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Identification of the Technocratic Factors Influencing Sustainable Logistics Parks in Poland

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Abstract

The technocratic and economically driven approach to urban and industrial planning can be observed in the evolution of modern logistics parks, which have become key infrastructural elements of regional development. This study explores how technocratic logic influences the spatial and environmental transformation of logistics parks in Poland within the context of sustainable certification systems such as BREEAM International (Building Research Establishment Environmental Assessment Method). The research employed an eight-stage methodological framework combining exploratory, analytical, and empirical methods. The process began with a comprehensive literature and data query on the development of logistics parks at global, European, and national levels, followed by a systematic review of sustainability assessment systems. A research framework was then defined to establish a consistent model of warehouse buildings, verified through the PLGBC database of certified facilities. The dataset was filtered and standardized, and a purposive sample of 25 BREEAM-certified warehouses was selected from 150 eligible cases. Each certification report was analyzed to identify credit distribution patterns, and the results were examined through a factor analysis to interpret the technocratic and systemic determinants influencing sustainability decisions. The findings reveal that the decision-making logic of developers is dominated by quantitative optimization and regulatory alignment, leading to the prioritization of low-cost, easily verifiable credits such as ENE03 (External Lighting) and WAT02 (Water Monitoring), while complex or innovative credits such as MAT06 (Material Efficiency) remain under implemented. The study contributes to the understanding of how technocratic rationality shapes sustainable certification outcomes and highlights the need for stronger policy and market incentives to promote circular and systemic approaches in the logistics real estate sector.

Keywords: green logistics buildings; technocratic and sustainable approaches; urban management choices

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Academic Editor: Giada La Scalia

Received: 15 October 2025
Revised: 6 November 2025
Accepted: 14 November 2025
Published: 19 November 2025

Citation: Ryńska, E.; Zielińska, M. Identification of the Technocratic Factors Influencing Sustainable Logistics Parks in Poland. *Sustainability* **2025**, *17*, 10365. https://doi.org/10.3390/su172210365

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1. Introduction

The spacious definition of technocratic planning covers a number of theoretical issues and practical experimentations, which emerged in Europe in the last few decades of the nineteenth century and in the first few decades of the twentieth century in the USA [1]. The main aim was to establish the legitimacy and specific guidelines for scoping urban planning and management procedures. The technocratic planning perspective had, and still has, a significant and long-lasting influence on urban planning and design, even if, as with other approaches, it was subject to numerous critics [2]. According to Moroni, technocratic

planners "believe themselves able to gather and analyse a priori and in quantitative terms the relevant information regarding the city. They consider themselves able to rely on specific predictions of future events. . . planners presume that they are able to design the desired urban end-state and to define, as precisely as feasible, target sites for particular uses" [3]. Moreover, according to Howe, this direction of city planning "anticipates the future with the farsightedness of an army commander, so as to secure the orderly, harmonious, and symmetrical development of the community" [4]. Hence, the city of those times was considered as a machine useful for manufacturing processes, where the logistics of the designed mechanism lead the main role [5].

Although the development of logistics parks has been widely discussed in the literature, existing research remains fragmented and predominantly descriptive. Previous studies have addressed selected aspects such as location determinants, transport accessibility, regulatory constraints, and demand dynamics [6–8], but they rarely integrate these factors into a unified analytical framework that would explain the multi-scalar evolution of logistics parks—particularly in Central and Eastern Europe. Most analyses are concentrated on Western markets and do not account for the specific conditions shaping warehouse construction in Poland, including post-socialist land-use transformations, industrial heritage, and changing investment models. As a result, there is a lack of empirical studies that simultaneously examine market, spatial, technological, and regulatory drivers of logistics development and verify them in relation to the actual building typologies and investment cycles observed in the Polish market between 2013 and 2023.

Another clear research gap concerns the relationship between multi-criteria certification systems and the development of modern logistics architecture. Comparative studies of certification methods such as BREEAM and LEED provide valuable methodological insights [9–11], yet they seldom explore how these systems influence the investment strategies of developers or shape the design decisions of large-scale logistics facilities. Most empirical work remains general, focusing on aggregated market value effects rather than the micro-level mechanisms of credit implementation [12,13]. Although the number of certified logistics parks has increased rapidly in recent years, there is still no comprehensive analysis of which credits are most frequently implemented, why they are chosen, and how they affect the spatial and environmental characteristics of logistics buildings. Recent studies emphasize the need for such targeted research, highlighting the lack of integration between the technocratic, efficiency-oriented logic of the sector and the sustainability principles underlying certification systems [14].

This article addresses these gaps by developing an analytical framework that links technocratic rationality with the implementation patterns of BREEAM International credits in certified logistics buildings in Poland. It identifies and interprets the factors driving certification outcomes, providing new empirical evidence on how the pursuit of quantifiable efficiency aligns—or conflicts—with the broader goals of sustainable development in the logistics real estate sector.

1.1. Historical Background

A typical example of the technical knowledge used in city-making in the past is the simplified attitude of dividing cities into areas and planning processes into systems. Designers and critics in this period mention the transportation system, the street system, parks and recreation facilities, public buildings and civic centres, the railroad system, and suburban "bedroom" areas. This attitude was dominant until the late 1990s of the 20th century, when the rapid urbanization process, economic instability, and global climate change created new challenges. Traffic congestion, economic stagnation, and environmental issues became problems to be solved [15–17].

The potential solution to dealing with those challenges was the notion of a smart city. Smart governance emerged mainly due to the growing role of technology and logistics, which was based on technocratic roots and chain management used in the functioning of cities [18]. The use of various smart technologies became a standard practice in the upgrading of traditional administrative systems, city operations, decision-making, and delivering improved quality of life [19,20]. However, in practice, smart governance is strongly characterized by a variety of supply oriented and technocratic management routes [21]. In this process, much emphasis is put on the role of technology in collecting data and automating many urban system functions [22,23]. This approach focuses on digital and technology-driven innovations, which are often considered to be universal solutions [23]. According to some authors, technocratic "smart" governance conceals and makes redundant urban issues that cannot be represented using digital tools and data analytics [24–27].

Differing priorities found within developing smart cities indicate that a comprehensive definition of the smart city concept must incorporate various thematic issues, such as "investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure which fuel sustainable economic growth and a high quality of life, with a wise management of natural resources" [28]. According to this definition, the concept of smart city governance should be built upon the knowledge, ideas, and opinions of various stakeholders to create innovative technological functions that can satisfy actual needs.

Smart cities emerged as an international phenomenon and soon became a normative method of urban logic management for confronting systemic global crises. A characteristic of this solution is a high need for efficient management of various supply chains, without which many areas would not thrive. Therefore, the adequate location of logistics nodes and distribution of routes started to play a major role in further development. Due to the large variety of logistics infrastructure, there is a significant disagreement in defining "a logistics centre" as well as in classifying its basic types. As Meidutė emphasizes, "different authors define and perceive the purpose of logistics centres differently," depending on the country and its logistics culture [29]. Although the idea of logistics has existed for more than half a century, its systematic spatial and infrastructural development occurred unevenly across regions [30]. Even recent studies continue to propose distinct conceptualizations, such as definition of logistics centers as multi-service hubs where diverse logistics activities converge [31]. There are several basic concepts of logistics centres to be distinguished in Europe, i.e., the British "Freight Villages", the French "Plate Forme Logistique" and "Plate Forme multimodales", the German "Güterverkehrszentrum" (GVZ), the Italian "Interporto", the Dutch "Rail Service Center" (RCS), and the Danish "Transport Center" [32]. The differences may be found in the very essence of the concepts, and many detailed solutions including building standards. The requirement to mitigate the negative environmental effects of transport activities prompted European countries to adopt a policy further supporting the development of logistics centres.

