

## THE BREEAM, THE LEED AND THE DGNB CERTIFICATIONS AS AN ASPECT OF SUSTAINABLE DEVELOPMENT

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### ABSTRACT

Some of the most significant problems of industrialised countries are increasing consumerism, the growing demand for more and more energy and other natural resources, and the depletion of non-renewable sources. The visible consequences are environmental pollution and global warming. To address these issues, there is growing pressure on the use of alternative energy sources, the use of natural resources and the introduction of new technologies. The use of multi-criteria building certification systems, which evaluate their performance, is becoming increasingly common in the building industry. The BREEAM, the LEED, and the DGNB are among the most popular methods for assessing sustainable architecture, and they are project management tools. The main task of the article was to define and describe the impact of documents related to sustainable development certificates on contemporary design and living and working conditions, as well as to demonstrate the relationship between the quality of architecture and environmental protection. Another goal is to indicate how dynamically the number of certificates issued in Poland is increasing. The study used the necessary research methods: analysis and criticism of applicable documents and literature, as well as an intuitive method based on personal experience. The scope of the work includes a discussion of the most frequently obtained certificates: the BREEAM, the LEED, and the DGNB, the achievements of which prove the use of solutions conducive to sustainable development.

**Keywords:** sustainable development, BREEAM, LEED, DGNB, architecture, sustainable architecture

### INTRODUCTION

Authorities in industrialised countries are struggling with many problems, including increasing consumerism and growing demand for energy. The visible effects are environmental pollution and global warming. In recent years, there has been a clearly noticeable increase in interest in sustainable construction (Runkiewicz, 2010). EY – an international concern providing audit services, tax, business, and transaction consulting, as well as belonging to the so-called Big Four – emphasises the huge role of sustainable development and environmental, social and governance (ESG) in their corporate social responsibility strategy (CSR) statute. Currently, business development is related to social responsibility and must be carried out while protecting natural resources and contributing to society (EY, [n.d.]). The European Union is striving to achieve climate neutrality, which is why the share of renewable energy is increasing. According to Eurostat Statistics Explained 2021 (Renewable energy statistics), renewable energy satisfied 19.7% of final consumption in 2019. The leading sources are wind and water, and a rapidly developing sector is solar energy (Eurostat,

2023). The way of designing and building is also changing – the popularity of wood as a building material is growing. Research by the European Forest Institute (EFI) indicates that the production of 1 t of steel causes the emission of 2 t of CO<sub>2</sub>, and 1 t of cement causes 1 t of CO<sub>2</sub>; therefore, the use of 1 t of wood allows for a reduction of CO<sub>2</sub> emissions by 2 t (Hurmekoski, 2018). There is a visible trend towards modular design and broadly understood prefabrication, which can reduce construction costs. Highly developed technology can also become very energy efficient.

The main task of the article is to indicate the impact of the certificate system on working conditions and the relationship between architectural quality and environmental protection.

The first and most basic goal of the article was to examine the impact of the increasingly widespread certification of buildings related to sustainable development issues on contemporary design, as well as on housing and working conditions and secondly, to demonstrate the relationship between the quality of architecture, the design process, building use and environmental protection.

## **MATERIAL AND METHODS**

The necessary research methods were used: analysis of literature and applicable documents, as well as observational and intuitive methods – based on personal experience in designing BREEAM-certified office buildings. The issues that have the greatest impact on the contemporary design of commercial buildings were selected, and the changes that have occurred in recent years in the design of multi-family residential buildings have been described. The challenge of contemporary design is sustainable design, which, due to the provisions in documents and market requirements, becomes almost obligatory. The work discusses certification systems, the benefits of sustainable construction, the impact on design decisions, the well-being of users and residents, and increased market attractiveness. The scope of the work includes a discussion of general issues related to design in line with sustainable development and the most frequently obtained certificates: the BREEAM, the LEED and the DGNB, the achievement of which proves the use of solutions conducive to sustainable development.

