ENVIRONMENTAL PROBLEMS

Vol. 9, No. 3, 2024

GREEN BUILDING STANDARDS AND THEIR IMPLEMENTATION IN UKRAINE

Antonina Savchenko

Kyiv National University of Construction and Architecture,
31, Povitryany Sil avenue, Kyiv, 03037, Ukraine
asav2509@gmail.com

https://doi.org/10.23939/ep2024.03.187

Received: 01.08.2024

Abstract. Today, one of the most discussed topics among builders is the post-war reconstruction of the country using the principles of green construction. Ever since the conclusion of the Association Agreement with the EU, Ukraine has been actively implementing EU environmental standards into national legislation. The threat posed by the war to the environment resembles an iceberg, because most of the negative consequences are hidden and will manifest themselves decades after the end of the war. That is why right now, we have to make maximum efforts to reduce the negative impact of man and his activities on the surrounding natural environment. Application of environmental standards in construction will make it possible to minimize the impact of the industry. For this purpose, we conduct an analysis of advanced BREEAM, LEED, DGNB systems. Each of the standards has its own characteristics and their application in the conditions of Ukraine has its pros and cons. Standards are one of the tools for the implementation of state policy, belong to the category of "normative document" (ND) and establish uniform rules, requirements, methods of control and testing, marking. Despite the intensive implementation of EU environmental standards in the legislation of Ukraine, there is still no legally established requirement for the certification of buildings according to a specific "green construction" standard. The development of own national standards is a significant step towards the introduction of green building standards in Ukraine.

Keywords: green construction, BREEAM, LEED, DGNB, building certification, implementation of environmental standards.

1. Introduction

The construction industry plays an important role and has a close connection with other branches of the national economy of the state. Realizing the important tasks of providing housing for the population, creating a developed infrastructure of settlements, providing all sectors of the economy with buildings and structures, the construction industry at the same time has a great impact on the natural environment. In today's conditions, we must take into account the damage caused by construction at all stages and try to reduce the negative impact on nature in the interests of current and future generations. The implementation of "green construction" norms is the basis of sustainable development for the construction industry. Certification of buildings and structures according to standards occupies a special place in "green construction".

The World Green Building Council points out that city must first strive to reduce global carbon emissions. This is because half of the world's population lives in cities, accounting for more than 70 % of CO_2 emissions. Buildings are the biggest contributors to urban emissions, accounting for 50–70 % of urban emissions and 38 % of global emissions. About 75 % of building emissions are operational emissions generated by building systems (e.g. heating, ventilation and air conditioning, lighting and others). The remaining 25 % are embodied emissions, i.e. carbon dioxide generated during the production of building materials, construction and interior design of buildings (World Economic Forum, 2022).

2. Materials and Methods

The purpose of this study is to review some environmental standards for the certification of

For citation: Savchenko, A. (2024). Green building standards and their implementation in Ukraine. *Journal Environmental Problems*, 9(3), 187–192. DOI: https://doi.org/10.23939/ep2024.03.187

buildings, to establish the positive consequences and features of their application in Ukraine.

Among the wide variety of "green building" standards:

- LEED (USA);
- BREEAM (Great Britain);
- DGNB (Germany);
- Green Globes (USA, Canada);
- Living Building Challenge (Australia);
- Beam (Hong Kong);
- CASBEE (Japan);
- Green Mark Scheme (Singapore);
- Green Star SA (South Africa);
- Pearl Rating System for Estidama (United Arab Emirates).

The British BREEAM system (Building Research Establishment Environmental Assessment Method), the American LEED (The Leadership in Energy & Environmental Design) and the German DGNB (Deutsche Gesellschaft fuer nachhaltiges Bauen) have gained the most popularity. In Ukraine, there are already buildings certified according to these standards. The BREEAM standard is most popular among developers. According to the Educational and Scientific Institute of Energy Saving and Energy Management, six certificates for new construction projects and eight for existing buildings have been received under the BREEAM certification system. For new construction projects, out of six certificates, four have the status of intermediate (after the design stage), and two – final (after the end of construction). Most often, projects in Ukraine receive the Good certification level (10 certificates), and two certificates each have the Pass and Very Good levels, respectively (Educational and Scientific Institute of Energy Saving and Energy Management, 2022).