For example, in Italy, logistics centres were established in the 20th century as early as the 1970s. The investments were local, but successful, as the decisions were made with the participation of the public sector. The transport plan emphasized the cooperation of logistics centres with seaports and supported international trade in goods with the greatest possible use of rail transport. The first German logistics centre was established in Bremen in 1985 as a result of a local initiative. However, the federal government evidently appreciated this idea, and thus in 1992 initiated the development of a network of logistics centres. German concepts are based on the rationalization of the spatial and functional layout of urban agglomerations. French and British solutions are also inspired by the desire to facilitate emerging centres for the transfer of technological innovations and skills covering the use of information technology and telecommunications.

1.2. The Development of the Warehouse Market

From 2003 to 2013, the number of storage facilities in the United States increased by 15% [33]. Other American metropolises, such as Atlanta, also experienced analogous growth [34–36]. Simultaneously, the location of logistics buildings is also changing. This evolution is sometimes compared with Burgess's theory of concentric circles, where with the increase in urban population and the expansion of urban areas, after a certain period of time each inner zone extends outward and invades the adjacent outer belt [37]. This model has been challenged by many contemporary urban planners, as it deals mainly with USA cities, which due to economic development changes, are no longer organized with clear "zones". Nevertheless, in this case, what is important is the succession pattern, which when applied to logistics clearly indicates the conflict between freight-related activities and other land uses [38]. As air pollution, noise, and traffic congestion had an enormous negative impact on the living environment, freight-related activities were forced to move away from mixed residential and industrial areas [39]. Nevertheless, this attitude is changing based on different delivery chains and applied technologies.

The first warehouse facilities and trans-shipment centres built in Poland in the 20th century in the early 1990s were built according to concepts and with the use of technologies that were regarded as outdated and inefficient even at that time. Almost none of the facilities put into operation were even considered modern. Simply, these buildings were treated as large volume "storage boxes" without any thought to the aesthetics or technological standards. In 2005, Prof. Paprocki, Chair of Transport, Warsaw School of Economics (SGH), wrote that "the process of creating a modern point-based logistics infrastructure has only started. . .. In Poland, the needs of the economy and its shape differ from these present in most EU countries, therefore foreign experience may be transferred to Poland only to a limited extent".

The total industrial and logistics stock in Poland has grown to approximately 33.5 million square meters, making it one of the top three markets in Europe. As of 2023, the Polish logistics market is the largest in Central and Eastern Europe. In 2017, it accounted for around 16% of Poland's total investment volume. The majority is concentrated in the five most developed markets: Warsaw, Central Poland, Upper Silesia, Wroclaw, and Poznan [40]. From the urban management perspective, these markets are in line with the technocratic approach and management upgrade. This development is consistent with the contemporary logistics business sector, which is one of the largest industries in Europe and employs more than 7 million people [41]. The sector's share of investment volume in Poland has also been significant, with warehouses accounting for nearly 50% of total investment in real estate. The key regions of Warsaw, Central Poland, Upper Silesia, Wrocław, and Poznań continue to dominate this market, reflecting sustained development in these urban areas [42,43].

In addition, despite challenges such as rising construction costs and supply chain disruptions, the Polish market remains attractive due to its growing e-commerce sector and relatively low operational costs compared with Western Europe. The continued expansion of warehouse and industrial space underlines Poland's strategic importance in the logistics sector [44,45].

The subject of this study is the question of which technocratic factors currently have the strongest influence on shaping warehouse market investments. The technocratic nature of warehouse investments facilitates the structuring of design guidelines for such buildings based on analyses and studies that consider complex technological and economic processes.

Warehouse investments are shaped by a combination of technical, economic, environmental, locational, and regulatory factors. According to a report by Brzeziński, Ł., and Wyrwicka, M.K. [46], automation can increase operational efficiency by as much as 30–40%, indicating that Warehouse Management Systems play an increasingly significant role in the design and location of warehouse investments. In the article by Wang et al. [47], economic

factors influencing warehouse investments are discussed, such as the shifts in supply chains related to the expansion of the e-commerce sector. According to research published by the World Economic Forum [48], sustainability has become a key requirement in the design and construction of warehouses. Given the growing role of investment financing tied to ESG reporting outcomes, along with the legislative requirements introduced by the EU (EU taxonomy), sustainability is the broadest and most important technocratic criterion affecting logistics investments.

The BREEAM International New Construction scheme for commercial and industrial buildings provides a standardized framework for assessing sustainability performance in projects located outside the United Kingdom. It covers ten thematic categories—ranging from energy efficiency and resource management to innovation—and awards credits that together determine the building's overall sustainability rating (BRE Global 2020). The system's adaptability to local contexts has made it particularly relevant in Central and Eastern Europe, where industrial and logistics facilities increasingly seek certification to demonstrate environmental compliance and market competitiveness.

An analysis of the available research indicates that BREEAM certification is widely employed by companies to achieve objectives aligned with the ESG (Environmental, Social, and Governance) framework, particularly in the real estate and construction sectors. Studies suggest that organizations readily adopt BREEAM International standards, as they facilitate compliance with the ESG framework goals while also contributing to enhanced investment value and competitive advantage [49].

The ESG framework is integrated into the real estate sector through certifications such as BREEAM, which ensure compliance with environmental and social standards [50].

Furthermore, as highlighted in the research conducted by the authors of [51], BREEAM certification supports the ESG transformation, particularly in the context of sustainable development.

According to the BRE report, the BREEAM International multi-criteria assessment system is the most widely used certification system in Europe, covering a broad range of sustainability criteria and supporting environmentally friendly investments. The documents also emphasize that BREEAM is adapted to regional and national requirements, making it a flexible tool for various types of properties [52].

Research by Piper and the World Green Building Council indicates that BREEAM certification can enhance the sale value and rental income of warehouse properties. These reports demonstrate that certification contributes to maintaining or increasing investment value, attracting investors seeking assets aligned with the ESG framework criteria [53].

Källman and Lundqvist conducted research on the impact of BREEAM on design and implementation processes in construction companies [54]. Their findings indicate that certification influences project organization and introduces additional requirements that raise the environmental standards of warehouses. At the same time, BREEAM is perceived as a tool that supports long-term property value management and ensures compliance with future environmental regulations. Research indicates that BREEAM contributes to reducing operational costs through the implementation of energy-efficient technologies and resource management. The BSRIA report reveals that 43% of respondents identified operational savings as a key benefit of BREEAM certification, which is particularly significant for warehouses with high energy demands [55]. Therefore, the aim of this study was to identify and describe the factors influencing the successful implementation of solutions required by BREEAM International certification for large-scale warehouse facilities in Poland.

The evolution of the warehouse and logistics sector in Poland has been predominantly shaped by technocratic patterns of decision-making rooted in standardization, cost optimization, and performance benchmarking. As the sector expanded rapidly after EU

accession, design and investment processes became increasingly structured around quantifiable indicators—such as cost per square meter, construction time, and operational efficiency. This orientation has fostered a culture of managerial rationality, where environmental goals are approached through procedural compliance rather than transformative innovation. Consequently, sustainability certification systems like BREEAM have been adopted primarily as instruments for institutional legitimacy and market competitiveness, rather than as tools for redefining design logic. This tendency establishes the contextual foundation for understanding how technocratic thinking continues to influence sustainability choices in contemporary logistics development.

1.3. Theoretical Background: Technocracy and Environmental Standardization

The emergence of sustainability certification systems such as BREEAM must be understood not as a radical break from earlier planning paradigms but as a continuation—and partial rearticulation—of technocratic principles rooted in the twentieth-century tradition of infrastructural rationalization. Technocratic approaches to spatial planning, prominent especially in the post-war era, were characterized by the prioritization of standardization, calculability, and control over urban systems [56,57]. These features remain deeply embedded in contemporary environmental assessment frameworks, particularly those applied to large-scale infrastructural developments such as logistics parks.

