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PATH TO SUSTAINABILITY: A CASE STUDY OF A POLISH PUBLIC HOSPITAL'S TRANSITION TO GREEN HOSPITAL STATUS

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Purpose: The main aim of the research was to recognize the activities undertaken by Hospital X to achieve Green Hospital status and assess their effects. In addition, the research aimed to identify the strengths, weaknesses, opportunities, and threats associated with Hospital X's transition to Green Hospital status.
Design/methodology/approach: The research goals were achieved through a qualitative research using a case study of Polish Public Hospital X.
Findings: The study indicates that Hospital X's efforts to achieve Green Hospital status involved investments in environmentally friendly infrastructure and renewable energy. Additionally, these efforts encompassed the improvement of key processes and the implementation of a strategy focused on green transformation. As a result of these activities, Hospital X has reduced CO_2 emissions and energy consumption. The strengths of Hospital X in its pursuit of Green Hospital status include the ability to leverage external funding sources, modernization of infrastructure, and a high level of ecological awareness among the management team. However, the Hospital X also faces several weaknesses in its ecological transformation, such as limited financial resources and an aging building constructed with non-energy-efficient technology. The main opportunities for Hospital X include various options for obtaining external funding for environmental initiatives. Meanwhile, the key threats in the external environment involve strict legal regulations. The strengths of Hospital X, together with the opportunities in the external environment, are why the hospital succeeded in achieving Green Hospital status.
Research limitations/implications: The main limitation of the study was that it was conducted only among one hospital.
Practical implications: The study demonstrates how Polish public hospitals can achieve Green Hospital status, offering practical insights that can be replicated by other public hospitals and healthcare facilities in Poland. In particular, the example of Hospital X may encourage other hospitals to secure grants and subsidies for environmental sustainability. Moreover, by highlighting the long-term cost savings associated with energy efficiency and waste reduction, the study can support hospital managers in making informed financial decisions regarding green investments.

Originality/value: The study extends the knowledge on the implementation of the Green Hospital concept in Poland.
Keywords: green hospital; polish healthcare system; public hospitals; climate change.
Category of the paper: Case study.

1. Introduction

Organizations in the health sector offer a diverse range of activities aimed at preventing and treating disease, maintaining human psychological, physical, and social development, prolonging life, and ensuring the healthy development of future generations. Many of these organizations carry out their tasks 24 hours a day, so they constantly consume energy and other resources, produce waste, and emit polluting gases. This state of affairs means that the global health sector is responsible for 4.4 percent of carbon emissions annually (Health Care Without Harm Report, 2022) and places a much greater carbon footprint on the environment than many other sectors, such as shipping or aviation.

In Poland, public hospitals are among the key healthcare entities operating within the healthcare system. In 2023, there were 894 of them in the Polish market and they had 161 200 beds (Główny Urząd Statystyczny, 2024, p. 58). Thus, the contribution of public hospitals to medical waste and carbon emissions is high. Therefore, transforming Polish public hospitals into sustainable institutions is becoming increasingly important. However, despite the potential benefits such as cost savings, improved patient well-being, and compliance with environmental policies, hospitals face numerous barriers to adopting green practices. These challenges include financial limitations, outdated infrastructure, resistance to change, and a lack of clear strategic frameworks (World Health Organization, 2021).

To reduce the negative impact on the environment, some public hospitals in Poland have started to implement the Green Hospitals concept, which is based on the premise of integrating sustainable practices into their infrastructure, operations, and resource management to reduce energy consumption, optimize waste management and promoting green healthcare solutions. Transforming public hospitals into green hospitals is complicated, as public hospitals need to provide comprehensive healthcare services of the highest possible quality to patients while rationally managing the resources at their disposal. Nevertheless, some public hospitals in Poland have been granted Green Hospital status. Hospital X is an example of such hospital. Recognizing the activities undertaken by Hospital X to achieve Green Hospital status and assess their effects has become the main objective of the research presented in this article. In addition, the study aimed to identify the strengths, weaknesses, opportunities, and threats associated with Hospital X's transition to Green Hospital status.

