in: *Oblicza równowagi [-Aspects of Equilibrium] (materiały konferencyjne)*, Wrocław 23-25 06 2005, p.200.
- [19] Kobylarczyk J., *Ocena jakości środowiska zamieszkania w wybranych miastach województwa podkarpackiego po okresie „transformacji” w pierwszej dekadzie XXI wieku*. Wydawnictwo Politechniki Krakowskiej, Kraków, 2013.