Historically, technocratic urban planning framed cities and industrial zones as machines for optimized function—spaces to be engineered for maximum throughput and minimal interference [58]. In logistics infrastructure, this logic manifests as operational efficiency, modular design, and spatial segregation optimized for goods movement [59]. Sustainability certifications such as BREEAM repackage this logic in environmental terms: metrics such as energy performance, waste management, and resource efficiency represent a green reconfiguration of technical optimization. As Sharifi and Murayama [60] argue, many sustainability rating tools rely on quantitative assessment frameworks that mirror managerial control structures more than participatory or place-based environmental strategies.

This alignment between technocracy and sustainability is particularly pronounced in the logistics sector. Logistics parks are inherently technocratic spaces, designed to enable predictability and systematization. The BREEAM certification scheme overlays this with environmental indicators that maintain the same structural logic—offering an algorithmic evaluation system wherein performance is quantified and standardized across projects. Appropriate tools create a form of 'green benchmarking' that is attractive to investors and developers because it translates ecological performance into legible, comparable, and often monetizable metrics [61].

The ideological shift, then, is not in the mechanisms of assessment, but in the rhetorical framing. What was once justified by throughput and productivity is now framed through the lens of sustainability and carbon reduction. Yet the underlying epistemology remains largely technocratic: reliant on predictive modelling, performance standards, and modularized assessment procedures [62].

To address this article's core concern—the intersection of technocracy and sustainable logistics parks—it is therefore necessary to conceptualize BREEAM not as an alternative to technocratic rationality, but as one of its contemporary expressions. The green building movement, as filtered through certification, does not escape from the managerial ethos; rather, it re-legitimizes it within the political economy of environmental compliance [63,64].

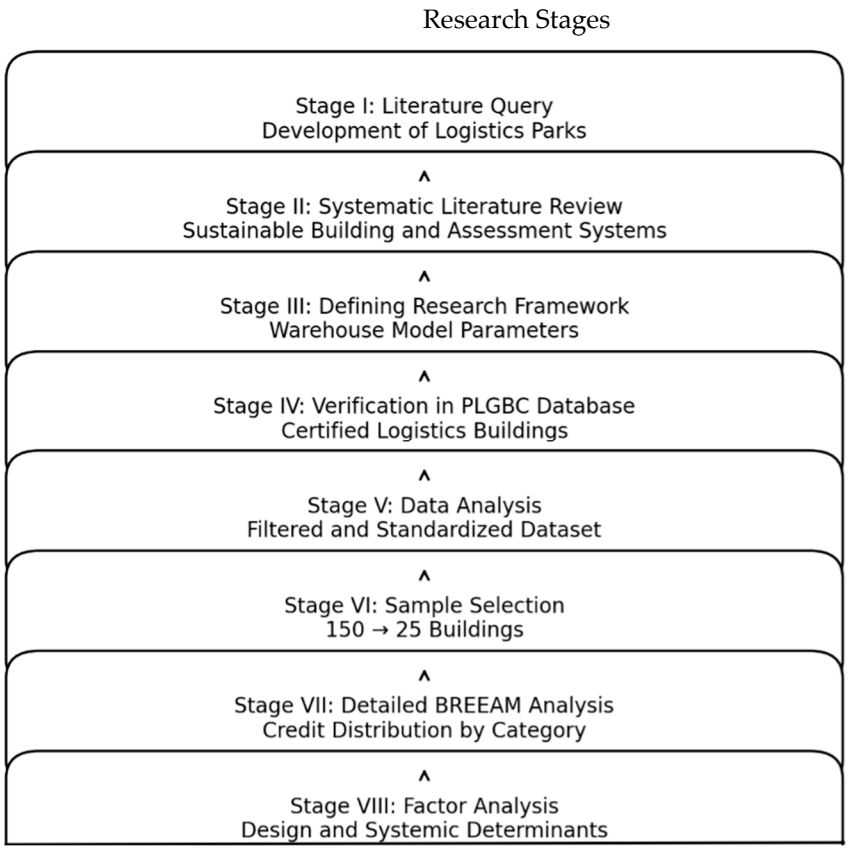
Within this framework, technocratic logic functions as a mediating force that shapes the selection of sustainability strategies at both the design and investment stages. The standardized, efficiency-driven mindset characteristic of logistics developers leads to the prioritization of BREEAM credits that are easily quantifiable, economically measurable,

and procedurally straightforward—such as those related to energy management, transport accessibility, or construction site organization. In contrast, credits requiring complex coordination, long-term monitoring, or higher upfront costs tend to be underrepresented. This selective approach demonstrates how technocratic rationality translates theoretical sustainability principles into pragmatic certification practices, revealing a structural link between the logic of standardization and the pattern of credit implementation observed in the empirical analysis.

2. Materials and Methods

2.1. Research Design

The study adopted a multi-stage research design combining exploratory, analytical, and empirical methods. The aim was to identify contemporary technocratic factors that serve as the main drivers in shaping the spatial structure of modern logistics parks. The research pathway leading to these investigations involved examining the development of logistics parks and identifying sustainability patterns in the certification of industrial buildings within the Polish context. The applied approach integrated a systematic literature review, a structured data analysis, and an empirical analysis of certified warehouse buildings. The research was conducted in eight consecutive stages, as presented below.



2.2. Stage I: Literature Query on the Development of Logistics Parks

The first stage involved a broad literature and data query concerning the development of logistics parks at global, European, and national levels. This stage aimed to reconstruct the contextual background for logistics park evolution and to identify the main economic, technological, and spatial factors shaping the modern warehouse landscape.

The analysis covered international reports and databases such as the OECD, World Bank, UNCTAD, Eurostat, and Polish sources including GUS, PAIH, and PFR. In addition,

market studies published by leading real estate consultancies—JLL, Cushman & Wakefield, and Prologis Research—were reviewed to trace contemporary development dynamics. The data were categorized by geographic scale (global, European, national) and type of influence (economic, spatial, technological, environmental), forming the analytical foundation for further research stages.

2.3. Stage II: Systematic Literature Review on Sustainable Building and Assessment Systems

The second stage comprised a systematic review of the scientific literature on sustainable architecture and multi-criteria building assessment systems. The review was conducted in major academic databases, including Scopus, Web of Science, ScienceDirect (Elsevier), SpringerLink and MDPI.

Searches employed the following keywords and phrases: "logistic buildings", "logistics parks", "sustainable architecture", "sustainable approaches", "technocratic approaches", "urban management choices", "sustainable building", "multicriteria assessment", "BREEAM", "LEED", "DGNB", "green certification systems", and "industrial and logistics sustainability".

The objective was to identify the main theoretical approaches to sustainable building design and to examine the structure and methodology of leading certification systems (BREEAM, LEED, DGNB, HQE, WELL) [65]. The review demonstrated an ongoing paradigm shift from technocratic frameworks focused on performance indicators towards holistic, ESG-integrated models combining environmental, social, and governance dimensions.

2.4. Stage III: Defining the Research Framework

In the third stage, the research framework was defined by establishing a set of parameters describing a typical warehouse building model, serving as the fundamental analytical unit within logistics parks. The goal was to create consistent criteria enabling the comparison of buildings and the exclusion of atypical facilities. The adopted selection criteria included:

- Buildings are located in sparsely populated areas, according to the DEGURBA classification of spatial units;
- Greenfield plots;
- Single-story medium-high buildings (between 13 m and 16 m);
- Gross floor area exceeding 20,000 m^2;
- Dominant logistics or warehouse function;
- Construction period between 2013 and 2023;
- Steel-frame structure;
- Location within Poland.

The examined facilities are modern warehouse spaces whose architectural form is primarily determined by their functional purpose. In this context, "modernity" refers to the contemporary standards established by the logistics sector, in which the warehouse constitutes a crucial link in the supply chain—from product manufacturing to final delivery to the end user. According to the definition set forth in the Polish Standard [66], a warehouse is understood as an organizational and functional unit intended for the storage of material goods (stocks), situated within a designated space of a warehouse structure, operating in accordance with a specified technology, equipped with appropriate devices and technical means, and managed and serviced by a dedicated workforce.