This study provides one of the first in-depth analyses of a Polish public hospital that has systematically implemented the Green Hospital concept and obtained official Green Hospital status. Unlike previous research, which focuses mainly on individual initiatives or sector-wide recommendations, this article reconstructs a two-decade-long transformation process and analyzes it through a structured SWOT framework. This original perspective helps understand the organizational capabilities required for ecological transition in the healthcare sector.

2. Theoretical Background

2.1. The Concept of Green Hospitals

The concept of Green Hospitals refers to the sustainable operation of healthcare facilities aimed at minimizing the negative environmental impact of hospitals while ensuring the provision of high-quality healthcare services (Megariani, Putra, Bayhakki, 2023). Green hospitals can be defined as institutions designed and constructed to utilize natural resources as efficiently and environmentally friendly as possible (Garg, Dewan, 2022). According to Asamoto et al. (2024), Green Hospitals are healthcare facilities that have adopted sustainable design practices as an integral part of delivering high-quality medical services. These hospitals are characterized by carefully considered location, efficient use of water and energy, proper emissions management, and the use of materials that take environmental impact into account (Asamoto et al., 2024).

In order to be classified as a green hospital, a facility must meet specific criteria in areas such as energy efficiency (including the use of alternative energy sources), environmentally conscious building design, transportation, food services, and waste and water management (Alkaabi, Aljaradin, 2022; Rupiwardani et al., 2022). To fulfill these criteria, hospitals must undertake a range of initiatives encompassing both core medical activities and supporting processes. Examples of such initiatives are presented in Table 1.

Table 1.
Examples of Actions Supporting the Implementation of the Green Hospital Concept

FIELD	ACTIONS
Energy Management	• Use of energy-efficient devices and technologies. • Utilization of renewable energy sources.
Eco-friendly Building Design	• Selection of building and finishing materials with low levels of harmful substances and sourced from recycling. • Location in well-connected areas with public transportation. • Development of existing green spaces on hospital grounds. • Consideration of sustainable development principles when designing and constructing new hospital buildings. • Monitoring air quality both inside and outside the buildings.

Cont. table 1.

Water Management	• Use of water-saving sanitary devices and water recycling systems.
Waste Management	• Segregation of medical and municipal waste. • Sorting medical waste by material type and risk level. • Ensuring safe disposal of medical waste in accordance with applicable regulations. • Reducing treatment duration. • Implementing IT systems for medication management. • Responsible management of chemicals and hazardous materials, minimizing usage, and ensuring safe storage and disposal.

Source: Own study based on: Borges de Oliveira & de Oliveira (2022), Collada Sánchez et al. (2023), Harhay et al. (2009), Loumer (2015), Megariani, Putra, Bayhakki (2023), Mkalaf et al. (2023), Nielsen, Hansen (2007), Sant'Anna, Gaviña, Lima (2022), Suwasono, Suman, Yanuwiadi (2013), Tsioumpri, Tsakni, Goula (2020).

The actions that a hospital should undertake in order to become a green hospital encompass not only technical and organizational aspects, but also the education of staff and patients. Green hospitals should also implement training programs for staff focused on sustainable development and environmental protection, raise ecological awareness among patients and visitors, and promote responsible behavior (Mkalaf et al., 2023). Furthermore, they should seek and implement innovative environmentally friendly solutions (Megariani, Putra, Bayhakki, 2023). Megariani, Putra, and Bayhakki (2023) also emphasize the importance of developing and implementing an environmental policy within the hospital, as well as monitoring and evaluating the effectiveness of implemented measures to support continuous improvement.

Based on research findings related to the implementation of the green hospital concept in Indonesia, it can be observed that green hospitals offer not only environmental but also health-related, social, and economic benefits (Rupiwardani et al., 2022; Rahma, Winny, Maria, 2022). Green hospitals can enhance the treatment process and contribute to reducing emotional stress, depression, and anxiety among patients (Dadvant et al., 2012). Moreover, green hospitals may positively affect employee satisfaction, well-being, and comfort (Kim et al., 2015). They can also achieve benefits in terms of reduced operational costs through efficient resource management, decreased energy and water consumption, and waste reduction (Borges de Oliveira, de Oliveira, 2022).

