






## Article

# Pro-Environmental Transformation of Cultural Institutions through Sustainable Infrastructural Projects: A Case Study of Poznan

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**Abstract:** The aim of the article is to elucidate pro-environmental solutions and activities, consonant with the tenets of sustainability and enduring developmental paradigms, implemented within the infrastructural purview of the cultural institutions situated in Poznan—a municipality located in western Poland. A diagnostic scrutiny was executed encompassing the entirety of municipal cultural entities, constituting a cumulative assemblage of 15 establishments, all of which were extended invitations to participate in this investigation. Interrogations were directed towards ascertaining their strategic, environmentally conscientious determinations vis à vis the construction, renovation, or modernization of edifices during the temporal expanse of 2021 and 2022. Ultimately, responses germane to the posed inquiries were proffered by 7 institutions, as the remaining entities refrained from financial investments during the stipulated timeframe. The discerned outcomes illuminate the manifold pro-environmental measures and endeavors embraced by these institutions within the domain of infrastructural initiatives. These initiatives pertain to ecological considerations, safeguarding the natural milieu, and fortifying sustainability, encompassing facets such as energy and water conservation, the abatement of water and air contaminants, recycling endeavors, the utilization of renewable materials, the afforestation of vicinities, and the mitigation of the ostensibly designated “heat island effect”, among sundry others. These initiatives are not only significant for the current ecological situation worldwide, but they also appear to be crucial for the better future of the next generations.

**Keywords:** environment; sustainability; sustainable development; climate change; eco-infrastructure; ecology; green buildings; cultural institutions; Poznan; Poland



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## 1. Introduction

Sustainability, sustainable development, heritage, ecology, global climate change—these are the most significant issues in the contemporary world [1–3]. We are facing, today, a very specific situation—social, cultural and economic development is something very needed by the whole humanity, especially in developing countries [4,5], but, at the same time, it constitutes a serious threat to the natural environment in which this development takes place [6,7]. That is why global climate change has become one of the most important issues, raised by political agenda for many years now [7]. In recent years, there have been numerous research studies on several issues related to climate change. One of them is the interrelation between the energy efficiency of buildings and energy saving and its interaction with climate change [7–13]. Several researchers have also investigated various benefits of different energy efficiency and energy choices [14–20].

According to Shoukai, serious ecological and environmental problems, triggered by industrialization and urbanization, have directly or indirectly threatened sustainable ecosystems and public welfare [21]. There are many problems, such as water and air pollution, the energy crisis, food shortage and food waste, the shortage and extensive use of natural resources for industry, droughts, floods, earthquakes, climate warming and fires, to name but a few [21]. An intense call for sustainability can be seen on local, national and international levels and is associated with many concepts and domains, such as circular or shared economy, especially visible in the fashion industry [22] or in small and medium-sized enterprises [23].

In general, sustainability means the ability to maintain or support a process continuously over time. In the context of the environment, it could mean maintaining and/or supporting natural resources, available on Earth (such as water, solar energy, food, etc.), to serve humanity as long as possible [24–26].

Although Jabareen has noticed that there is still a lack of a comprehensive theoretical framework for understanding sustainable development and its complexities [27], there are some concrete and practical aspects, initiatives and activities that are connected with the conceptual framework of sustainable development and sustainability. For instance, in 2015, the United Nations adopted the Sustainable Development Goals (SDG), consisting of six major elements. One of these elements is protecting our planet. There are, in total, 17 main SDG goals. Goals no. 2, 6, 7, 13, 14 and 15 are related to the environment [28–30]. SDGs introduce specific aims and actions, such as fighting climate change, conserving and using water resources, such as seas and oceans, in a sustainable way, etc. [21,29]. Moreover, in the special report “Transformations to Achieve the Sustainable Development Goals”, prepared by “The world in 2050 initiative”, there are six main points that are needed to be fulfilled in order to achieve the above-mentioned SDGs. We can find, among them, the need for responsible consumption and production of resources, water and energy saving, as well as education for smarter environmental choices [31]. Furthermore, among the 12 ways to live more sustainably, elaborated by the Center for Biological Diversity, there are some important pieces of advice, related to the environment, the climate and the protection of humanity and other species, such as ditching plastic and switching to reusing, choosing organic products, saving water, greening homes by using adequate insulation and energy-saving windows and a programmable thermostat for more efficient heating and cooling, or changing the mode of transport for a more ecological one (such as walking, cycling, using public transport), etc. [32].

In addition, we should be aware that not only is the natural environment threatened by the consequences of economic development, global climate change, etc., but also cultural institutions and the cultural heritage they protect [33,34]. The managers of such institutions should, therefore, make their important contribution to the above-mentioned activities, aimed at mitigating and reducing the effects of global climate change and other ecology-related threats to our planet. They do it, for example, by introducing initiatives and solutions related to ecological constructions in the infrastructural projects of the cultural institutions they manage, which will be described in this paper later in detail.