Within the framework of the present study, the primary classification criterion—due to its unambiguous nature—was the building category established by the Construction Law Act of 7 July 1994 (Journal of Laws No. 89, item 414), consolidated text published on 14 May 2024, effective from 1 July to 9 November 2024. According to the annex to this Act,

the analyzed buildings fall under Category XVIII—industrial buildings, which includes, among others, warehouse buildings (storage facilities, cold stores, hangars, sheds).

For the purposes of this research, the scope of Category XVIII was limited exclusively to warehouse facilities.

These parameters provided a standardized foundation for filtering the dataset and ensuring methodological consistency across subsequent research stages.

2.5. Stage IV: Verification of Certified Warehouse Buildings in the PLGBC Database

The fourth stage involved querying the Polish Green Building Council (PLGBC) [65] database to determine the total number of certified logistics and warehouse buildings and to identify the dominant environmental certification system in Poland. All certifications issued between 2013 and 2024 were analyzed and classified according to building type and certification scheme.

The number of buildings subject to multi-criteria assessments in Poland is constantly growing. The most popular assessment system is BREEAM International, which currently accounts for 86% of the total certified area of all types of buildings. By narrowing the criteria to warehouse buildings only, BREEAM certification applies to 92% of all certified warehouse buildings [67].

According to the data in Figure 1, multi-criteria assessments are becoming the most pronounced driver shaping modern warehouse space. The number of certifications is growing year by year. Currently, over 17,477,400 m^2 of warehouse space in Poland has a BREEAM or LEED certificate, which indicates a total market share of over 53% [68]. The following graph in Figure 1 has been developed from Supplementary Materials, which provides a list of all buildings certified in BREEAM International New Construction sector: Commercial and building type: Industrial, available in the PLGBC database. Buildings that do not meet the research criteria and were therefore not included in the statistics presented in the article are marked in red in the Supplementary Materials. Excluded from the analysis were facilities that represent extensions of existing warehouse halls, production rather than warehouse buildings, multi-story structures, and buildings with atypical parameters specific to a single tenant.

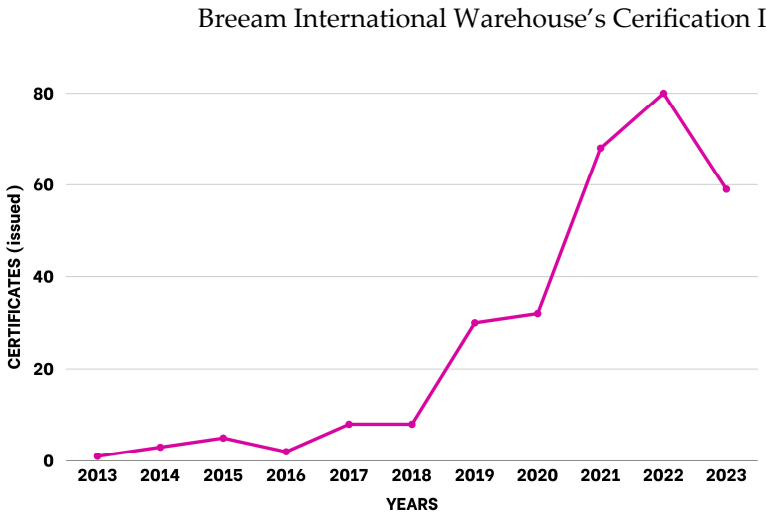


Figure 1. This figure shows the growth of BREEAM International New Construction certifications, versions 2013 and 2016, V6; sector: Commercial; and building type: Industrial, Shell and Core, and Fully Fitted over 10 years (2013–2023). Author's own elaboration based on PLGBC data, filtered according to the study's framework assumptions [65], the data on which the chart is based are provided in Supplementary Materials.

2.6. Stage V: Data Analysis of Certified Buildings

In the fifth stage, data obtained from the PLGBC database containing a list of warehouse buildings that have obtained BREEAM International New Construction certification were filtered using the qualification criteria established in Stage III. The dataset was then standardized in terms of certification scope, system version, year of certification. The buildings were certified in the BREEAM International New Construction 2013 and 2016 system and met the following criteria: sector: Commercial; building type: Industrial, Shell and Core, and Fully Fitted from the years 2013 to 2023. This ensured comparability and homogeneity of the sample, providing a reliable empirical basis for the analysis.

Figure 2 presents a compilation of the number of BREEAM International New Construction certifications in the last 10 years (versions 2013 and 2016, V6; sector: Commercial; and building type: Industrial, Shell and Core, and Fully Fitted). The figure highlights the year-to-year increase in the number of buildings attaining higher BREEAM ratings, thereby demonstrating a clear upward trend in sustainability ambition and the pursuit of higher scores over time.

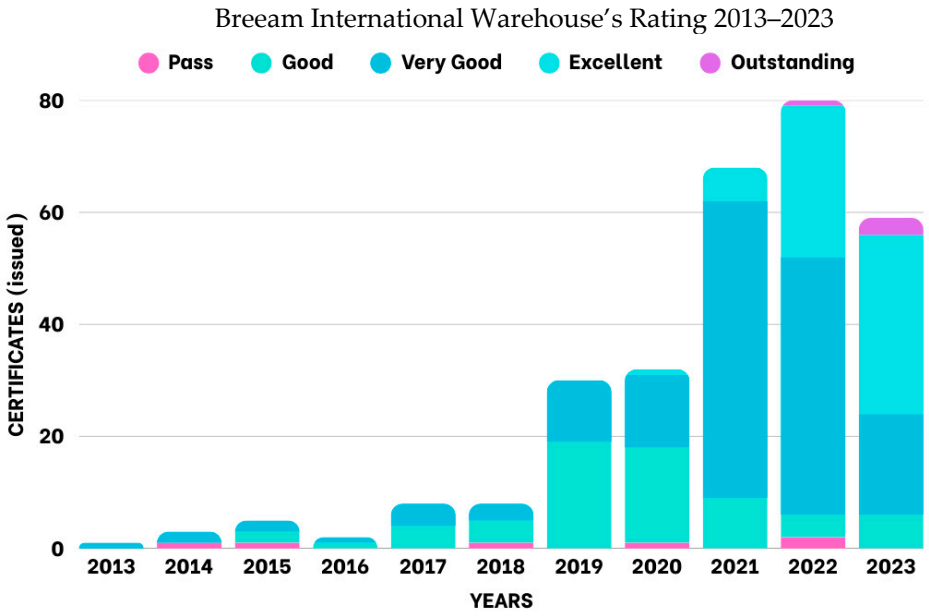


Figure 2. BREEAM International warehouse's rating. Author's own elaboration based on PLGBC data, filtered according to the study's framework assumptions [65], the data on which the chart is based are provided in Supplementary Materials.

2.7. Stage VI: Selection of the Research Sample

Based on the standardized dataset, 150 warehouse buildings that met the qualification criteria were identified. From this pool, 25 representative buildings were selected using a purposive sampling method to reflect diversity in geographical distribution, building size, and version of the BREEAM International scheme. These 25 cases formed the final research sample used for in-depth examination.

The final research sample comprised 25 warehouse buildings, representing approximately 20% of the total eligible population (≈150 facilities) identified through the filtering process. From a quantitative perspective, a 20% subset of the target population provides a sufficiently large basis for inferential analysis. Assuming a finite population of 150 buildings, a sample of 25 yields a margin of error of approximately 15% at a 95% confidence level [69] Results showed no statistically significant differences ($p > 0.05$) between the distribution of these attributes in the final sample and in the overall eligible

set of 150 facilities, indicating that the selected 25 buildings can be considered broadly representative of the population.