2.2. Development of the Green Hospital concept in Poland

Polish public hospitals, similar to those in other countries, are characterized by high levels of energy and water consumption, as well as the generation of significant amounts of medical waste (Tomiak et al., 2024). Therefore, improvements are needed in both energy and waste management, particularly in the area of hazardous and medical waste. According to the Supreme Audit Office of Poland, numerous irregularities exist in Polish hospitals regarding the storage, segregation, and disposal of hospital waste, indicating the need for more effective management procedures in this domain (Naczelna Izba Kontroli, 2022).

The concept of Green Hospitals represents a forward-looking solution aimed at reducing the negative environmental impact of public hospitals in Poland (Lurka, 2025). The implementation of this concept has been undertaken by the Polish Hospital Federation, which, under the "Green Hospitals – Polish Hospital Federation" project, developed a strategy outlining priorities for the sustainable development of public hospitals. This document focuses on aspects such as achieving carbon neutrality, waste management, improving energy efficiency, and enhancing working conditions for staff and comfort for patients. The implementation of these principles takes place within the broader context of social determinants of health and the increasing emphasis on ecological solutions in the healthcare sector (Polska Federacja Szpitali, n.d.).

Among the activities undertaken in Polish hospitals as part of the Green Hospital concept is the initiative known as "eco-dialysis". This involves promoting environmentally friendly systems for the delivery of dialysis concentrates. The "eco-dialysis" initiative may contribute to reduced water and energy consumption as well as a decrease in waste generated by dialysis centers (Zawierucha et al., 2023). Another initiative involves the search for ecological methods of delivering dialysis fluids, aimed at reducing both the flow rate and consumption of dialysis fluid, as well as the production of wastewater. Each hemodialysis session consumes more than 500 liters of water, making this an increasingly important issue in light of the depletion of natural resources (Wieliczko et al., 2020). Other examples of activities undertaken within the green hospital framework include recycling efforts, emission reduction initiatives, material conservation, and waste minimization (Swałek, Steinerowska-Streb, 2023).

It is worth noting that pro-environmental actions in Polish hospitals have been implemented since 2004, although they were not initially defined as part of the Green Hospital concept. One such example is the thermal modernization of hospital buildings, made possible through access to European Union funds (Przesmycka et al., 2023). Another example is the gradual implementation of electronic medical records in Polish hospitals after 2011 (Swałek, 2024).

A key milestone in the development of the green hospital concept in Poland was the establishment of the Green Coalition for Health in 2024. This cooperation platform is directed at healthcare institution managers, local government representatives, and policymakers. Its aim is to implement innovative solutions that minimize the environmental impact of hospitals, facilitate knowledge exchange, and promote best practices in sustainable healthcare management (Zielona Koalicja dla Zdrowia, n.d).

Although recent studies increasingly examine various aspects of green hospitals, they tend to focus on selected areas such as energy efficiency (Borges de Oliveira, de Oliveira, 2022), waste management (Suwasono et al., 2013), or sustainable building design (Asamoto et al., 2024), without analyzing the long-term organizational transformation required to achieve full Green Hospital status. Research conducted in Indonesia, Japan, or Western Europe (Rupiwardani et al., 2022; Tsioumpri et al., 2020) confirms the growing relevance of sustainability in healthcare, yet similar analyses are largely absent in Central and Eastern

Europe, particularly in Poland. According to what we were able to find, there are no studies referring and reporting on a comprehensive, multi-year transition of a Polish public hospital toward obtaining Green Hospital status. This indicates a clear research gap that the present article addresses.

3. Methodology

The main aim of the research was to recognize the activities undertaken by Hospital X[1] to achieve Green Hospital status and assess their effects. In addition, it aimed to identify the strengths, weaknesses, opportunities, and threats associated with Hospital X's transition to Green Hospital status. Achieving these objectives required answering the following research questions:

RQ1: What activities were performed by Hospital X to achieve Green Hospital status?
RQ2: Which activities Hospital X undertook to achieve Green Hospital status were the most challenging?
RQ3: What are Hospital X's strengths in pursuing green solutions?
RQ4: What are Hospital X's weaknesses in pursuing green solutions?
RQ5: What are the opportunities in the Hospital X environment that favor the introduction of green solutions?
RQ6: What threats may constrain Hospital X in pursuing green solutions?
RQ7: What results does Hospital X achieve by introducing green solutions?