Moreover, culture and the so-called cultural sustainability is acknowledged as one of the most important pillars of sustainable development, along with its social, economic and environmental pillars [35]. In addition, global climate change and its consequences for human beings are always mediated by the culture in which people live. Cultural dimensions of climate change must, therefore, be taken into consideration, if activities, initiatives and solutions for protecting the environment and resources on Earth are understood, accepted and actively supported by people [36]. The cultural institutions form part of such cultural sustainability and should combine serving humanity by fulfilling its basic socio-cultural functions, but also taking initiatives to be more eco-friendly. Thanks to these, they can avoid the above-described conflict and contradiction between social and economic development on the one hand, and the protection of the natural environment on the other.

Furthermore, these cultural institutions are located in buildings. In cities, they form an important component of the municipal infrastructure. In order to deal with this, it is crucial to combine or integrate such infrastructure and couple it with ecological and social processes [21]. It should lead to building sustainable cities, filled with the so-called “green” or “ecological” infrastructure [21,36,37]. “Ecological Infrastructure” is an important, composite system on which the sustainable development of cities depends. This concept was first introduced in 1984 by UNESCO in its Man and Biosphere Programme. It was one of the five principles of ecological city planning [38,39]. It consists of using natural areas as the framework for the spatial organization of cities. Later, it was developed, adding numerous actions, such as, among others, protecting natural resources, promoting the healthy development of people, and improving urban living and working. In some countries, there have been several initiatives undertaken to put the idea of “Ecological Infrastructure” into practice. For instance, in Canada, ecological concepts have included the ecological renovation of municipal infrastructure [21].

In the special European Union’s Report “Cities for tomorrow. Challenges, visions, ways forward”, the authors clearly stated that cities are key for the sustainable development of Europe. European cities of tomorrow should become places of green, ecological or environmental regeneration. Their development should enjoy a high level of environmental protection. According to the authors, it goes far beyond simple reduction of CO<sub>2</sub> emissions. It should comprise a holistic approach to environmental and energy issues, as components of the natural environment are connected with social, economic, cultural and urban systems in a unique manner [37,40]. It is, therefore, crucial to introduce such sustainable actions, initiatives and solutions to as many activities as possible to prolong the lifecycle of our planet. It should be done not only by individuals, but also by many types of organizations and institutions. The cultural institutions can also be an important part of this movement.

## 2. Literature Review and Theoretical Background

The hitherto research on actions and initiatives related to sustainability in cultural institutions has shown that it is a very important issue, as cultural, historic and other such buildings constitute a significant part of the built environment [41–43]. Moreover, buildings are constructions that consume a vast amount of energy and water. Their functioning can be very harmful to the natural environment as they use too many non-renewable resources [24]. The building sector consumes over 40% of the world’s energy consumption from fossil sources for construction processes [44].

On the other hand, however, according to W.E. Rees, the building sector has bigger material leverage in reducing the human ecological footprint than any other major industrial sector [39]. Due to this fact, the idea of sustainability also came into the architectural agenda with the aim to diminish the negative environmental impact of the buildings [39]. It is, therefore, crucial that the owners or managers of numerous buildings all over the world take regular actions to mitigate these threats. There are many types of private and public buildings in which many pro-ecological initiatives can be taken. Some of them house cultural institutions—very important types of institutions in this context.

There has already been some research on pro-environmental solutions in cultural, including historic, and heritage buildings. Some authors underline that, in this case, these actions and initiatives must take into account the cultural value of such institutions and must try elaborating a trade-off between preserving these values and introducing sustainable solutions, such as, for instance, the suppression of carbon emissions [45]. Recent research on this subject has shown that, among the eco-solutions used in cultural institutions, we can find the correction of the thermal performance of buildings [46,47], installation of insulation layers [46], installation of solar panels on the roofs to reduce carbon emissions [48], ecological retrofitting works with numerous benefits, such as energy consumption’s reduction, a cut in CO<sub>2</sub> emissions, the reduction of pollutions, and many others [49]. Focus has been on improving energy performance by using sustainable materials and renewable energy [41], improving the thermal efficiency of buildings by equipping

them with a thermal plant with a heat exchanger and heat pumps, using geothermal water as a renewable source of heating [50], the adaptive and sustainable reuse of cultural and heritage buildings [50], installing green walls and roofs as ecological solutions [51,52], improving energy efficiency in buildings [53–55], and others.

Most of this research has delivered valuable, but rather general examples. There is a need, however, for more case studies, investigating concrete cultural institutions in this context. An interesting example of such a case study in the described context is an analysis of the campus of the University of Oradea in Romania. The authors investigated the transformation of this campus into a “green” and “healthy” one. They described numerous interventions on the infrastructure and other initiatives that had been done to fulfil this aim, such as the installation of a thermal plant equipped with a heat exchanger and heat pumps or using renewable sources of energy, such as geothermal water. These initiatives resulted it, among other things, improving the campus buildings’ energy performance, a decrease in the buildings’ energy consumption and CO<sub>2</sub> emissions [49]. For this reason, in the presented paper, the authors wanted to expand this perspective by investigating concrete cultural institutions from Poznan, Poland.