Despite the intensive implementation of EU environmental standards in the legislation of Ukraine, there is still no legally established requirement for the certification of buildings according to a specific "green construction" standard. So, the developer himself chooses the standard according to which he certifies the building, and he does it voluntarily. Each of the standards has its own characteristics and their application in the conditions of Ukraine has its pros and cons. BREEAM "Method for assessing the environmental efficiency and level of energy consumption of building structures" is a method of voluntary assessment of the energy efficiency of a building according to the principle of "green certification". The BREEAM method is based on the principle of assessment, establishment of nominal value and certification of the main factors of construction, which ensure its long-term environmental and socio-economic stability (MCL Group, 2022). This method considers and evaluates the construction process and the building or structure itself at such stages of the operational cycle as construction, overhaul and commissioning. Also, the BREEAM method evaluates and emphasizes the cost of construction and the rational distribution of eco-resources and eco-materials, makes certification more attractive for investment, and creates an environmentally sustainable and safe natural environment and office space for building workers (MCL Group, 2024). The biggest advantage of BREEAM is that the building assessment takes place step by step at each stage of the construction process, and therefore an expert can be involved in the assessment of the building both at the design stage and at the stage of construction completion. No less important is the flexibility of this evaluation system, taking into account national characteristics. In 2017, the Optima Plaza shopping center in Lviv received BREEAM In-Use, Very Good (Fig. 1). In 2018, BC Astarta Organic Business Center received BREEAM International NC v.2013, Good (Fig. 2).

The LEED system was developed by the USGBC to certify high-performance buildings and sustainable environments. According to this standard, "green" construction must meet the so-called concept of the triple criterion, which combines economic development (income), social responsibility (people), environmental protection (planet) (MCL Group, 2020). LEED, like BREEAM, is aimed at evaluating the energy efficiency of buildings, but the following criteria are taken into account for the evaluation: land plot, building materials or resources for production, the level of technical support for the operation of the building, as well as the transport accessibility of the building (MCL Group, 2024).

This method has less stringent requirements for building evaluation, but requires starting the evaluation from the design stage, which, accordingly, does not allow for evaluation of already completed buildings. Shell company office in the capital BFK "Toronto-Kyiv" became the first object in our country, which received such a rating, namely LEED Gold in 2013. The second was the building of the US Embassy located in Kyiv – in 2014 it won LEED Silver (Fig. 3).

Fig. 1. BC “Optima Plaza” (Lviv)

Fig. 2. Astarta Business Center (Kyiv)

Fig. 3. Embassy USA in Ukraine

At the end of 2020, the B9B10 business campus of the Kyiv innovation park UNIT.City received the "green" LEED Silver certificate from the American Counci of Green Building (USGBC). This object was implemented development company UDP in 2019. In general, she certified two of its buildings with a total area of more than 31,500 m^2 (Comercial Property, 2021).

The DGNB environmental certification system is used as a tool for designing and assessing the quality of buildings, based on the concept of integrated planning and taking into account all important aspects of construction. The basis for evaluating the building is the criteria that take into account functional and socio-cultural, technical, economic, ecological characteristics and the location and management of the process. At the same time, the system has a high degree of flexibility ("Novatorstroy" company, 2024).

According to statistics, the majority of the population lives in cities, which leads to the fact that a person spends most of his life in buildings. Of course, it is equally important to understand that the building must be ecologically and economically balanced. Therefore, the DGNB certification method pays great attention to the study of the building's environmental friendliness. Determining how comfortable a person's stay in a building is determined by eight criteria, including air quality and air temperature in the room, sound insulation, and visual comfort. To ensure compliance with the mandatory DGNB certification criteria, it is important that all involved parties (architects, engineers, builders, designers and other professionals) work closely together. After all, obtaining a DGNB certificate requires detailed supporting documents of all implemented activities and their results.

Table "Comparison of certification systems" shows the criteria by which the building is assessed and the assessments used by the British, American and German certification systems. All evaluation systems have their own features and advantages, but what puts them in the same row are the benefits that each of the participants in the construction and operation process receives. For the tenant, this is an opportunity to create a more comfortable environment for employees, in each evaluation system sufficient attention is paid to comfort in the middle of the building.

The developer gets a marketing advantage in the market, the opportunity to fill the vacancy faster, increase the capitalization rate, it is easier to get credit financing, and provide the building with a stable and solvent flow of tenants. A certificate of compliance with "green" requirements is a modern trend. The investor, first of all, reduces the risks of moral aging of the asset, increases in energy prices and improves the corporate image. For architects, designers, engineers and contractors, participation in a project certified according to international standards is an independent international confirmation of their competence, the quality of design solutions and an additional competitive advantage (Advansys Group, 2016).