## **SUSTAINABLE DEVELOPMENT AND THE DESIGNER'S ETHICAL RESPONSIBILITY**

Designers are bound by contracts with their clients that cover the production of a specific project. However, there is also ethical responsibility, taking into account the impact of projects on the surrounding reality – both professional and personal. Including environmental issues among public safety, architects and urban planners should protect the ecosystem and maintain key resources. Saving and developing alternative energy sources is important, while ensuring the well-being of current and future generations is a comprehensive goal. A holistic view of buildings as individual systems in themselves and inextricably linked to the ecosystems surrounding them will allow us to understand the role of the facility in the ecosphere and enable us to make important design decisions (Bergman, 2012). From a systemic perspective, the environment is a set of objects with their features and the relationships between them (Chmielewski, 2010). Completing certification and implementing these types of facilities is obligatory, but it proves that the developer and user take a serious approach to environmental protection. The problem of research on the design and assessment of sustainable architecture is increasingly being addressed (Kamionka, 2012).

In dictionaries, sustainability is defined in terms of continuity, as bringing about or maintaining balance (Drabik, Kubiak-Sokół & Sobol, 2023). In the literature, the ESD phrase is used to monitor education for sustainable development. It is the UNESCO education sector's response to the urgent challenges facing the planet. Human actions have led to compounding threats that are becoming increasingly difficult to reverse (UNESCO, [n.d.]). The meaning of E oscillates between environmental, ecological, and economic;

D stands for development and also design; S stands for sustainable and sustainability. ESD is treated as a code expressing concern for sustainable development issues. In Western countries, it suggests social and cultural change. The problem is treated on a global scale and concerns the basic issue related to population growth and the resulting effects of human existence on Earth. Sometimes, the meaning of ESD includes actions aimed at mitigating the perceived adverse impact of trends towards economic globalisation (United Nations Conference on Environment and Development Rio de Janeiro, Brazil, 1992).

According to the strategy to reduce or limit carbon dioxide emissions by 2054, the efficiency of buildings is considered one of the basic elements that are essential in reducing the intensity of global warming (Pascala & Socolow, 2019). Existing research shows that the most important decisions are made at the initial stage of the design cycle and have the greatest impact on the life cycle cost of the building. Designers are, therefore, obliged to create more energy-efficient buildings (Stipo, 2015).

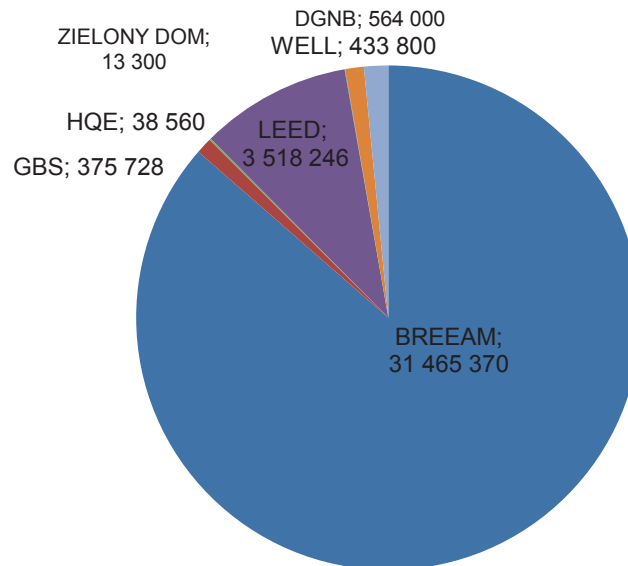
## **AN OUTLINE OF DOCUMENTATION RELATED TO SUSTAINABLE DEVELOPMENT AND CONSTRUCTION**

The most important documents regarding the issue include Agenda 21 (Action Program – Agenda 21), adopted on the initiative of the UN in 1992 at the Second Conference in Rio de Janeiro, where the guiding act was the slogan: “Environment and development”. The document describes the protection and management of natural resources, the aim of which is to ensure lasting and sustainable development (United Nations Conference on Environment and Development Rio de Janeiro, Brazil, 1992). In Poland, the principle of sustainable development is enshrined in Article 5 of the Constitution of the Republic of Poland: “The Republic of Poland safeguards the independence and inviolability of its territory, ensures human and civil freedoms and rights as well as the safety of citizens, guards the national heritage and ensures environmental protection, guided by the principle of sustainable development.” (Dz.U. 1997 Nr 78 poz. 483). The definition itself was described in the Polish Environmental Protection Law: “It is understood as such socio-economic development in which the process of integrating political, economic and social activities takes place, while maintaining natural balance and the durability of basic natural processes, in order to guarantee the possibility of meeting the basic needs of individual communities or citizens of both the present generation and future generations.” (Dz.U. 2001 Nr 62 poz. 627).