What is also important for fighting against the negative consequences of the before-mentioned industrial revolution, urbanization, socio-economic development, climate change, and so on, is taking ecological initiatives by the cultural institutions as examples of activities for sustainable development. Rozmiarek et al. have done interesting research on cultural institutions in Poznan, Poland. A cultural institution in Poland is defined as a unit of the public finance sector, established to carry out public tasks in the area of cultural activity, consisting of the creation, dissemination, and protection of culture [34].

The authors found that the cultural institutions in Poznan had undertaken numerous eco-initiatives as activities for sustainable development. They divided these actions into three categories: internal institutional activities, projects on environmental issues and educational activities in the field of ecology. The authors concluded that these initiatives are beneficial for the environment and people, and can be an inspiration for others, as society should follow existing eco-trends and should be more and more aware of the significance and impact of the environmental activities undertaken [34].

However, the cultural institutions can do something more to contribute to the issues under study. They can introduce “eco-friendly” building solutions in their infrastructural projects. Therefore, the aim of this paper is to present such activities undertaken by the cultural institutions in Poznan. The city is investing in culture and tourism [56], and, in the years 2015–2020, it aimed to maintain its status as a modern, green, and open city, prioritizing sustainable development not only in cultural aspects but also in sports [57,58]. Therefore, the forthcoming research will elucidate the environmentally conscious architectural resolutions embraced by civic cultural establishments hailing from Poznan—the city situated within the central–western expanse of Poland, specifically nestled in the Greater Poland region. The years 2021–2022 have been designated as pivotal junctures, serving as temporal benchmarks for the initiation of endeavors within the scrutinized entities.

Within the study, several key research questions were formulated. The first question aimed to investigate whether cultural institutions in Poznan are enhancing their ecological awareness and undertaking an increasing number of pro-environmental actions in response to the contemporary challenges related to environmental conservation. The second question explored the diversity in approaches to pro-environmental actions among different cultural institutions in Poznan, examining how these approaches stem from their specific needs, resources, and priorities. The third question focused on the influence of external factors on decisions regarding pro-environmental investments in these institutions, considering factors such as funding availability, public policies, and societal pressure. The final research question examined whether pro-environmental actions undertaken by cultural institutions may also yield economic benefits, such as energy savings or increased attractiveness to the local community. These research questions formed the basis for the analysis and

interpretation of the study's findings, aiming to better understand the role of cultural institutions in shaping pro-environmental practices in Poznan.

A comprehensive assemblage of all municipal cultural institutions, comprising a total of 15 distinct entities, has been proffered an invitation to partake in this systematic inquiry. The core aim underlying this inclusive approach is to render a panoramic vista of multifarious initiatives, concomitantly spotlighting recurrent pursuits. The diverse panorama of institutional frameworks and operational modalities, as expounded through the chosen exemplars, has not only facilitated the identification of noteworthy parallels but has also laid bare equally significant divergences in the modes of implementation of the undertaken actions. Ultimately, responses pertaining to the posed inquiries were furnished by 7 institutions, as the remaining did not undertake any architectural modernization during the specified years.

### 3. Materials and Methods

Poznan stands as a hub for a myriad of cultural institutions, encompassing both governmental and local entities. The urban landscape is enriched by a multitude of theatrical venues, including the city-administered Polish Theatre, Animation Theatre, Musical Theatre, and the Theatre of the Eighth Day as an offshoot. The cultural fabric of the city is woven with museums and art galleries, exercising a pivotal influence. Among the array of museums, particular emphasis is placed on the Greater Poland Museum of Independence, an establishment with six branches, the Museum of Archaeology, and the Arsenal Municipal Gallery, which holds a prominent position on the Old Market Square. The realm of choral music finds representation in the form of the Poznan Boys' Choir, while the mantle of literary enrichment is shouldered by the Raczyński Library, extending its influence through a network of several dozen branches scattered throughout the urban expanse. A significant force in the cultural propagation is the Zamek Culture Centre, counted among the most expansive cultural institutions within the nation. The Centre orchestrates an annual cavalcade of approximately two thousand five hundred events spanning the domains of theatre, cinema, music, and literature. The cultural milieu further hosts the activities of Estrada Poznańska, Posnania Municipal Publishing House, Children's Art Centre, "Daisy" House of Culture, and Poznan Heritage Centre. The institutions are located in various facilities, not only in the historical buildings protected by the city's conservator of monuments but also in modernist buildings built in the second half of the 20th century. Furthermore, not all of them are owned by the city of Poznan; however, due to the fact that municipal cultural institutions operate in them, the city of Poznan is fully responsible for conducting necessary infrastructure modernizations and finances the undertaken projects from its budget, often also utilizing external grants from government or EU programs.