The established objectives were achieved using a case study. That method was chosen because it is one of the key methods that enable a detailed understanding of the phenomena under study in their natural context (Yin, 2018). Using a case study as a research method is particularly effective when the research field is emerging, as case studies capture contextual factors that may not be noticed in qualitative research. In particular, case studies help identify best practices, challenges, and solutions that may not be apparent in theoretical models.

The case study included interviews, observations, and document analysis. The documentation review included internal reports made available by Hospital X, information posted on Hospital X's website, and information concerning Hospital X, which can be found in the Public Information Bulletin. In addition, the review covered press materials and reports published by the founding authority and the city authorities where Hospital X is located.

The gathered data concerning Hospital X was analyzed in detail in the context of the set objectives. In particular, these data were used to conduct a SWOT analysis of Hospital X. That kind of analysis is widely used for assessing different organizations' Strengths,

[1] The authors do not have permission to use the full name of the hospital.

Weaknesses, Opportunities, and Threats. It highlights areas requiring improvement and helps anticipate challenges before they escalate. Likewise, it allows organizations to develop unique capabilities that provide a competitive edge and enhance resilience and sustainability.

4. Results

4.1. Case study

Public Hospital X was established in the 1950s on former municipal forest land by the Self-Government of the Greater Poland Voivodeship. It is a non-commercial medical entity operating as an independent public healthcare institution. As a healthcare provider, Public Hospital X has been classified—according to the list of service providers qualified for the various levels of the basic hospital healthcare security system in the Greater Poland Voivodeship, effective from January 1, 2023, to June 30, 2027 (PSZ, 2022)—as an oncology or pulmonology hospital. The hospital's primary area of activity is the provision of medical services, both inpatient and outpatient, for adult patients suffering from pulmonary disorders, lung diseases, and tuberculosis. Public Hospital X comprises four wards, three diagnostic units, an outpatient clinic, and an emergency admission unit. Notably, in 2022, Public Hospital X became the first healthcare facility in Poland to join The Global Green and Healthy Hospitals—the world's largest network promoting sustainable healthcare.

Data collected for the purposes of this study indicate that since 2004, Public Hospital X has been consistently implementing a pro-environmental strategy, continuously adapting its infrastructure and operations to the principles of the green hospital concept. Undertaken initiatives include building modernization, investments in renewable energy sources, optimization of resource consumption, and collaboration with national and international organizations in the area of sustainable development. One of the first actions taken under the hospital's pro-environmental strategy was the modernization of its boiler plant in 2004. The coal-based system was replaced with a more environmentally friendly gas-oil system, resulting in a significant reduction in carbon dioxide and other pollutant emissions. In 2017, the hospital commissioned a modern wastewater treatment plant, capable of effectively eliminating harmful phosphorus and nitrogen compounds, in compliance with EU standards. Another major initiative aimed at reducing heat loss and energy consumption was the thermal modernization of hospital buildings in 2018. This project involved the insulation of walls, replacement of windows, and upgrading of heating systems. In 2021, the hospital expanded its sustainable development efforts by acquiring a bronchoscope with endobronchial ultrasound (EBUS), allowing certain diagnostic procedures to be performed on-site. This reduced the need for patient transport to external facilities, thereby lowering the hospital's carbon footprint.

In the same year, Public Hospital X also established cooperation with the World Health Organization (WHO) to support the implementation of sustainable development strategies.

In 2022, Public Hospital X carried out a series of key investments aimed at increasing energy efficiency and optimizing the use of natural resources:

- Installation of photovoltaic panels covering an area of 968 m² on the hospital's roof and grounds, with a total capacity of 199.8 kWp, which significantly reduced the hospital's consumption of electricity from conventional sources.
- Expansion of the hospital with a new wing constructed using modern modular technology and energy-efficient building materials. The project included the installation of a recuperation system and a Building Management System (BMS), which enables real-time monitoring and optimization of energy use.
- Installation of a rainwater harvesting system consisting of six underground tanks with a total capacity of 45 m³, enabling the collection of up to 900 m³ of water annually, which is used for irrigating green areas.
- Acquisition of a composting device for biodegradable waste, contributing to a reduction in the volume of waste sent to landfills.