In recent years, sustainable construction has become an important element of the construction industry. The Polskie Stowarzyszenie Budownictwa Ekologicznego (Polish Association of Ecological Buildings) defines a sustainable building as an economical, comfortable building created with respect for the natural environment. Green buildings should be designed in such a way as to simultaneously meet the needs of current users and future generations (Polskie Stowarzyszenie Budownictwa Ekologicznego [PLGBC], 2023e). The association’s website contains a database of certified buildings. According to the PLGBC Report from 2023, over 36 million m<sup>2</sup> of usable building space is subject to certification in multi-criteria systems (PLGBC, 2023f). Building assessment systems available in Poland are: the BREEAM, the Green Building Standard (GBS), the HQE, the LEED, the ZIELONY DOM, the WELL, and the DGNB. The GBS and the ZIELONY DOM are Polish multi-criteria assessments. The GBS is a building assessment system adapted to Polish conditions. It is important to promote user comfort and a high level of internal environments with rational energy consumption. The ZIELONY DOM (in English: green house) is a Polish multi-criteria assessment of residential buildings introduced in 2021.

Figure 1 shows the division of the usable area of certified buildings into individual systems, in accordance with the above-mentioned report. The three most popular systems in the world are the BREEAM (UK), the LEED (USA) and the DGNB (Germany). The first certificates in Poland were issued in 2010: four for office buildings located in Warsaw (two BREEAM at a very good level – Crown Square and Signum Work Station;

two LEED: Atrium City Deutsche Bank Green Branch – LEED gold level and Atrium City Skanska Office – LEED silver level) and two for logistics and industrial facilities (LEED silver level: Colgate-Palmolive Facility, Świdnica and BorgWarner Manufacturing Plant, Jesionka), (PLGBC, 2023a).



**Fig. 1.** Division of the usable area of certified buildings into individual systems in 2023

Source: own study based on the PLGBC (2023f).

Over the years, new legal regulations related to the design of low-energy buildings have appeared. In accordance with Directive 2010/31/EU of the European Parliament and of the Council, from 2019, all new public buildings in Member States must have almost zero energy consumption. Members of the European Union undertake to create national plans that aim to increase the number of such buildings. The definition of the term nearly zero energy building is as follows: “a building with very high energy performance [...]. The almost zero or very low amount of energy required should come to a very high extent from energy from renewable sources, including energy from renewable sources produced on-site or nearby” (Directive 2010/31/UE). In accordance with the applicable regulation on the detailed scope and form of the construction project (Dz.U. 2022 poz. 1679), the technical design must include energy characteristics, including the power balance of devices, thermal properties of external partitions, energy efficiency parameters of the installation and data indicating that the adopted construction and installation solutions meet the conditions for energy savings in accordance with applicable regulations.

In 2021, the European Union introduced the Fit for 55 package, which aims to achieve climate neutrality by 2050 and a 55 % reduction of net greenhouse gas emissions by 2030 (compared with 1990 levels). According to the Fit for 55 package, greenhouse gas emissions from industry and electricity have been significantly reduced thanks to the European Union Emissions Trading System (EU ETS). However, GHG emissions from the transport sector have remained stable over the last decade. Therefore, the directives include provisions on energy taxation (Council Directive 2003/96/EC), which will increase the prices of greenhouse gas emissions in the transport sector. The emphasis is on the use of renewable transport fuels in transport and the promotion of electromobility (Erbach & Jensen, 2024).

## The BREEAM

The Building Research Establishment's Environmental Assessment Method (BREEAM) was the world's first system for assessing buildings in terms of sustainable development (1990, Building Research Establishment Global, UK). Currently, as an international standard, it is used in over 85 countries. In each country, the BREEAM is adapted and operated by local specialists. Thanks to this system, before the construction of the building, the developer has knowledge of the impact of the designed building on the environment, obtains information on the effective use of energy, and has the opportunity to ensure maximum thermal conditions and comfort for future users, as well as cheaper operation. The main goals of the system are buffering the impact of the building operation cycle on the environment, creating buildings in a way that is beneficial to the environment, creating a credible building label, and supporting innovation in the construction industry and its supply chain (BRE Global, 2021).