As Hawkes [59] defined culture as the fourth and essential pillar of sustainable development, a notion confirmed by UNESCO which places it at the center of sustainable development policy [60], a diagnostic study was conducted to gain a comprehensive understanding of the environmentally friendly solutions and actions that were implemented within the infrastructure scope of the cultural institutions located in Poznan. The research method employed was based on interviews using individual, semi-structured conversations focused on the specific issue. Thanks to the applied method and technique [61], it was possible to gather information on the investigated issue while avoiding the imposition of answers. This justifies the utility of the adopted methodology in the context of the conducted study. The interviews were conducted with the directors of municipal cultural institutions or their representatives. For a holistic approach to the issue, with the support of the Department of Culture of the Poznan City Office, it was possible to reach the representatives of all municipal cultural institutions operating in Poznan. Out of 15 functioning institutions, 8 did not participate due to the absence of any pro-environmental investment activities in the specified time frame. Therefore, the results present responses from the remaining 7 institutions, which provided insights into the strategic decisions they made regarding



the construction, renovation, or modernization of facilities, as well as the extent to which the contemporary trend towards implementing pro-environmental investment solutions was incorporated into their operational actions. Each institution was asked to provide specific examples illustrating their adherence to the principles of sustainable architecture. Adopting these methodological frameworks, similar to those demonstrated in studies concerning sustainable tourism management during sports events in protected zones [62] or research on ecological initiatives in cultural institutions [34], constituted an approach that ensured the integrity and comprehensiveness of the conducted research. All obtained responses were thoroughly analyzed. The study was conducted following the guidelines outlined in the Publication Manual of the American Psychological Association. In line with research recommendations, the presentation of results also included the anonymization of institutions.

## 4. Results

### 4.1. Cultural Institution 1

In 2021, the institution implemented an investment in the fortification (renovation and adaptation for statutory purposes) and designed the building of the new headquarters. The ecological aspects were taken into account in both measures. In the case of one of the facilities, the renovation activities concerned, among other things, the replacement of window joinery, which resulted in, among other things, improving the thermal features of the object. During the reinforcement of the area in front of the facility, a surface with a high degree of water permeability was used.

When designing the building of the new institution, the architect proposed the use of materials of natural origin (e.g., plaster on the walls). When planning the land development, the potential of the existing trees was used. In the field of designing the ventilation of the building, it was proposed to use the solutions that enable the recovery of heat generated during the operation of heating and air-conditioning devices. Moreover, water retention solutions will be applied around the facility.

The project uses high-class window joinery and insulation to reduce heat loss. The facility was designed in large part underground. This solution results in greater “natural” stability of climatic conditions, and, thus, reduces the need to supply energy for devices, providing such conditions.

### 4.2. Cultural Institution 2

In the context of environmental and climate protection, the institution has implemented diverse actions.

In 2021, a space for a shared warehouse was established, involving the separation and renovation of a facility for storing materials used in the institution’s ongoing activities. Many materials left as a result of investments were subsequently utilized for recycling and upcycling. Additionally, the functions of the courtyard in front of the institution were altered, relinquishing the role of a car parking area in favor of supporting other low-emission forms of transportation. Another phase of window joinery replacement was completed, accompanied by the modernization of sanitary installations on the institution’s ground floor.

In 2022, a “bicycle room” was created following the separation and renovation of a designated space. The goal was to provide facilities for employees using bicycles, thereby supporting emission-free transportation methods. Furthermore, sanitary facilities in one of the buildings were modernized, and a thermal insulation curtain was installed.

In 2023, a tender was announced for the reconstruction of the courtyard in front of the institution, which was preceded by an architectural competition and the preparation of a construction and executive design. The project aimed to preserve existing trees, introduce new green zones filled with plants, and establish a green roof for a pavilion. Prior to the investment, nine trees had grown on the institution’s premises, and the biologically active area occupied only 30 m<sup>2</sup> of land in bowls around them. The project envisioned preserving

eight trees, transplanting one, introducing twenty new tall trees in the courtyard, and expanding the green zones filled with shrubs, perennials, grasses, and flowers to 703 m<sup>2</sup>. Additionally, 222 m<sup>2</sup> were allocated for the green roof of the pavilion, and selected facades of the building were covered with vines. The greening of the courtyard aimed to support water retention, reduce dust and noise, provide necessary shade, and positively influence the microclimate. Selected plant species were intended to serve as shelter and food for insects and birds. Furthermore, the introduction of water infrastructure elements as part of the investment aimed to reduce the urban heat island effect. Hence, the water circuit in the courtyard was partially closed, and the water tank for watering the greenery was equipped with a rainwater collection system. An essential aspect of the project was the care for existing courtyard elements, such as preserving the granite floor. It was assumed that existing and undamaged elements of stone cubes and slabs would be maximally utilized, reducing the consumption of natural resources. Plans also included another phase of window joinery replacement and the implementation of mechanical ventilation for selected rooms.