Comparison of certification systems

	BREEAM	LEED	DGNB
Evaluation criteria	Management Healthy microclimate Energy efficiency. Transport interchanges nearby Use of water resources Materials for construction Waste management Use of land resources Harmful emissions Innovations	Location and transport interchanges A place in the local ecosystem Use of water resources Energy efficiency Materials for construction A healthy indoor environment Innovations Local priorities	Environmental friendliness Economy Functionality and comfort Technical criteria Process organization Site evaluation and location area
Assessments	have passed fine very good ideally excellent	certified silver gold platinum	certified silver gold platinum

3. Results and Discussion

Since 2017, the Law "On the Energy Efficiency of Buildings" has been in force in Ukraine, which defines the term energy certificate – an electronic document of the prescribed form, which indicates the indicators and class of the energy efficiency of the building, provides recommendations for its improvement formed in accordance with the procedure established by legislation, as well as other information defined by law. The energy efficiency of buildings is determined in accordance with the Procedure for conducting energy efficiency certification and energy audit of buildings, which is developed taking into account the requirements of the legislation of the European Union, the Energy Community, harmonized European standards in the field of energy efficiency of buildings and is approved by the central executive body, which ensures the formation of state policy in in the field of energy efficiency of buildings.

In the process of determining the energy efficiency of buildings, information on:

1) local climatic conditions;

2) functional purpose, architectural planning and constructive solution of the building;

3) geometric (taking into account the location and orientation of the enclosing structures), thermal and energy characteristics of the building, as well as the energy balance of the building;

4) regulatory sanitary and hygienic and microclimatic conditions of the premises of the building;

5) technical characteristics of engineering systems;

6) use of renewable energy sources, passive solar systems and sun protection systems, as well as energy produced by cogeneration (On Energy Efficiency of Buildings, 2017).

Undoubtedly, such certification has a positive impact, but in order to achieve a more sustainable and effective result, it is necessary to implement certification of all buildings and structures according to green construction standards at the legislative level. Taking into account the best elements of the above standards and national features, Ukraine is in the process of developing its own standards. Standards are one of the tools for the implementation of state policy, belong to the category of "normative document" (ND) and establish uniform rules, requirements, methods of control and testing, marking. In accordance with international practice, European law and Article 8 of the Law of Ukraine "On Standardization", the objects of standardization are technical standardization committees (On Standardization, 2014). The National Technical Standardization Committee TK 82 "Environmental Protection" was established in 1993. As of today, TC has undergone a number of reorganizations and operates in accordance with the Regulation on TC 82, which corresponds to the legislation and the system of standards in the field of national standardization. 51 collective and individual members make up TC 82. In particular, collective members of TC 82 are 19 state authorities, institutions, establishments and enterprises (Tkachenko, 2023). The draft of the first edition of the energy-efficient green building standard for public buildings has already been approved, which can be considered an important step, but there is still a lot of work ahead.

4. Conclusions

In the cities of Ukraine, the negative consequences of climate change are becoming increasingly apparent: a decrease in the area of green spaces, as well as a decrease in the types of vegetation, an increase in the number of allergic manifestations and infectious diseases, the deterioration of the quality of drinking water, and heat stress. If the necessary measures are not taken, after some time, new ones will be added to the listed ecological problems of cities: disruption of the functioning of energy systems of cities, flooding, landslides, a decrease in the amount of drinking water, natural hydrometeorological phenomena. It is known that environmental problems cause the deterioration of the health of the population, which in turn will affect all sectors of the national economy, and the state of the economy in the state will deteriorate (Kryvomaz; Savchenko, 2021).

Modern trends in the implementation of "green construction" norms are promising for overcoming the ecological crisis of cities and make it possible to reduce the impact of the construction industry on the state of the environment. In order to speed up the pace of implementation of aspects of "green construction", it is necessary to implement European environmental standards into the legislation of Ukraine. The introduction at the legislative level of mandatory environmental certification of buildings (starting with new buildings) is one of the most important steps in this direction (Savchenko, Tkachenko, 2022).

As Green building certification schemes typically take into account partial assessments such as energy efficiency, water savings, acoustic comfort,

indoor lighting and air quality, and the use of vegetation. Certification schemes often have different rules and requirements, so it is difficult to compare them with each other (Ujma et al., 2024)

The development of own national standards is a significant step towards the introduction of green building standards in Ukraine.