The BREEAM develops schemes to assess the environmental performance of buildings at various stages. The basic division concerns the distinction between newly designed buildings (new construction) and existing buildings (in-use – buildings existing and in use for at least two years). The system also enables certification covering renovation and finishing (refurbishment & fit-out), civil engineering and infrastructure (the CEEQUAL) and, in Great Britain, also newly built apartments (the Home Quality Mark). In order to illustrate the certification method, a new construction scheme for an office building was discussed (PLGBC, 2023b).

The completed buildings subject to evaluation receive a final percentage result that corresponds to a specific rating: outstanding  $\geq 85\%$ , excellent  $\geq 70\%$  (Fig. 2), very good  $\geq 55\%$ , good  $\geq 45\%$  pass  $\geq 30\%$ , unclassified  $\leq 30\%$ . When the developer decides to certify the building, an assessor is introduced to the design process and is responsible for coordinating the proceedings. Based on the point matrix specifying the level and the score in given BREEAM categories, guidelines for a given project are created. The assessor provides recommendations to the entire project team, collects evidence and creates reports confirming the clear compliance of the project with the relevant criteria defined in accordance with the adopted BREEAM scheme. Facilities are assessed in the following categories: management, health and well-being, threats, energy, transport, water, materials, waste, land use and ecology, pollution, and innovation. Certification uses flexible methods of scoring individual elements, which means that non-compliance in one area can be compensated in another. In the case of office buildings, depending on how the facility will be used, there are two certification options: shell and core, and fully fitted. It is the developer who decides which type will be considered. The first term refers to a project without a tenant area, while the second one applies to a project with a tenant area.

In the management category, points are awarded, among others, for design consultations, including with representatives of third parties at the conceptual design stage (strictly defined criteria). In the case of the health and well-being section, the guidelines include, among others, visual comfort, where the necessary condition is the use of lighting fixtures with fluorescent light sources equipped with high-frequency ballasts. Points are also awarded for designing a system that limits excessive sunlight (rollers, blinds). The diagram contains strictly defined criteria regarding the arrangement of rooms in terms of access to daylight, which involves analysis. The BREEAM guidelines specify, among others, the maximum distance from a window that a workstation can be located, and the location of conference rooms. Regarding air quality, it is essential not to use materials containing asbestos. The installation designer is obliged to prepare an indoor air quality plan to obtain the most favourable conditions for future users. Guidelines for ventilation and emissions from products used in the building are also specified. In the case of acoustics, an acoustician should be appointed at an early stage of the process to define design guidelines. Noise levels in individual rooms should meet minimum national requirements.





**Fig. 2.** The Bałtyk office building in Poznań (BREEAM certification level excellent): a – photo taken during the construction of the building, 2016; b – photo after the construction of the building was completed, 2017

Source: ©Anna Piętocha.

Safe access to the building should be provided for both pedestrians and cyclists. The designer must develop a strategy for access to the building for disabled people, people of different ages and genders, and parents with children by conducting consultations, among others, with future users and technical specialists. In terms of energy efficiency, at the stage of the design process, an analysis of the vertical transport system is performed, allowing the selection of the appropriate number and size of elevators, escalators and walkways, which also have energy-saving features. The category regarding alternative means of transport defines, among others, the development of the surrounding land by improving the layout of bicycle paths, equipping an appropriate number of parking spaces with electric vehicle charging stations, dedicated parking spaces for people using the car sharing system, as well as designing an appropriate number of bicycle racks with showers, changing rooms (with lockers) and drying rooms. In the case of the water category, points are counted using an appropriate calculator. Loans may be granted, for example, to equip sanitary facilities with devices with low water consumption or to install grey or rainwater utilisation systems. The water installation should include solutions that reduce water consumption.