#### 4.3. Cultural Institution 3

At the indicated time, in its own buildings, the institution continued the investment started in 2019, entitled “Modernization of the building of the institution and conservation and digitization of valuable resources”. The subject of modernization was the historic building of the institution. The task included the following aspects: reduction of energy losses by replacing window sashes with triple-glazed ones (increasing energy efficiency), supplying the building with heat from the so-called “heat pumps” (renewable sources), using energy-saving LED lighting.

As part of the above task, in 2023, the institution submitted an application for co-financing the installation of photovoltaic panels on some other institution buildings.

#### 4.4. Cultural Institution 4

In 2021, the roof surface of the institution building was renovated, and a deep well was drilled to obtain groundwater for watering the garden in front of the building. This action has allowed for significant water savings from the municipal water supply. In addition, in 2022, as a part of the Poznan Civic Budget, a unique, external green flower wall, combined with a mural, was made. This element of the garden architecture of the institution community center reduces air pollution.

In all of the above-mentioned initiatives, modern construction materials and technologies were used in the activities, bearing in mind the principles of an ecological approach to the implementation and conduct of renovation and modernization works.

#### 4.5. Cultural Institution 5

In connection with one of the premieres that took place in September 2023, cooperation was established with the Aquanet Municipal Water and Sewer Company to capture rainwater. In the spring of 2023, four rain gardens, supplied with captured water, were built around the building. For many years, the institution’s goal has also been to build a new headquarters, and for this reason, the prepared projects incorporate the latest solutions in the field of pro-ecology.

#### 4.6. Cultural Institution 6

In 2022, two bathrooms were modernized. The modernized spaces feature energy-saving lighting and modern energy-saving water heaters.

#### 4.7. Cultural Institution 7

As part of the institution’s modernization efforts, a series of comprehensive measures has been undertaken, including the planned thermal modernization of the building involving, among other aspects, window replacement and the installation of photovoltaic panels.

The institution is carrying out a construction investment within the framework of activities KL/P/045 “Revitalization of the Old Market Square in Poznan”, encompassing the transformation of a segment of the mid-market block into the Cultural Passage (since November 2019) and KL/P/015—“Modernization—Improvement of the Quality of Cultural Services Provided” (since June 2020). Within the scope of the institution building’s modernization, the following solutions have been considered: the installation of photovoltaic panels on the roof above the main exhibition hall, the modernization of air-handling units through the implementation of mechanical ventilation with heat recovery, the enhancement of the building’s thermal performance through the utilization of wall insulation, and the renovation and replacement of window joinery.

## 5. Discussion

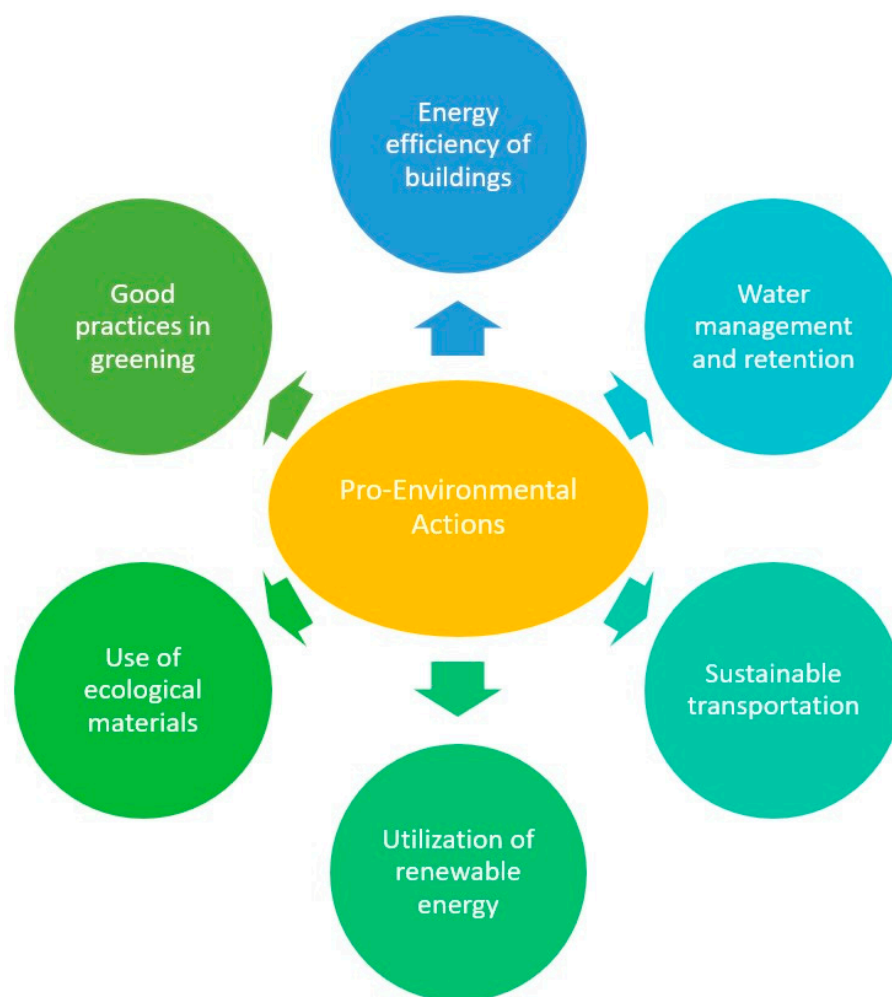
The study addressed all the research questions that were formulated prior to its commencement. It found evidence supporting the idea that cultural institutions in Poznan are indeed increasing their ecological awareness and participating in a greater number of pro-environmental initiatives in response to contemporary environmental challenges. Furthermore, it identified the diversity in approaches to pro-environmental actions among various cultural institutions in Poznan, highlighting how these approaches reflect their distinct needs, resources, and priorities. Additionally, the study confirmed the influence of external factors on decisions concerning pro-environmental investments in these institutions, demonstrating that funding availability, public policies, and societal pressure play a role in shaping such decisions. Lastly, it verified the suggestion that pro-environmental actions undertaken by cultural institutions can lead to economic benefits, such as energy conservation and increased attractiveness to the local community. These research questions provided the framework for the analysis and interpretation of the study’s outcomes, ultimately enhancing our understanding of the role of cultural institutions in shaping pro-environmental practices in Poznan.