2.8. Stage VII: Detailed Analysis of BREEAM International Certifications

In the seventh stage, detailed analyses of BREEAM International certification results were conducted for the 25 selected buildings. Each building's certification report was examined to identify and classify achieved credits within the main BREEAM categories: Management, Health and Wellbeing, Energy, Transport, Water, Materials, Waste, Land Use and Ecology, Pollution, and Innovation. For each building, the total number of credits achieved per category was recorded, followed by a percentage analysis to determine the most and least frequently achieved credits. This step provided quantitative insight into which sustainability strategies were most implemented in certified logistics buildings in Poland.

This study considered 43 credits that were potentially attainable in each certification. To ensure the reliability of the results, only the credit assessing the energy efficiency of elevators was excluded, as the use of elevators in buildings is optional.

2.9. Stage VIII: Analysis of Factors Influencing Credit Selection

The final stage focused on identifying and interpreting the factors influencing the selection and achievement of specific BREEAM credits. Two primary groups of factors were analyzed: (1) design-related determinants, such as site conditions, technological availability, investor priorities, and financial constraints; (2) systemic determinants, including documentation requirements, cost–benefit ratio, and the contribution of individual credits to the overall certification score. Drawing on empirical observations and the author's certification experience, a conceptual model was proposed in Section 3 to explain the correlation between project characteristics, certification strategies, and the implementation of sustainability principles in logistics parks.

This conceptual framework informed the methodological design of the study and guided the interpretation of empirical findings. By linking technocratic rationality with sustainability assessment practices, the research assumes that decision-making in the Polish logistics sector is driven primarily by standardization, quantification, and economic optimization. These structural characteristics influence the hierarchy of sustainability priorities, directing developers toward credits that are measurable, low-risk, and cost-efficient, while discouraging those requiring systemic innovation or cross-disciplinary coordination. The subsequent analysis therefore examines how this technocratic logic is reflected in the distribution of BREEAM credits, revealing the extent to which certification outcomes mirror broader patterns of managerial and economic rationality within the logistics real estate market.

3. Results

3.1. BREEAM International New Construction Certification Credits with the Highest Level of Implementation in Warehouse Facilities in Poland During the Period 2013–2023

The five credits that are implemented in nearly 100% of BREEAM International certifications are presented in Table 1.

Table 1. The percentage of BREEAM International New Construction credits granted in warehouse certifications in Poland between 2013 and 2023: the five credits most commonly applied.

Name of the BREEAM International New Construction Credit	Short Description	The Percentage of Implementation
Ene 03	External lighting	100.00%
Wat 02	Water monitoring	100.00%

Table 1. *Cont.*

Name of the BREEAM International New Construction Credit	Short Description	The Percentage of Implementation
LE 04	Enhancing site ecology	100.00%
LE 05	Long-Term impact on biodiversity	100.00%
Ene 02	Energy monitoring	98.00%

3.1.1. ENE03 External Lighting

The ENE03 credit in the BREEAM International certification system focuses on the energy efficiency and environmental impact of outdoor lighting systems. This credit promotes the use of energy-efficient lighting designs that reduce unnecessary light spill, energy consumption, and light pollution. To achieve this credit, external lighting must be properly controlled and designed to minimize upward light transmission, thereby protecting local ecosystems and reducing visual and ecological disturbances. The goal is to ensure that external lighting meets sustainability standards by using appropriate light levels, timing controls, and efficient fixtures to balance functionality with environmental sensitivity. LED lighting has long been a standard in warehouse investments due to its economic viability. In particular, LED lighting has proven to be a key innovation in reducing energy consumption and operational costs in large warehouse spaces [70].

In all the examined warehouses, LED lighting was used both inside the halls and in the external areas of the investment. The use of LED lighting in warehouse buildings significantly reduces energy consumption, as LEDs use approximately 75% less energy than traditional bulbs and generate less heat, which reduces the need for cooling. Additionally, when combined with smart systems such as motion sensors, LEDs can reduce energy consumption by up to 83% (Energy Department). LEDs are also more durable, which reduces costs associated with maintenance and lamp replacement. This is clearly a positively assessed action towards sustainable construction.

3.1.2. WAT 02 Water Monitoring

The WAT 02 credit in the BREEAM International certification system focuses on the installation of systems for effective monitoring of water consumption. This credit promotes the use of water meters and sub-metering to track water usage in different areas of a building. The goal is to enable facilities to detect leaks, identify usage patterns, and manage water resources more efficiently. By achieving this credit, buildings can support sustainable water use and enhance operational efficiency through real-time monitoring and reporting of water consumption [52]. To earn a point for this credit, it is sufficient to install water meters with remote reading capability. A BMS installation and actual monitoring are not required; it is only necessary to create the potential for such water management in the future. Therefore, this is a very easy and inexpensive credit, which, from a marketing perspective, allows the project to be labelled as water efficient.

3.1.3. LE 04 Enhancing Site Ecology

The LE 04 credit in the BREEAM International certification system encourages the protection, enhancement, and management of ecological features on and around a development site. This credit aims to promote biodiversity by implementing measures that improve the ecological value of the site. Strategies may include preserving existing natural habitats, planting native species, creating green roofs, and collaborating with ecologists to develop and monitor an ecological plan. By achieving this credit, projects contribute to local

biodiversity, create healthier environments, and mitigate ecological impact, supporting a more sustainable built environment [52].

3.1.4. LE 05 Long-Term Impact on Biodiversity

The LE 05 Long-Term Impact on Biodiversity credit in the BREEAM International certification system focuses on protecting and enhancing biodiversity over the long term. This credit encourages projects to implement a strategic, ongoing plan for biodiversity management, which is developed with input from qualified ecologists. Key elements include monitoring biodiversity enhancements, protecting natural habitats, and maintaining ecological features throughout the building's lifecycle. By achieving this credit, developments contribute to sustained biodiversity, helping to ensure that ecological benefits are preserved and strengthened long after construction is complete, which aligns with sustainable development goals [52].

Credits LE04 and LE05 have led to a significant increase in ecological awareness among developers. Since the minimum requirement to achieve these credits is the hiring of a Suitably Qualified Ecologist (SQE) at an early stage of project preparation, the likelihood of intentionally developing biodiversity strategies is enhanced. The ecologist is also required to inspect the completed landscaping work at the end of the project to ensure recommendations have been properly implemented.

The popularity of these credits stems from the relatively high number of points awarded for meeting the land and ecology category criteria, as well as the potential to use green space imagery in marketing materials. Greenery is associated with environmental protection, and a warehouse facility surrounded by lush vegetation symbolizes an aspiration toward environmentally sustainable investment.

3.1.5. ENE 02 Energy Monitoring

The ENE 02 credit in the BREEAM International certification system focuses on tracking and managing energy consumption within a building. This credit encourages the installation of energy sub-meters that allow monitoring of the energy use of different systems or areas, such as lighting, HVAC, and equipment. The goal is to provide detailed insights into energy consumption patterns, enabling facilities managers to identify inefficiencies, reduce waste, and improve energy performance. Achieving this credit supports more sustainable building operations by promoting proactive energy management and aiding in meeting energy reduction targets [52]. The ENE02 credit is mandatory for certification above the Good level, leaving investors no choice but to implement remote energy metering. BREEAM certification has significantly influenced the functionality of energy systems in warehouses, accelerating the development of available and competitively priced technology that enables remote energy monitoring.

3.2. BREEAM International New Construction Certification Credits with the Lowest Level of Implementation in Warehouse Facilities in Poland During the Period 2013–2023

The five least frequently implemented credits of the BREEAM International New Construction certification system are presented in Table 2.

Table 2. The percentage of BREEAM International New Construction credits granted in warehouse certifications in Poland between 2013 and 2023: the five credits least frequently applied.