The materials category provides a detailed specification of the main building elements. Information regarding the use of products from the materials sector covered by the environmental products declaration (EPD) certification and conducting an LCA analysis are important. The BREEAM guidelines also specify the durability and resistance of elements to external factors. The protection of sensitive elements should be ensured, as well as security of entrances, elevators, stairs, and vehicle manoeuvring areas – using, among others, bollards and barriers, as well as specialised solutions used to reduce the potential degradation of materials by environmental factors. In terms of waste, it is important to create appropriately sized waste storage zones for recycling and to finish floors and ceilings only when the tenant is known – to avoid wasting materials. The designer should create

a report specifying the adaptability of the building in the event of future functional changes. Regarding ecology, an ecologist's report should be created specifying the value of the area, as well as the greenery management plan prepared by a landscape architect. All valuable elements should be secured at the construction stage. One of the first certified commercial buildings in Poland was Plac Unii Lubelskiej in Warsaw (Fig. 3), with an area of 94,000 m<sup>2</sup> (APA Kuryłowicz & Associates), completed in 2013 – BREEAM very good (PLGBC, 2023a).



**Fig. 3.** Plac Unii Lubelskiej in Warsaw, 2024: a – view from the tram stop; b – view from Puławska  
Source: ©Anna Piętocha.



**Fig. 4.** The Mickiewicz Estate in Warsaw, 2024 – the first BREEAM-certified housing estate in Poland  
Source: ©Anna Piętocha.



Until recently, in Poland, mainly office buildings were certified, but more and more often, these are commercial, logistics, and warehouse buildings, as well as residential buildings (PLGBC, 2023a). The Mickiewicz Estate (Fig. 4) in Warsaw was the first BREEAM-certified housing estate in Poland (2016). The first stage was certified at a good level. According to data from Skanska, Residential Development Poland, which implemented the project, nearly 40% of clients declared that the certificate was an important factor when choosing an apartment (SKANSKA, 2023).

### **The LEED**

The Leadership in Energy and Environmental Design (LEED) rating system was first introduced in 1998 in the United States by the U.S. Green Building Council (U.S. Green Building Council [USGBC], 2019). Currently, it is the most widely used system in the world (168 countries). In Poland, the LEED appeared in 2009 and is the second most frequently used certification system (PLGBC, 2023d). The aim of the system is to create buildings that will save money, create effective buildings with reduced carbon dioxide emissions and places that are healthier for people. Counteracting climate change is also crucial. Office, industrial, hotel, school and commercial spaces are certified.

The certification levels awarded are: platinum  $\geq 80$  points, gold 60–79 points, silver 50–59 points, and certified 40–49 points. Points are awarded in five basic categories: integrated design process, energy and environment; effective water management; materials and natural resources; quality of the internal environment; location and transport (max. 100 points); and in two additional ones: sustainable terrain, and innovation and regional priorities (max. 10 points). There are also critical points in each category (prerequisites), which are obligatory, e.g. the use of the HVAC system (PLGBC, 2023d).

The certification includes the following categories: Building Design and Construction (BD+C), Interior Design and Construction (ID+C), Building Operations and Maintenance (O+M), and Neighbourhood Development (ND), Homes, Cities. Similarly to BREEAM, the basic BD+C category includes LEED New Construction (for newly constructed buildings), and LEED Core&Shell (common areas in new buildings) for schools and retail, etc.

The certification process is divided into the design and implementation phases (until the building is put into use), in which the design team, LEED AP, and the developer actively participate. In the implementation phase, an additional person is appointed responsible for coordinating the work (commissioning agent), acceptances, reports, and procedures.

The first certified building in Poland was the logistics and industrial facility BorgWarner Manufacturing Plant in Jasionka, Podkarpackie Voivodeship, with an area of 7,000 m<sup>2</sup> (LEED New Construction Silver) completed in 2008, certified in January 2010 (PLGBC, 2023a).

### **The DGNB**

The DGNB Certification System is the youngest of the three systems discussed and is present in 21 countries. It was created in Germany in 2008 on the initiative of the Deutsche Gesellschaft für Nachhaltiges Bauen (German Sustainable Building Council). An accredited auditor takes part in the process (PLGBC, 2023c). The system is divided into schemes for individual buildings and regions (e.g. industrial areas). The DGNB covers six key aspects of sustainable construction: environmental, economic, socio-cultural, functional, technological, process and location quality. The first four have equal weight in the assessment: 22.5%, the next 10%. This system defines objectives that contribute to the building's overall performance depending on the degree to which they are met (Gesellschaft für Nachhaltiges Bauen [DGNB], 2014).