Co-funded by the Erasmus+ Programme of the European Union

References

Advansys Group. (2016). *Energy efficiency building certification standards: LEED, BREAM, DGNB and others*. Retrieved from https://advansys.ua/baza-znan/standarty-seritfikacii-zdanij-po-jenergojeffektivnosti-leed-bream-dgnb-i-drugie/

Comercial Property. (2021). "*Green*" *real estate certification: an international trend – Ukrainian practice. Comercial Property №2(210)*. Retrieved from https://ic-consulenten.com.ua/wp-content/uploads/2021/03/CP210_Green-Certification.pdf

Educational and Scientific Institute of Energy Saving and Energy Management. (2022). *Green certification of buildings: the situation in Ukraine*. Retrieved from https://iee.kpi.ua/%D0%B7%D0%B5%D0%BB%D0%B5%D0%BD%D0%B0-%D1%81%D0%B5%D1%80%D1%82%D0%B8%D1%84%D1%96%D0%BA%D0%B0%D1%86%D1%96%D1%8F-%D0%B1%D1%83%D0%B4%D1%96%D0%B2%D0%B5%D0%BB%D1%8C-%D1%81%D0%B8%D1%82%D1%83%D0%B0%D1%86/

Kryvomaz, T. I., & Savchenko, A. M. (2021). Reducing the impact of the construction industry on climate change by implementing the principles of green construction. *Environmental safety and nature management*, *37*(1), 55–68. https://doi.org/10.32347/2411-4049.2021.1.55-68

MCL Group. (2022). *Certification of "green construction" according to the BREEAM standard*. Retrieved from https://mcl.kiev.ua/uslugi/mezhdunarodnaya-sertifikatsiya/uslugi-sertifikacii-zelenogo-stroitelstva/sertifikacija-zeljonogo-stroitelstva-po-standartu-breeam/

MCL Group. (2024). *Features of BREEAM and LEED certification*. Retrieved from https://mcl.kiev.ua/osobennosti-sertifikatsii-breeam-i-leed/

MCL Group. (2020). *Features of LEED certification*. Retrieved from https://mcl.kiev.ua/osobennosti-sertifikacii-po-standartu-leed/

Novatorstroy company. (2024). *System of ecological certification DGNB (Deutsche Gesellschaft fuer nachhaltiges Bauen)*. Retrieved from https://novatorstroy.com/press-relizy/ekologicheskie-standarty-stroitelnyh-materialov-chto-nuzhno-znat/#:~:text=DGNB%20(Deutsche%20Gesellschaft%20f%C3%BCr%20Nachhaltiges,%D0%B8%D0%B7%20%D1%81%D0%B0%D0%BC%D1%8B%D1%85%20%D0%BA%D0%BE%D0%BC%D0%BF%D0%BB%D0%B5%D0%BA%D1%81%D0%BD%D1%8B%D1%85%20%D1%81%D0%B8%D1%81%D1%82%D0%B5%D0%BC%20%D1%81%D0%B5%D1%80%D1%82%D0%B8%D1%84%D0%B8%D0%BA%D0%B0%D1%86%D0%B8%D0%B8

On Energy Efficiency of Buildings: Law of Ukraine 2017, No. 33 (2017) Retrieved from https://zakon.rada.gov.ua/laws/show/2118-19#Text

On Standardization: Law of Ukraine 2014, No. 31 (2014). Retrieved from https://zakon.rada.gov.ua/laws/show/1315-18#Text

Savchenko, A., & Tkachenko, T. (2022). Implementation of European standards of green construction in the construction industry of Ukraine. *Environmental Security and Nature Management, 41*(1), 31–43. doi: https://doi.org/10.32347/2411-4049.2022.1.31-43

Tkachenko, T. (2023). *The draft of the first edition of the energy-efficient green construction standard for public buildings was approved*. Retrieved from https://livingplanet.org.ua/en/news/skhvaleno-proekt-pershoji-redaktsiji-standartu-energoefektivnogo-zelenogo-budivnitstva-dlya-gromadskikh-budivel

Ujma, A., Iremashvili, I., Kamalbekova, V., Mskhiladze, N., & Morgoshia, D. (2024). Green building certification: basic assumptions and selected application results. (in:). *XI International Scientific and Technical Conference „Modern Problems of Water Management, Environmental Protection, Architecture and Construction"*. doi: http://doi.org/10.36073/1512-2344

World Economic Forum. (2022). *Accelerating the Decarbonization of Buildings: The Net-Zero Carbon Cities Building Value Framework*. Retrieved from https://www.weforum.org/publications/accelerating-the-decarbonization-of-buildings-the-net-zero-carbon-cities-building-value-framework/