Name of the BREEAM International New Construction Credit	Short Description	The Percentage of Implementation
Wst 02	Recycled aggregates	16.00%
Ene 04	Low-carbon design	13.33%

Table 2. *Cont.*

Name of the BREEAM International New Construction Credit	Short Description	The Percentage of Implementation
Mat 03	Responsible sourcing of materials	6.00%
LE 01	Site selection	2.67%
Mat 06	Material efficiency	0.00%

3.2.1. WST 02 Recycled Aggregates

The WST 02 credit in the BREEAM International certification system encourages the use of recycled or secondary aggregates in construction projects. This credit aims to reduce the demand for primary raw materials by promoting recycled content in concrete, sub-base, and other aggregate applications. To achieve this credit, projects must demonstrate that a certain percentage of aggregate use was obtained from recycled or secondary sources, thus supporting waste reduction and conservation of natural resources [52].

This credit contributes to more sustainable material sourcing and helps minimize the environmental impact of construction activities. However, the benefit of earning 1 point in BREEAM certification is not substantial enough to motivate contractors to change their habits regarding the conservation of materials.

3.2.2. ENE 04 Low-Carbon Design

The ENE 04 credit in the BREEAM International certification system focuses on minimizing a building's carbon footprint through low-carbon design strategies. This credit encourages projects to integrate passive design measures, optimize energy efficiency, and utilize low-carbon technologies, such as renewable energy sources. By prioritizing these strategies during the design phase, the ENE 04 credit aims to reduce operational carbon emissions and dependence on non-renewable energy, contributing to the building's overall environmental performance and alignment with climate change goals. Achieving this credit supports a building's journey toward a lower carbon impact and greater energy sustainability [52].

This credit rewards the installation of zero-emission energy sources in projects. None of the buildings examined featured such systems. In Poland, there is a noticeable dynamic growth in the photovoltaic (PV) sector and its influence on the popularity of heat pumps, especially in the context of increased investment and financial support for green energy [71].

However, during the period from 2013 to 2023, warehouse investments were not yet prepared to implement these solutions.

3.2.3. MAT 03 Responsible Sourcing of Materials

The MAT 03 Responsible Sourcing of Materials credit in the BREEAM International certification system promotes the use of materials sourced from suppliers with verified environmental, social, and ethical standards. This credit encourages projects to select materials from certified sources, such as FSC-certified wood or products with BES 6001 certification, thus demonstrating sustainable and responsible procurement practices. By achieving this credit, projects support supply chain transparency, reduce environmental impact, and contribute to fair labour practices. Achieving this credit also aids in promoting the use of sustainable materials, which aligns with broader sustainability and corporate responsibility goals [52].

Research as early as 2011 identified price, quality, and supplier capacity as three fundamental determinants in the construction of warehouse facilities [72].

These findings are corroborated by more recent studies on modern construction technologies, which continue to emphasize cost and time optimization in building processes [73].

Certified construction materials are associated with higher costs, and the process of selecting materials that comply with requisite standards is inherently labour-intensive and time-consuming. The duration of project execution and the cost of materials represent two pivotal determinants of investment success and serve as the primary contributors to the total financial outlay of the project. Greater market availability of materials certified with EPDM, EPD, FSC, and similar standards is essential to facilitate the implementation of solutions for credits related to sustainable construction materials.

3.2.4. LE 01 Site Selection

The LE 01 credit in the BREEAM International certification system encourages the selection of development sites that minimize environmental impact. This credit prioritizes the use of previously developed or contaminated land and discourages building on ecologically sensitive or high-value agricultural land. By choosing sites with lower ecological and social sensitivity, projects can reduce habitat disruption, conserve biodiversity, and contribute to more sustainable land use. Achieving this credit aligns with broader environmental objectives by promoting responsible site selection that mitigates harm to natural ecosystems [52].

An analysis of available scientific research indicates that the construction of warehouse buildings on greenfield sites is often more prevalent than on brownfield sites, despite growing initiatives aimed at revitalizing post-industrial areas.

The construction of warehouses on greenfield sites is preferred due to the availability of larger spaces and greater design flexibility, despite its adverse environmental impact [74].

To facilitate the successful engagement of developers in brownfield areas, governments at all levels have mobilized efforts to support the remediation and repurposing of these land resources, thereby reintegrating numerous brownfield sites into productive use [75].

3.2.5. MAT 06 Material Efficiency

The MAT 06 credit in the BREEAM International certification system focuses on minimizing material waste throughout the design, construction, and operation phases of a building. This credit encourages developers to adopt strategies that optimize material use, reduce waste generation, and improve resource efficiency. Practices may include design optimization, prefabrication, and efficient procurement planning. By achieving this credit, projects contribute to reduced environmental impact, lower material costs, and promote a more sustainable approach to resource management across the building lifecycle.

Despite these advantages, the implementation rate of MAT 06 in Polish logistics buildings remains at 0%, which reveals systemic barriers within the national market context rather than isolated project decisions. Several interconnected factors explain this low level of adoption.

The lack of awareness and education concerning efficient procurement processes represents a significant limitation and a key barrier to the adoption of circular economy (CE) principles [76]. Low prices of primary raw materials and a lack of knowledge about the circular economy (CE) hinder the integration of circular practices into investment strategies [77].

The Polish construction supply chain still shows limited maturity in the area of material efficiency and circularity. Although initiatives promoting secondary materials, recycled aggregates, or reclaimed components are emerging, they remain marginal in the logistics and industrial sector. The supply of certified sustainable materials, such as Cradle-to-Cradle or EPD-verified products, is relatively scarce, and their availability varies regionally. This restricts design flexibility and limits the feasibility of implementing circular design

principles on large-scale logistics projects, where construction speed and standardization are prioritized over material experimentation.

The economic structure of the Polish logistics market exerts a strong influence. The sector is dominated by build-to-suit or speculative developments driven by cost optimization and rapid delivery rather than innovation.

In a highly competitive market characterized by tight profit margins and short investment cycles, developers often perceive such measures as economically unjustified, especially when their impact on the final BREEAM rating is limited.

Regulatory and policy frameworks in Poland have not yet strongly incentivized material efficiency. While EU-level directives (e.g., the Circular Economy Action Plan, EU Taxonomy Regulation 2020/852, and Level(s) framework) increasingly emphasize material circularity and life-cycle assessment, their translation into Polish building codes and procurement practices remains partial. Current national standards and public procurement mechanisms rarely require or reward the demonstration of material efficiency beyond basic waste segregation, thus weakening the incentive to pursue MAT 06 compliance.

There is a knowledge and coordination gap across project stakeholders. Effective implementation of MAT 06 requires early-stage collaboration between architects, contractors, suppliers, and waste management operators, supported by digital tools such as BIM-integrated material passports. In practice, the logistics sector in Poland continues to operate within traditional, linear project delivery models with limited data exchange on material flows. The lack of specialized training for procurement and construction management teams further hinders the practical adoption of circular material strategies.

4. Discussion

The empirical findings presented in this study confirm that the implementation of BREEAM International credits in Polish logistics buildings follows a pattern strongly aligned with technocratic optimization and regulatory compliance, rather than with systemic environmental innovation. This observation corresponds with the conclusions of Reed et al. [61] and Sharifi and Murayama [60], who emphasized that many certification systems reinforce managerial and quantitative control logics rather than holistic sustainability transitions. Similar tendencies have been documented in Western European contexts, where developers prioritize "low-cost, high-certainty" credits that align with existing building codes and investor expectations [10].

Compared with previous international studies, this research extends the discussion to Central and Eastern Europe, where the structure of the warehouse market and institutional maturity differ significantly. While Mattoni et al. [10] showed that certification enhances environmental performance in office and residential sectors, few analyses addressed industrial typologies. The present study demonstrates that in logistics parks, sustainability remains primarily an instrument of economic legitimacy. Developers treat BREEAM as an extension of compliance frameworks rather than a transformative design tool—a finding consistent with Fischer's [57] notion of technocratic environmentalism.

In contrast to studies by Darko and Chan [13] and Ding [9], which underline the innovative potential of certification in promoting green materials and circular processes, the Polish dataset reveals negligible implementation of material-related credits such as MAT 03 and MAT 06. This discrepancy can be attributed to the limited availability of certified materials and the dominance of short investment cycles, as observed by Illankoon et al. [11]. The findings therefore confirm that structural and market barriers, rather than individual awareness alone, hinder the integration of circular economy principles in logistics construction.