In 2023, the hospital continued the modernization of its infrastructure. The boiler plant was upgraded from a coal-based to a gas-oil system, which led to a 30% to 45% reduction in carbon dioxide emissions and other harmful gases and particulates compared to hard coal combustion. In addition, the hospital utilizes heat pumps as a secondary energy source. Public Hospital X also undertook actions in support of international cooperation in the area of green hospitals. A partnership agreement was signed with a hospital on the island of Syros (Greece), aimed at promoting environmentally responsible practices in the healthcare sector. Moreover, the hospital is engaged in long-term initiatives such as education, ecotherapy, and the promotion of the green hospital concept through the organization of conferences and awareness-raising activities.

The Head of the Administrative and Operational Department at Public Hospital X, who was interviewed for the purpose of this study, emphasized that the greatest challenge in pursuing green hospital status is financial constraints. His statement was as follows: *The biggest problem is simply the financial condition of the healthcare sector in Poland. It's terrifying to even think about trying to implement an environmentally friendly initiative, because the governing bodies immediately ask: How? Where will the money come from? It costs so much.* He also pointed out the lack of incentives for staff to engage in environmentally friendly actions: *We wanted to encourage them, but since there were no financial rewards attached to it (...) it just didn't work out*; *Money still remains the strongest motivator. If there were more financial resources—if the director had the freedom, for instance, to appropriately reward those who come up with initiatives—things might look different.* The department head also stressed that awareness, a sense of agency, and intrinsic motivation among all hospital staff are crucial for successfully implementing green solutions: *That's when everything starts to work and make sense—*

when those involved in the process are doing it because they are aware and genuinely want to. Despite the many pro-environmental initiatives already implemented at Hospital X, the Head of the Department noted that in the near future, the hospital plans to continue thermal modernization efforts in the remaining buildings, as well as actions related to the heating system.

4.2. SWOT Analysis of Public Hospital X

The analysis of the data collected on Public Hospital X indicates that its key strengths in implementing the Green Hospital concept lie primarily in its systematic investments in environmentally friendly infrastructure as well as in modern diagnostic equipment. As early as 2004, Hospital X underwent modernization and began investing in renewable energy sources. This was followed by the implementation of solutions aimed at reducing energy and water consumption and minimizing harmful emissions. Additionally, energy-efficient diagnostic equipment was acquired.

Another strength of Hospital X is its location. The hospital is situated in the middle of a pine forest, on a plot exceeding 23 hectares in size. This natural environment has a direct influence on the functioning of the hospital. Nature contact is actively integrated into patient therapy—for example, through a green health path and a relaxation area featuring aromatherapy. The hospital's location also contributes to a high level of environmental awareness and a strong sense of responsibility for environmental stewardship among the hospital's leadership and management. Another significant strength of Hospital X is its qualified medical staff, committed to maintaining high-quality services and continuously improving their professional competencies. The hospital also holds ISO 9001:2015 (Quality Management System) and ISO 14001:2015 (Environmental Management System) certifications, which further confirm its commitment to quality and sustainability. Equally important is the hospital's active cooperation with various partners and organizations specializing in green technologies and sustainable development. This collaboration brings valuable know-how and access to additional resources. In the context of sustainable development, it is also beneficial that since 2022, Hospital X has been a member of the international organization Global Green and Healthy Hospitals, as well as a partner of the Green Coalition for Health and UN Global Network Poland, operating under the auspices of the United Nations and in cooperation with Philips Health Care.

A key weakness of Public Hospital X in obtaining and maintaining Green Hospital status is the technology used during its original construction, as many of the solutions implemented at that time no longer meet current environmental standards. The aging infrastructure in some cases makes modernization impossible, or it becomes highly costly and time-consuming.