This system aims to increase the quality of life and well-being of users, reduce costs, reduce additional costs, reduce greenhouse gas emissions and waste, and make planning more efficient. The documents developed



indicate to consultants and manufacturers the extent to which construction products influence the durability of the project, which thus contributes to further sustainable development.

The DGNB certification process takes place in four steps: preparation and registration, documentation submission, compliance check, and results and certification. In the first stage, the client contacts the auditor and signs the contract; in the second stage, the auditor completes the necessary documents; in the third stage, the DGNB Certification Team checks the content of the submitted documentation, then sends a report to the auditor, who sends an official statement to DGNB or fills in the gaps. The commission will confirm the next test result is confirmed by the commission. The certification notice is then sent to the client and the auditor. The official presentation of the certificate usually takes place during trade fairs, congresses or building openings. The final rating is as follows:  $\geq 35\%$  bronze (only for existing buildings),  $\geq 50\%$  silver,  $\geq 65\%$  gold,  $\geq 80\%$  platinum.

## RESULTS AND DISCUSSION

As a result of the studies carried out, it was possible to show how important a role the aspect of sustainable development plays in contemporary design. Further detailed research is required. Green building certificates are relatively new design guidelines that lead to the introduction of standards in the design of sustainable buildings. The evaluation systems for the discussed certificates are presented below in tabular form (Fig. 5).

BREEAM rating		Score [%]	LEED rating		Points earned	DGNB rating		Score [%]
Outstanding	*****	$\geq 85$	Platinum	80+	Platinum	$\geq 80$		
Excellent	****	$\geq 70$	Gold	60–79	Gold	$\geq 65$		
Very Good	***	$\geq 55$	Silver	50–59	Silver	$\geq 50$		
Good	**	$\geq 45$	Certified	40–49	Bronze	$\geq 35$		
Pass	*	$\geq 30$						
Unclassified	–	$< 30$						

**Fig. 5.** Rating systems of the BREEAM, the LEED and the DGNB

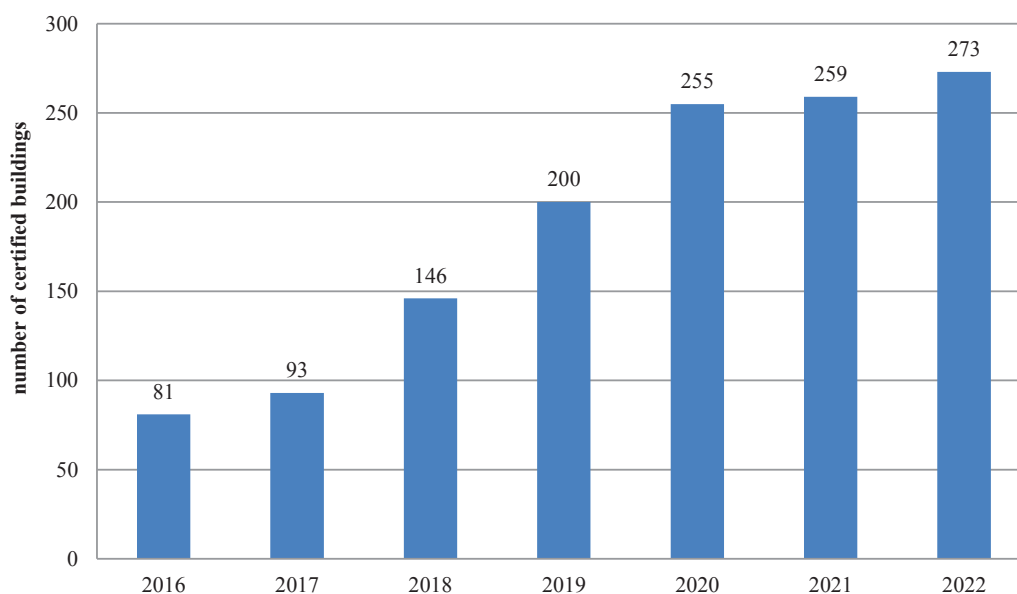
Source: own work.