The high frequency of easily verifiable credits—ENE 03 (External Lighting), WAT 02 (Water Monitoring), and LE 04/05 (Biodiversity)—reflects a pattern identified by Chidiac et al. [78] and Fuerst and McAllister [12]: developers tend to implement credits that offer clear financial or reputational returns. This study reinforces that logic but situates it within the technocratic paradigm of warehouse design, where decisions are data-driven, modular, and aimed at cost minimization.

A crucial contribution of this paper lies in empirically linking technocratic rationality to certification outcomes, using Poland's logistics sector as a case where environmental assessment reproduces rather than transforms existing decision hierarchies. The results demonstrate that the diffusion of sustainability certification does not necessarily translate into systemic innovation; instead, it institutionalizes selective efficiency gains compatible with prevailing economic models.

By situating these findings within the broader literature, this study extends the comparative geography of BREEAM implementation. While prior works (e.g., Källman & Lundqvist [54]; Marques et al. [49]) described certification impacts on organizational processes in Western Europe, this research shows how such dynamics evolve in a rapidly developing, post-socialist market. The technocratic sustainability observed in Polish logistics parks represents a distinct developmental path where environmental performance is subsumed under economic rationality.

Thus, the paper contributes new evidence to debates on the managerialization of sustainability (Guy & Marvin [62]) and calls for more robust policy instruments that would realign certification frameworks with genuine circular and low-carbon objectives.

The growth curve presented in Figure 1, illustrating the sharp increase in BREEAM International New Construction certifications in Poland between 2013 and 2023, reflects the interaction of regulatory alignment, market transformation, institutional strengthening, and broader sociocultural shifts. These trends mirror developments observed across Europe but are particularly pronounced in Poland, where BREEAM has become the predominant sustainability certification in the commercial and industrial real estate sectors [79,80].

A major driver behind the expansion of certified buildings is the increasing alignment of Polish building regulations with European Union sustainability directives, notably the Energy Performance of Buildings Directive (EPBD) [81] and associated energy efficiency mandates. Stricter requirements concerning energy performance, life-cycle carbon, and building envelope standards have raised baseline expectations for new construction. Consequently, developers view certification systems such as a means to demonstrate compliance and exceed these evolving benchmarks [82].

According to Green Building Market Intelligence reports, BREEAM's compatibility with EU frameworks has facilitated its dominance in the Polish market. Developers recognize that the credit structure of BREEAM closely corresponds with European regulatory priorities, particularly in energy, water, and materials efficiency [83]. This regulatory convergence has effectively lowered transaction costs associated with certification and positioned BREEAM as an extension of national compliance mechanisms rather than as optional.

The second major factor underpinning the growth in certifications is market driven demand from investors, tenants, and institutional clients. Empirical studies [84,85] highlight that BREEAM certified buildings are increasingly perceived to deliver tangible financial and operational advantages, including lower energy and water costs, enhanced indoor environmental quality, and greater tenant retention.

Developers thus pursue certification to differentiate assets and secure premium market positioning. The association between certification and reduced operational expenditure has become a powerful marketing tool in competitive property markets, particularly in Warsaw and regional logistics hubs [84]. Moreover, certification is now viewed as an indicator of

corporate credibility and environmental responsibility. As the "Value of BREEAM" briefing paper notes, the question of "value" is central: sustainable buildings are recognized not merely for regulatory compliance but as assets with quantifiable benefits for developers, owners, and occupants [81].

The institutional landscape supporting certification has also strengthened considerably. The Polish Green Building Council (PLGBC) has played a pivotal role in promoting, documenting, and facilitating sustainable construction practices. Through its public databases, annual market reports, and training initiatives, PLGBC has reduced informational and procedural barriers to certification [79].

The increasing availability of accredited assessors and standardized guidance has professionalized the certification process, making it more predictable and integrated within project planning. Institutional maturity has therefore acted as a catalyst, enabling developers to incorporate sustainability considerations at early design stages rather than as post hoc adjustments [86].

A further contributor is the expansion of Poland's industrial and logistics real estate sector. Between 2018 and 2023, warehouse construction has surged due to the rise in e-commerce, global supply chain diversification, and Poland's geographical position as a logistics hub between Western Europe and Eastern markets [85].

Because the BREEAM International framework offers adaptable criteria applicable to large scale industrial typologies, it has become the preferred system for logistics developments. The warehouse sector now accounts for a substantial share of the country's certified floor area, reflecting developers' efforts to align environmental performance with investor and tenant expectations in this rapidly expanding market [87].

While sustainability certification entails additional upfront capital costs, research consistently demonstrates that these are offset by long-term operational savings and enhanced asset valuation. The 'Value of BREEAM' report emphasizes that capital cost premiums typically remain below 2%, whereas life-cycle benefits such as lower utility expenditures, improved durability, and higher occupancy rates generate positive net returns [80].

This perception of favorable cost balance has become embedded in investment decision-making processes. Financial institutions and green financing mechanisms increasingly recognize certification as evidence of reduced asset risk and environmental due diligence, thereby improving access to capital [82]. The economic rationale, therefore, reinforces the trend toward certification as both a risk management tool and a market differentiator.

Finally, the rise in BREEAM certifications also reflects a broader cultural transformation within Poland toward environmental responsibility and sustainable development. Over the past decade, sustainability discourse has moved from policy rhetoric to public consciousness, with increasing media attention and civic engagement [88].

Certification is now viewed not only as compliance but also as part of corporate social responsibility and ethical investment. Studies of the residential sector corroborate that public awareness of sustainability credentials influences purchasing and leasing decisions [89]. As a result, developers increasingly perceive certification as integral to brand reputation, aligning environmental stewardship with competitive strategy.

The increasing popularity of assessment systems has an impact on the number of buildings that meet the requirements of the Excellent and Outstanding levels as in Figure 2. This raises the question of whether the awareness of the need to implement environmentally sustainable solutions is growing or the ability of developers to perform certification is growing. The increasing popularity of assessment systems translates into a change in the technologies used in warehouse buildings, especially considering that from 2022 we can observe the emergence of individual certifications at the Outstanding level, which raises the bar in terms of the ambitions of warehouse facility owners.

In summary, the rapid growth of BREEAM International certifications in Poland between 2013 and 2023 can be understood as the outcome of multilevel drivers: the synchronization of national regulation with EU policy, evolving market expectations, strengthening institutional support, the expansion of industrial real estate and an emergent culture of sustainability. Together, these factors have embedded environmental certification within the mainstream of Polish construction and investment practice, transforming BREEAM from a niche differentiator into a normative benchmark for sustainable development.

The BREEAM International system is structured around weighted credit categories, such as Energy, Water, Materials, and Health & Wellbeing, with defined thresholds for certification ratings (e.g., Very Good, Excellent, Outstanding) [80]. Such threshold-based design encourages developers to "aim for the label" rather than pursue continuous performance improvements [90]. Empirical analyses indicate that many projects cluster just above threshold levels, suggesting a form of strategic optimization where developers allocate resources to low cost and high weight credits while neglecting deeper systemic performance [91].

Moreover, the introduction of innovation credits within BREEAM is intended to reward pioneering sustainability measures, yet studies suggest that developers may selectively pursue these credits to differentiate their projects rather than integrate them into a long-term sustainability strategy.

The analysis of credit distribution in warehouse investments (Figure 3) demonstrates how developers selectively prioritize certain credits while neglecting others.