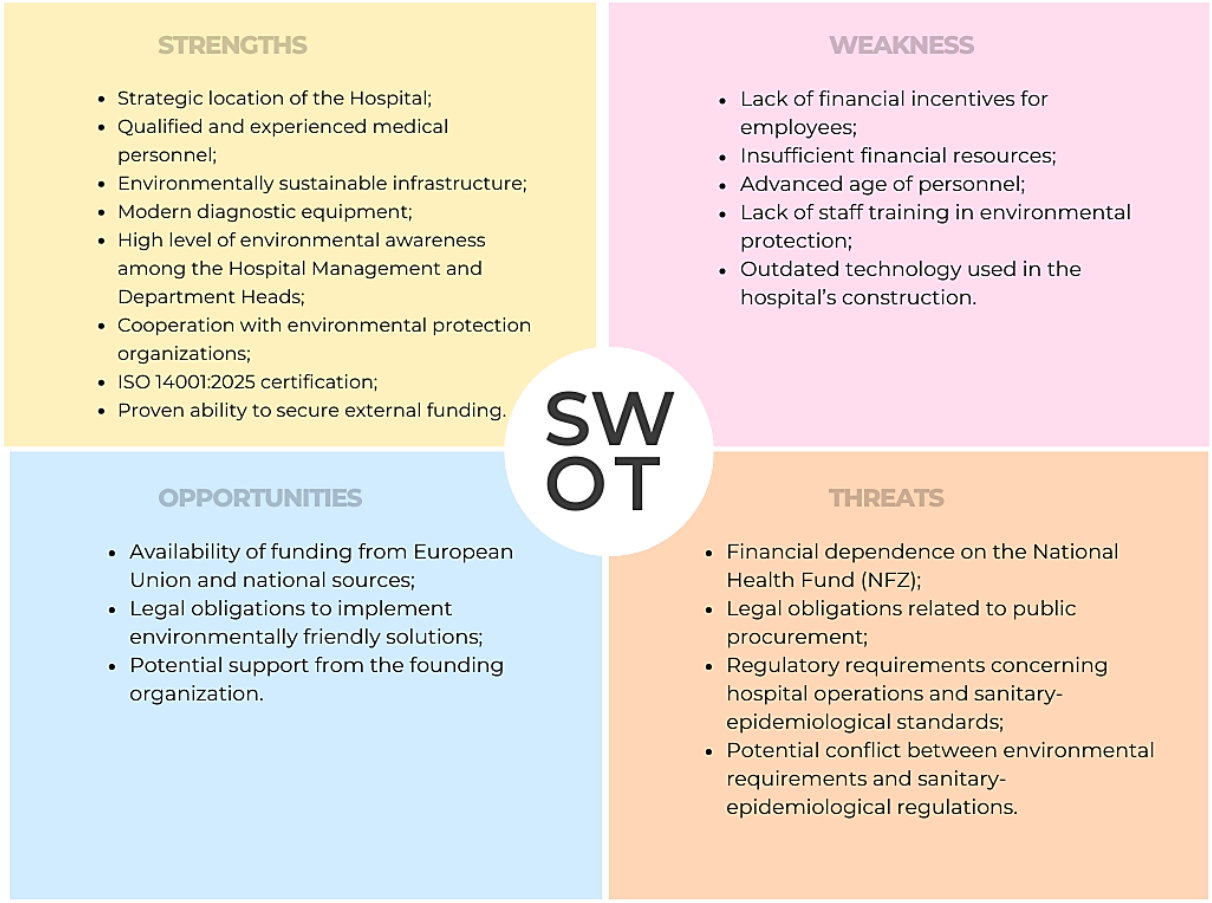
Another significant weakness is the hospital's limited financial resources, as investments in green technologies and sustainable solutions require substantial capital. Securing adequate funding for such investments poses a challenge for Hospital X. Financial constraints also result in low salaries for both medical and administrative staff, which may lead to employee demotivation and staffing issues. This situation discourages staff engagement in additional responsibilities. Moreover, due to budget limitations, the hospital is unable to provide training related to sustainable development practices. Data analysis also reveals a structural weakness: the aging medical staff. Each year, the risk of staff shortages among physicians increases as more approach retirement age, and there is an insufficient influx of younger doctors. Potential personnel shortages may further limit the hospital's capacity to engage in environmental initiatives. Although Hospital X holds an ISO 14001:2015 certification (Environmental Management System), the time and costs associated with maintaining the certification and potential recertifications may also constitute a weakness.