According to the 2022 Report, 1,359 certified buildings were built in Poland, most of them in the Masovian Voivodeship (572), then the Małopolskie Voivodeship (130) and the Silesian Voivodeship (122), (PLGBC, 2023f). This result represents 45% of all buildings certified in Central and Eastern European countries (followed by: the Czech Republic – 562, Romania – 375, Hungary – 262). There is a growing interest in certification systems for developers of multi-family buildings. As of the date of preparation of the above-mentioned report, the number of all certified residential buildings was 118 (106 BREEAM, 7 LEED, 5 HQE), of which 29 buildings were completed in 2022. After the commencement of the COVID-19 pandemic, there was noticeably increased demand from the e-commerce sector (online trade) for warehouse and industrial areas. In the period from March 2021 to March 2022, 171 certificates were awarded in this sector, with the total amount being 398. Also, due to the pandemic, the WELL Health & Safety Rating certificates focusing on the health-promoting features of buildings have gained popularity. However, there is a visible decline among commercial facilities – only four certificates were issued in the analysed period (45 in the previous year).

Designers are increasingly willing to use long-lasting building materials. In the case of certified buildings, it is important that the products have an EPD declaration, which considers the transport of the raw material from

the extraction point to the factory and to the construction site, the carbon dioxide equivalent in the production process, the durability of the material and the possibility of recycling or reusing. The implementation of certified buildings is also related to the need to meet additional criteria on the part of the construction site, e.g. in the case of the BREEAM, the general contractor is bound by the Environmental and Social Code of Conduct for contractors (proper and safe access, good neighbourhood, ecological awareness, safe and comfortable working conditions), construction site impact (e.g. monitoring and reporting CO<sub>2</sub> emissions of construction works and transport) and construction waste management – the requirement to prepare and implement the site waste management plan (Jaczewski, 2014).

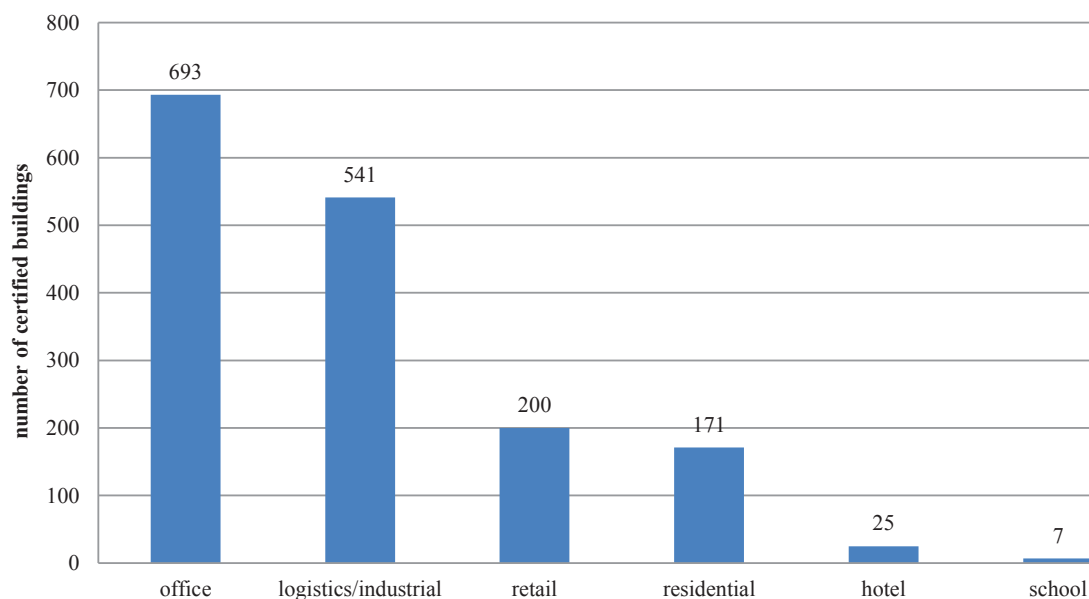
During the lockdown, public awareness of the climate crisis and the need to actively counteract this phenomenon increased. According to the Polskie Stowarzyszenie Budownictwa Ekologicznego (PLGBC) survey, 60% of office workers expect their employers to implement sustainable strategies in the work environment; 83% of developers expect more demand for the rental of sustainable buildings, where tenants expect operational savings as well as the use of comfortable interiors (PLGBC, 2023f). Green buildings also improve user comfort. For example, provisions on the maximum distance of the desk from the daylight source prevent substandard solutions. Thanks to specific criteria, BREEAM-certified office buildings include cyclists' locker rooms, clothes dryers, bicycle racks, electric car charging areas, and green roofs. Figure 6 shows how dynamically the number of certified buildings in Poland has been growing in recent years. In 2016, 81 green building certificates were issued, and 273 in 2022 (Fig. 6).