Actions related to the pro-ecological transformation of cultural institutions can be grouped into several key areas. The first of these is the energy efficiency of buildings, including window replacement, improvement of thermal insulation characteristics, use of energy-efficient lighting, modernization of sanitary installations, and improvement of ventilation in buildings. Another area is water management and retention, which includes strengthening the terrain in front of the building with a high-water permeability surface, supporting water retention through rainwater collection, and even digging wells for garden irrigation. Sustainable transport also plays a significant role, so cultural institutions can support emission-free transport by providing bicycle parking spaces. The utilization of renewable energy, especially through actions related to photovoltaics, is another key area of activity. The use of ecological materials is also an important aspect, including the use of materials of natural origin and modern ecological materials. Finally, good practices in greening, such as removing parking lots in favor of green spaces or creating green roofs, can also be effective ways to improve the ecological footprint of cultural institutions. The applied division into 6 categories is visualized in Figure 1.

An example of the pro-environmental actions undertaken by cultural institutions in Poznan can be visualized using the following Table 1.

The cultural institutions are located in buildings with a vast amount of infrastructure that can be built and/or re-designed in line with an eco-friendly approach. Given the fact that they fulfill very important social functions and respond to the socio-cultural needs of humanity as a whole, they must operate in accordance with the principles of sustainable development [3,27] and should positively influence pro-environmental attitudes and behaviors of the recipients of their cultural offerings. They also need to undertake several actions and solutions in their buildings to be more “eco-friendly” and to take other steps towards being closer and closer to the idea of the above-described “green buildings” [63]. It is also crucial to make them be part of the “green enough” cities and urban green spaces [64,65].





**Figure 1.** General categorization of pro-environmental actions applied in cultural institutions. Source: Own work.

**Table 1.** Pro-environmental actions undertaken by cultural institutions in Poznan.

Pro-Environmental Actions	Cultural Institutions						
	1	2	3	4	5	6	7
Energy efficiency of buildings	Yes	Yes	Yes	Yes	No	Yes	Yes
Water management and retention	Yes	Yes	No	Yes	Yes	No	No
Sustainable transportation	No	Yes	No	No	No	No	No
Utilization of renewable energy	No	No	Yes	No	No	No	Yes
Use of ecological materials	Yes	Yes	No	Yes	No	No	No
Good practices in greening	No	Yes	No	Yes	No	No	No

In the past, the concept of sustainable development used to be associated with three pillars: social, economic and environment. However, the fourth pillar of this movement, which is culture, was added and is currently widely accepted [33]. Cultural sustainability is, therefore, as important as natural environment protection. Greater consideration and appreciation of cultural sustainability was, among others, a primary focus in the United Nations 2015 sustainability goals [55]. UNESCO's Culture for the 2030 Agenda for Sustainable Development recommends undertaking numerous important actions, aimed at educating and raising awareness on climate change mitigation, adaptation and the reduction of its consequences, sustainable water management, positive relationships between cultural

and natural environments, etc. [37]. As Rozmiarek et al. have shown, municipal, cultural institutions in Poznan are contributing to this very important goal. They have undertaken several activities, aiming at increasing access to knowledge and raising awareness for the bottom-up mitigation of climate change [34].