A key opportunity for Hospital X in its efforts to maintain Green Hospital status is the financial support available for environmental projects from the Regional Fund for Environmental Protection and Water Management. Hospital X has previously benefited from this fund by securing financing for building modernization projects. Another opportunity lies in the potential to obtain additional funding and resources for ecological initiatives from its founding authority—the Self-Government of the Greater Poland Voivodeship.

Among the main threats to maintaining Green Hospital status is the hospital's financial dependency on the National Health Fund (NFZ). Financial instability within the NFZ and changes in healthcare service funding limit the hospital's investment capacity and hinder long-term planning. Further threats include the hospital's obligation to comply with strict sanitary and epidemiological standards. The implementation of green solutions must fully respect these regulations in order not to pose additional risks to patients. As such, potential conflicts may arise between medical guidelines and ecological practices. Additionally, the hospital is subject to the Public Procurement Law, which can limit its flexibility in selecting suppliers and thus impede the implementation of sustainable solutions. Finally, changes in legislation that impose new ecological obligations on the hospital are of significant importance—especially in the context of its Green Hospital status. These changes directly influence the hospital's responsibilities and actions, requiring continuous adaptation of its procedures to current environmental requirements.

The results of the SWOT analysis conducted for Public Hospital X in the context of implementing Green Hospital initiatives are presented schematically in Table 2.

Table 2.
SWOT Analysis of Hospital X



Source: Own study based on collected data.

5. Discussion

Based on the conducted analysis, it can be concluded that Hospital X undertakes systematic and comprehensive efforts toward sustainable development, which have enabled it to obtain Green Hospital status. These efforts include both investments in infrastructure and changes in operational processes. Implemented initiatives—such as thermal modernization of buildings, installation of renewable energy sources, advanced resource management, and innovative diagnostic and treatment solutions—have significantly contributed to reducing CO_2 emissions and improving energy efficiency. It is also worth emphasizing that Hospital X is engaged in international cooperation and environmental education, which further strengthens its position within the sustainable healthcare sector.

However, the implementation of actions aimed at achieving and maintaining Green Hospital status does not come without challenges. Hospital X faces a number of obstacles in this area, among which financial constraints play a crucial role. The lack of sufficient funds for ecological

investments and the absence of effective incentive mechanisms for staff hinder the initiation of new activities within the Green Hospital framework.

The study indicates that Hospital X possesses numerous strengths that support its Green Hospital status, including its ISO 14001:2015 certification, which confirms the implementation of an environmental management system. Another notable strength is the awareness and support of the hospital's management team, as well as its active participation in international initiatives such as membership in Global Green and Healthy Hospitals and partnerships with the Green Coalition for Health and UN Global Network Poland. Nevertheless, Hospital X also demonstrates certain weaknesses in relation to the implementation of Green Hospital activities. These include limited financial resources, an overburdened and aging workforce, and insufficient resources that may hinder the hospital's ability to renew its ISO 14001:2015 certification due to the time-consuming and costly nature of the recertification process. Among the key opportunities that could help mitigate the hospital's weaknesses is the availability of funding from the Regional Fund for Environmental Protection and Water Management, which Hospital X has already successfully accessed to support infrastructure modernization projects. Another opportunity lies in securing additional funding and resources for ecological projects from the hospital's founding authority—the Self-Government of the Greater Poland Voivodeship. In contrast, the main threats to maintaining Green Hospital status include the hospital's financial dependence on the National Health Fund (NFZ). Ongoing financial difficulties within the NFZ and changes in healthcare financing significantly limit the hospital's investment capacity and complicate long-term planning. Additionally, strict sanitary and epidemiological regulations, along with the requirements of public procurement law, may constrain the hospital's flexibility in selecting suppliers and technologies that meet ecological standards. Legal changes that impose new environmental obligations are of particular importance for Hospital X, especially given its Green Hospital designation. These changes directly impact the hospital's operations and require it to continuously adapt its procedures to comply with updated environmental standards. One potentially helpful resource in navigating these legal complexities is the "Guide to Current Legal Regulations in the Area of Green Public Procurement", published in 2022 by the Public Procurement Office. This publication is intended to direct public investments toward the use of more environmentally friendly products, raw materials, technologies, and innovations (Public Procurement Office, 2022). It can be expected that other hospitals pursuing transformation toward Green Hospital status may face similar challenges. Therefore, the experience of Hospital X—considered a model example of the first hospital in Poland operating in line with the Green Hospital concept—offers valuable insights. Based on the conducted analysis, it can be also concluded that transformation of Hospital X towards the 'Green Hospitals' status depended on its gradual accumulation of dynamic capabilities, such as the capacity to absorb external financing, learning capabilities resulting from international collaboration, and integrative capabilities enabling the coordination of infrastructural and operational innovations.