**Fig. 6.** Number of certified buildings in Poland in a given year. The period covers the time from March to March

Source: own study based on the PLGBC (2023f). Chart prepared on the basis of the Polskie Stowarzyszenie Budownictwa Ekologicznego (PLGBC) reports published since 2015.

Office buildings in Poland gave rise to building certification in Poland and constitute over 42% of all certified buildings. However, recently there has been an annual decline in their number. However, the share of the housing sector is increasing. The share of other buildings in the 2023 Report (PGLBC, 2023f) has basically not changed (Fig. 7).



**Fig. 7.** Industry division of certified buildings in Poland in 2023

Source: own study based on the PLGBC (2023f).

The emerging multi-family residential buildings allow their users to save on costs and function in balance with nature, where comfortable green zones are designed, with green roofs utilising rainwater, and bird and insect boxes installed, along with photovoltaic panels on the roofs. Figure 7 shows that hotels and schools in Poland are also starting to be covered by certificates.

## CONCLUSIONS

The certification process and adapting a project to the guidelines is time-consuming and is often associated with increased financial outlays. Certificates contribute to the increase in the market value of the building, both in the case of rental and sale. However, it should be noted that an economical operation largely depends on the way this type of building is managed. In certified buildings, construction costs are higher, but rent rates are also higher. Many international corporations have provisions in their CSR statutes that leased office space must be located only in certified buildings. Analysis of the reports of the Polskie Stowarzyszenie Budownictwa Ekologicznego (PLGBC) shows a huge increase in the number of buildings being constructed with this type of certificate, which has changed the way of design in recent years. In a dynamically changing reality, a building certificate is no longer optional, but in the case of office buildings, even obligatory – it is increasingly becoming a basic market requirement.

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## **CERTYFIKACJE BREEAM, LEED I DGNB JAKO ASPEKT ZRÓWNOWAŻONEGO ROZWOJU**

### **STRESZCZENIE**

Do największych problemów krajów uprzemysłowionych należy zaliczyć postępujący konsumpcjonizm, rosnące zapotrzebowanie na coraz większą ilość energii i innych zasobów naturalnych oraz wyczerpywanie się nieodnawialnych źródeł. Widocznymi skutkami są zanieczyszczenie środowiska i globalne ocieplenie klimatu. Ograniczoność zasobów może prowadzić do globalnego kataklizmu. W celu przeciwdziałania wymienionym problemom coraz większy nacisk kładziony jest na wykorzystywanie alternatywnych źródeł energii, korzystanie z zasobów naturalnych oraz wdrażanie nowych technologii. Coraz powszechniej stosowane są w budownictwie systemy certyfikacji wielokryterialnej budynków, które oceniają ich wydajność. Do najpopularniejszych metod oceny zrównoważonego budownictwa należą BREEAM, LEED i DGNB – stanowią narzędzie zarządzania projektem. Głównym zadaniem artykułu jest zbadanie, jaki wpływ na współczesne projektowanie i warunki mieszkaniowe czy pracy mają dokumenty związane z certyfikatami zrównoważonego rozwoju, a także wykazanie związku między jakością architektury a ochroną środowiska naturalnego. Kolejnym celem jest wskazanie, jak dynamicznie zwiększa się liczba wydawanych tego typu certyfikatów w Polsce. W badaniu zastosowano niezbędne metody badawcze: analizę i krytykę obowiązujących dokumentów oraz literatury, a także metodę intuicyjną opartą na osobistym doświadczeniu. Zakres pracy obejmuje omówienie najczęściej uzyskiwanych certyfikatów: BREEAM, LEED i DGNB, których uzyskanie świadczy o zastosowaniu rozwiązań sprzyjających zrównoważonemu rozwojowi.

**Słowa kluczowe:** zrównoważony rozwój, BREEAM, LEED, DGNB, architektura, budownictwo zrównoważone