As shown in this paper, the cultural institutions in Poznan are also contributing to this goal by implementing numerous solutions in their buildings in order to be more “eco-friendly” and to contribute to the most important goals of the contemporary sustainable development movement. Thanks to that, they direct themselves towards being closer to the idea of the above-mentioned “green buildings” [62] and towards being part of urban green spaces [65], which are desperately needed nowadays and in the future. Moreover, their cultural offer, aimed at fulfilling very important, socio-cultural needs for people, can be “consumed” by them in a more sustainable and eco-friendly manner. It is very important as, for the sustainable consumption of cultural goods, it is crucial to change social and cultural norms among human societies. The construction of more “green” infrastructure and creation of better conditions for people to visit cultural institutions can be of key significance here [66].

An analysis of the literature on the subject under study shows that there are research findings related to cultural institutions that can be compared to the findings presented in this paper. Hambrecht and Rockman, investigating international approaches to climate change and cultural heritage, have noticed that one of the strategies in mitigating the consequences of climate-change threats is the integration of cultural historic buildings into energy efficiency plans, as well as a reduction in the carbon footprint of the cultural institutions and building management [33]. They also mentioned the reduction of greenhouse gas emissions and the overall environmental footprint of cultural heritage and historical buildings, and lessening energy consumption in historical and cultural structures; they also mentioned strategies for achieving carbon-neutral ventilation and temperature systems in such buildings. These and other, similar actions are undertaken in numerous countries, such as USA, Canada, England or Scotland and others [33]. These activities are in line with the above-mentioned pro-ecological initiatives undertaken by the cultural institutions in Poznan, especially in energy saving and efficiency, and the reduction of gas emissions by promoting eco-transport and proper ventilation solutions.

Loach et al., while conducting research on specific cultural institutions in UK—museums and libraries—mentioned many such actions that contribute to sustainable development and ecology issues, which can also be beneficial to institutions themselves, not only in the environmental pillar of sustainability, but also in the economic one [55]. They used an example of the efforts that cultural institutions make to reduce energy consumption within their facilities. This environmental goal can have a positive economic effect, i.e., financial savings on energy [55]. In their paper, they put a special emphasis on the cultural aspect of sustainable development. They claimed that cultural sustainability is of equal importance to social, economic and environmental concerns, creating the fourth pillar of sustainable development [55]. They even claimed that, for cultural institutions, sustaining culture is crucial and all the other three pillars of sustainable development should support it to help such institutions fulfil their basic role. The environmental pillar, for instance, could focus on the physical conditions and processes required for the functioning of such institutions, as well as on providing the environment needed for the survival of cultural assets within these organizations [55]. For the cultural institutions in Poznan, cultural sustainability should also be crucial for their everyday functioning and for fulfilling their most important roles in society. However, adding the above-mentioned initiatives and actions related to the pro-ecological approach to this is also very beneficial to society. All four pillars of sustainable development should be taken into consideration if these institutions wish to contribute to the most important issues in our world.

Semenyuk et al. noticed that, since the 1990s, the eco-solutions in the constructions of buildings have moved towards energy saving and constructing energy-efficient buildings and structures [67]. The authors also claim that, nowadays, the role of effective energy

saving and energy consumption in buildings is crucial, as the construction industry is a strong energy consumer. This is in line with the findings presented in this paper, as many of the investigated cultural institutions in Poznan have introduced several energy-saving and reduction-of-energy-use solutions mentioned above. Thanks to that, the buildings of these institutions can move towards being closer to the already-mentioned concept of green buildings or sustainable buildings, where the ecological balance between human needs and the environment is maintained [67].

Kirbas et al. performed an interesting analysis of traditional Turkish houses, paying attention to the proper spatial layout of these houses and using eco-friendly materials, resources and construction techniques to build them. They mentioned, among other things, the use of proper materials to prevent heat loss, efficient ventilation and the use of suitable materials to keep them warm [40]. The cultural institutions described in this paper are certainly not houses. However, they can also use (or have already used) eco-friendly materials and resources to do the same, as preventing heat loss means saving energy for heating them, especially in winter, which is crucial from an ecological point of view.

The already-mentioned Rozmiarek et al. interviewed 12 cultural institutions in Poznan, asking them about the eco-initiatives they undertake internally and during the cultural events in order to promote environmental attitudes among the participants of these events. The authors found that these institutions had undertaken many initiatives that fit into the discourse of the so-called deep ecology and that address the most important concerns of the contemporary climate change and environmental crisis [34]. The examples of such initiatives are as follows: saving paper by using electronic documents, avoiding plastic utensils, generating a minimum amount of waste, recycling, environmentally friendly solutions during the renovation and modernization of the premises, the restoration of old furniture, strict segregation of waste, using energy-efficient dishwashers and washer dryers, energy saving (by using LED bulbs, electrical equipment and proper heating solutions), re-using various materials, using reusable utensils and ecological paper, reducing the use of artificial materials, using renewable energy sources and raw materials for producing some materials for the projects, reducing consumption, taking care of water purity, water saving, etc. [34]. What is especially important for the aim of this paper is that these cultural institutions in Poznan have also paid attention to the issues related to building constructions (taking into account that buildings consume energy and produce waste), as well as to the above-mentioned idea of “greening” the urban space. One of the institutions transformed its square into a green courtyard. They changed their space in such a way that the greening of the inner-city space increased, creating the possibility to retain surface water and rainwater for the roofs, as well as the reduction of the “heat island effect”. In addition, the car park that used to be there disappeared, which encouraged people to choose more eco-friendly modes of transport to get to this institution [34]. These findings are similar to the ones presented in this paper. The cultural institutions in Poznan have undertaken several ecological initiatives and building solutions in their infrastructural projects as examples, serving for the better future of our planet.