These findings suggest that long-term ecological transformation of public hospitals may result not only from their financial condition and financial support possibilities but also from their organizational capabilities.

The findings of this case study are confirmed by other research. As suggested by Megariani, Putra, and Bayhakki (2023), access to external funding and state budget support, as well as growing environmental awareness among staff and leadership, constitute key opportunities for hospitals. Moreover, collaboration with environmental organizations is perceived as a valuable enabler for implementing green initiatives. On the other hand, hospitals' financial limitations, insufficient public awareness of environmental issues, potential conflicts between medical and environmental priorities, and resistance to change among staff are identified as key threats and weaknesses (Bayhakki, 2023).

Conclusion

Public hospitals, like other modern organizations, must align their operations with environmental protection regulations and policies. The urgency and necessity of taking action in this area stem from both academic research and real economic challenges, including the current energy crisis. Although public hospitals are undertaking initiatives to minimize their negative environmental impact, the level of environmental integration across individual organizational units remains varied.

The main limitation of this study lies in the fact that it focused on a single public hospital in Poland, which prevents the generalization of findings to all facilities of this type in the country. Other public hospitals may differ significantly in terms of organizational structure, available resources, and commitment to environmental issues. Future research should involve a broader sample of respondents and include a larger number of public hospitals in Poland, to enable more generalizable conclusions. Such studies could also incorporate the perspective of hospital employees by using qualitative methods such as individual interviews.

The results of this study offer preliminary conceptual implications for innovation and capability theory. The case of Hospital X demonstrates that the transformation of public hospitals toward green hospitals depends on the gradual accumulation of dynamic capabilities—such as the capacity to absorb external financing, learning capabilities resulting from international collaboration, and integrative capabilities enabling the coordination of infrastructural and operational innovations. These results extend existing theoretical perspectives by suggesting that long-term ecological transformation in public healthcare organizations results not from isolated technological changes but from an evolving configuration of organizational capabilities shaped by regulatory and financial conditions. The findings of this study have several important practical implications. The research

demonstrates how Polish public hospitals can achieve Green Hospital status, offering practical insights that can be replicated by other public healthcare institutions across Poland. In particular, the case of Hospital X may serve as an example for other hospitals, encouraging them to seek grants and subsidies for environmentally sustainable development. Additionally, by highlighting the long-term cost savings associated with energy efficiency and waste reduction, this study may support hospital administrators in making informed financial decisions regarding green investments.

The results of this study extend existing knowledge concerning ecological innovation by revealing that ecological transformation of public hospitals stems from an evolving configuration of organizational capabilities shaped by regulatory and financial conditions. In light of this conclusion, the present study opens up new research avenues focusing on a dynamic and contextual approach to ecological innovation in public healthcare organizations. Key directions for future research cover further conceptualization and measurement of organizational capabilities in public hospitals in the context of implementation of ecological innovations. Future research may also empirically test the model presenting the complex relationship between regulatory conditions (e.g., EU directives, national health policies), financial constraints (e.g., public funding, reimbursement models), and the introduction of ecological innovations. It would also be useful to capture the long-term and evolutionary nature of the green transformation of public hospitals and conduct longitudinal studies in this field. In this way, future research can significantly contribute to the development of innovation theory within the context of ecological innovation in the public sector.

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