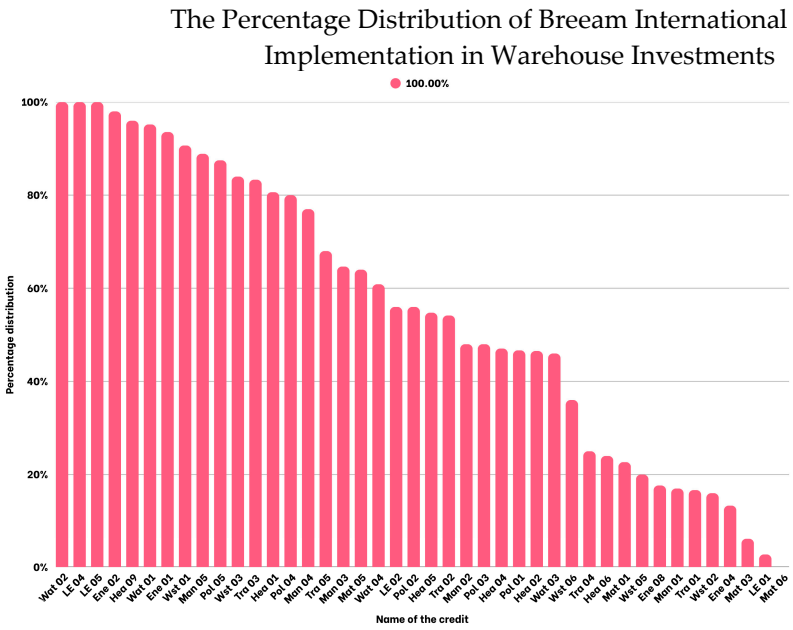


Figure 3. This figure shows the percentage distribution of BREEAM International New Construction certifications, versions 2013 and 2016, V6 credit implementation, based on warehouse investment certification levels from 2013 to 2023. This chart was produced based on the authors' data.

The feasibility study of individual credits for certified investments revealed that the most successfully implemented solutions are those mandated by Polish law, rather than choices driven solely by sustainable construction objectives.

Credits such as Wat 02, LE 04, Ene 05, and Hea 09 were attained in nearly 100% of cases. These reflect low cost and regulation aligned requirements, such as water efficiency or basic health and comfort measures, which are relatively easy to document and implement. Their universal attainment indicates that developers regard them as low hanging fruit, providing guaranteed points with minimal disruption or expense.

In contrast, mid-range credits such as Mat 05, Hea 04, and HEA05 were achieved in approximately 50–80% of cases. These credits often involve moderate costs and operational commitments, such as enhanced commissioning. Developers appear to weigh these credits more carefully, implementing them when certification targets justify the additional investment but omitting them when aiming only for baseline compliance.

At the lower end of the distribution, credits such as LE 01 (land use and ecology), Mat 06 (life-cycle assessment of materials), and Man 01 (project brief and stakeholder engagement) were achieved in less than 20% of projects. These credits demand substantial design innovation, specialized expertise, or site-specific ecological preparation, which are often misaligned with the economic and spatial realities of warehouse typologies. Warehouses, typically located in industrial or peri-urban zones, face inherent barriers to credits related to biodiversity, advanced material assessments, and extensive stakeholder engagement. Their limited adoption illustrates how structural building typologies shape the feasibility of credit implementation.

The overall pattern suggests that developers follow a threshold driven optimization strategy, prioritizing credits that are inexpensive, regulation compliant, or market visible, while neglecting those that are complex, costly, or perceived as yielding limited short-term returns. This aligns with prior observations of point chasing behaviours in sustainability certification systems [92].

The competition for higher BREEAM scores is not without risks. Marginal cost escalation occurs as developers approach higher certification levels, with each additional credit requiring disproportionately higher investments [93]. This can lead to inefficient resource allocation, where financial investment outweighs the environmental gains achieved. The focus on credit farming undermines the credibility of sustainability labels, as projects may emphasize less impactful measures over critical but costlier interventions such as embodied carbon reduction [94].

The clustering of developments at top rating levels also risks diminishing the discriminative power of BREEAM as a market signal, thereby reducing its value to tenants, investors, and policymakers.

From a theoretical standpoint, the developer's pursuit of BREEAM scores resembles a multi criteria optimization problem under resource constraints. Developers strategically allocate budgets across weighted criteria to maximize scores and, by extension, market benefits. Economic perspectives also suggest that sustainability certifications function as market signals. Developers compete not solely to reduce environmental impact, but to capture a green premium in property valuation, rental rates, or reputational benefits [95].

The quantitative study presented in this article refines the general conclusions regarding the impact of multi-criteria assessments on the design of contemporary warehouse investments, indicating that environmentally friendly warehouse design and the implementation of sustainable logistics practices are crucial for achieving success in sustainable development [96].

Bartolini et al. [97] found that energy savings constitute the most frequently studied theme in sustainable warehouse operations, followed closely by the environmental impact of warehouse buildings and the practices of green warehouse management. Their research identified material handling equipment, building characteristics, lighting systems, and HVAC (heating, ventilation, and air conditioning) as the primary areas of focus.

The business case for sustainability extends beyond profit figures at the organizational level, necessitating an understanding of evolving environmental conditions, regulatory frameworks, market dynamics, and long-term viability [97].

This study highlights a positive aspect of the technocratic nature of warehouse buildings, which allows for ease and transparency in parameter selection. However, to achieve

this, thorough quantitative research is required to analyse the factors influencing the level of implementation, with a specific focus on the market dynamics shaping the decisions of entities participating in the investment process of warehouse construction.

5. Conclusions

This study examined how technocratic rationality influences sustainability practices in the Polish logistics real estate sector, focusing on the distribution and selection of BREEAM International credits in warehouse developments. The results demonstrate that developers tend to pursue solutions that are economically efficient, regulation-aligned, and easy to document, while credits requiring circular strategies, material efficiency, or innovative design remain largely underused.

The research contributes to the existing body of knowledge by empirically linking the structure of certification outcomes with the decision-making logic of the logistics industry. It provides one of the first systematic analyses of BREEAM-certified warehouses in Central and Eastern Europe, showing that sustainability certification in this sector often reinforces rather than transforms the technocratic model of investment management. By revealing how quantitative optimization dominates over qualitative innovation, this study highlights the gap between formal environmental assessment and genuine sustainability transition.

However, the study has several limitations. The sample of twenty-five BREEAM-certified warehouses, although representative of the Polish market, does not fully capture regional variations across Europe. The research focuses exclusively on the BREEAM International system, leaving out other certification schemes and contextual policy instruments that could influence sustainability outcomes. Additionally, the analysis relied on secondary certification data rather than on direct operational performance metrics such as post-occupancy energy or carbon data, which would allow a more precise assessment of environmental impact.

Future research should therefore explore three directions. First, comparative studies across different certification systems and European regions could reveal whether technocratic patterns identified in Poland are general or context specific. Second, integrating quantitative building performance data with certification outcomes would help assess the real environmental benefits of certified warehouses. Third, interdisciplinary research combining architecture, economics, and environmental policy could propose new models of industrial certification that better reflect circular economy principles and life-cycle performance.

In conclusion, while the spread of certification demonstrates growing environmental awareness in the logistics sector, it primarily remains as a tool of managerial compliance. To evolve into a true driver of transformation, sustainability assessment must move beyond the logic of optimization toward systemic innovation—linking environmental objectives with social and spatial dimensions of sustainable industrial development.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su172210365/s1, Industrial buildings certified in BREEAM International New Construction sector available in the PLGBC database.

Author Contributions: Conceptualization, E.R. and M.Z.; methodology, E.R. and M.Z.; software, E.R. and M.Z.; validation, E.R. and M.Z.; formal analysis, E.R. and M.Z.; investigation, E.R. and M.Z.; resources, E.R. and M.Z.; data curation, E.R. and M.Z.; writing—original draft preparation, E.R. and M.Z.; writing—review and editing, E.R. and M.Z.; visualization, E.R. and M.Z.; supervision, E.R.; project administration, M.Z.; funding acquisition, M.Z. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: BREEAM rating: https://baza.plgbc.org.pl/building/ (accessed on 14 February 2025).

Conflicts of Interest: The authors declare no conflicts of interest.

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