According to Rees, the green buildings idea, along with other popular approaches to sustainability today, do not address the fundamental problem. They, instead, attempt to reproduce the status-quo, as contemporary society equates sustainability with maintaining growth through technological innovation and greater material and economic efficiency [39]. This is in line with the paradox mentioned at the beginning of this paper—the contradiction between the need for the economic and socio-cultural development of human societies and the threats to the natural environment this development brings with it. However, as it was underlined here, the building industry has a huge impact on ecology. In consequence, the ecological solutions in many types of buildings, including these housing the cultural institutions, have to be taken regularly and on a much bigger scale in order to combine serving the humanity in terms of their significant social functions, but, at the same time, directing themselves towards being more eco-friendly, green, sustainable or, at least, “just green enough” buildings.

## 6. Study Limitations and Implications

Of course, our study had certain limitations. Firstly, we focused on one Polish city—Poznan. Therefore, conducting a similar study in other Polish cities may reveal different approaches. Secondly, and ultimately, only 7 out of 15 institutions were surveyed. While this might seem like a small number, the remaining 8 did not undertake any pro-environmental investments. Hence, the obtained results visualize all the actions taken within the specified time frame, and, thus, the study in the proposed area could not be broader. Thirdly, the adopted research method relied on individual and partially structured interviews. Perhaps, a fully structured interview method applied to all institutions or, conversely, an unstructured one, would shed light on the results from a different perspective.

The implications of the study are significant, despite the limitations outlined in the article. By highlighting the pro-environmental solutions and activities implemented within the cultural institutions of Poznan, the study underscores the importance of sustainability and enduring developmental paradigms in contemporary urban settings. It sheds light on the efforts made by these institutions to address environmental concerns through various infrastructural initiatives, such as energy and water conservation, recycling, and the use of renewable materials.

One implication is the potential for knowledge transfer and emulation. Other cultural institutions in Poznan and beyond can learn from the practices identified in the study and potentially implement similar initiatives in their own infrastructural projects. This could contribute to a broader adoption of environmentally conscious practices within the cultural sector, leading to positive environmental impacts at the local level.

Furthermore, the study suggests the need for policy support and incentivization to encourage more cultural institutions to undertake pro-environmental investments. If certain institutions refrained from such investments due to financial constraints or other reasons, targeted policies or funding mechanisms could help overcome these barriers and promote greater sustainability across the sector.

Overall, the study highlights the role of cultural institutions in contributing to environmental sustainability and underscores the importance of their efforts for both the current ecological situation and the well-being of future generations.

## 7. Conclusions

The last centuries have brought many huge changes to humanity, including rapid economic and industrial development, urbanization, and social and cultural transformations that have never been seen before on such a huge scale. On the other hand, the natural environment of our only planet has encountered many threats related to this development due to numerous human activities, leading to enormous climate-related changes. Fighting against the consequences of these changes has led to numerous actions, initiatives and solutions related to ecology, the protection of the natural and cultural environment, sustainability, sustainable development, etc.

As far as the cultural institutions in Poznan are concerned, they have undertaken numerous actions and initiatives to engage in this trend. It is worth noticing that these initiatives are not only significant for the present ecological situation all over the world, but they seem to be crucial for the better future of the next generations. If life on Earth is expected to continue, we need to act. Climate change-based threats are already very serious, and their impacts are increasing in range and intensity [39].

We should be aware of the fact that undertaking ecological initiatives is not always easy and it can face many challenges. One of them is the high cost of such initiatives, sometimes difficult to deal with, as some research has shown [68,69]. When it comes to the Polish context, as Rozmiarek et al. have noticed, the recent high inflation and the vast increase in living costs have made ecological choices even more difficult to take [34]. This situation applies not only to Poland, but also to other countries in Europe, due to the political and economic situation which we all live in nowadays. Moreover, introducing some policies aimed at preventing the global warming problem can also be difficult to

accept by people. This is due to the fact that the costs of such policies are to be taken today, and the benefits for the planet and our living conditions can be felt in fifty years or even one year from now [70].

Taking this into account, some compromises could be necessary, but undertaking various ecological activities, initiatives and solutions, like the ones described in this paper, needs to continue, as it is crucial for the future of our world.

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