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MANAGEMENT OF THE RENOVATION OF MONUMENTS TO OPTIMISE THE BUILDINGS UTILITY VALUES AND ENERGY EFFICIENCY (CASE STUDY RZUCHÓW, POLAND)

Abstract: Historic buildings are an essential component of the national heritage, constituting the fundamental determinants of the cultural identity of each society. The protection and conservation of monuments are a manifestation of care and evidence of their responsibility. The way owners deal with historic buildings has its specificity. Management, protection, and sharing should follow the conservation rules defined by law and good practices. After World War II, due to Poland's historical, political, and socio-economic transformations, some historic buildings gradually degraded and lost their original functions. Devastated monuments are often considered redundant by society. Effective use of them for new functions allows society to preserve unique elements of the landscape and develop the economic and social potential of the monument's surroundings. The renovation and adaptation of monuments to a new function should be preceded by a multi-level analysis allowing for the sustainable revitalisation of the building. The diversity of types of monuments, their state of preservation, location, and the form of ownership significantly affect the procedure. This article aims to present a holistic approach to the renovation of monuments and sustainable management of these objects. The concept is based on the results of questionnaire research and considers conservation guidelines, pro-environmental solutions, utility value and the socio-economic potential of the monument. The survey conducted with the owners of the monuments described in the article is the basis for determining the conditions for the sustainable revitalisation of monuments. The survey results will help develop a management model for this process. Sustainable revitalisation is shown on an example of an adaptation palace in Rzuchów for cultural and scientific purposes.

Keywords: monuments protection, management of heritage, sustainable revitalisation, retrofitting, pro-environmental solutions

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Introduction

The long-term and complex process of shaping culture and cultural heritage is one of the fundamental factors in building the identity of nations. Each community's moral and legal duty is to protect and care for the evidence of the past. This article focuses on preserving architectural monuments, which are an essential element of cultural heritage. Jan Pruszyński (2001) defines *heritage* as "(...) the stock of immovable and movable things along with related spiritual values, historical and moral phenomena considered as the basis for legal protection for the good of a specific society and its development, and their transfer to the next generations".

From the above definition, it can be concluded that only objects under legal protection are included in it. In a broader sense, heritage is also the resources of old architecture that are not entered in the register of monuments. A broad understanding of heritage is crucial for the renovation process of many public buildings that exhibit historical or architectural value and have not been legally protected.

The protection of cultural heritage is guaranteed by international and national law. The primary Polish normative document is the Act on the Protection and Guardianship of Monuments (Ustawa z dnia 23 lipca 2003 r. o ochronie i opiece nad zabytkami). The Act defines the subject, forms and scope of protection of cultural goods. It regulates the principles of shaping monument protection programs, conducting and financing conservation works, and the activities of conservation services. The juxtaposition of the cited Act with other legislation implies the need to harmonise the protection of monuments with other values, principles and standards (Lis, 2020). The protection of monuments should take into account environmental protection, resource efficiency and energy efficiency. Restrictive conservation guidelines oppose the utility and ecological standards of modern construction, in which the implementation of new pro-environmental technologies is typical. In newly built facilities, pro-environmental solutions are standard and can be implemented without any obstacles. In the case of historical objects, especially those entered in the Register of Monuments, these activities require an in-depth, multi-faceted analysis, e.g. architectural, construction, economic, and social. Due to the risk of disturbing the historic building fabric and the composed historical space, the Polish conservation services often oppose using modern technologies. They rarely allow any significant interference in the material structure of monuments.

The implementation of ecological solutions in historical buildings depends on the dominant conservation doctrine in a given country. This is evident in the examples of Sweden and Norway. Comparing the standards of the energy performance of historic residential buildings allows the analysis of the advantages and disadvantages of both systems. In Sweden, the restrained implementation of environmental solutions makes it challenging to achieve the climate policy goals. In Norway, priority is given to environmental recommendations, which may reduce the value of existing architectural monuments (Berg & Donarelli, 2019). Guidelines for improving the energy efficiency of historic buildings often take the form of government documents or guides for investors.

An example of regulations at the national level is the guidelines for the modernisation and improvement of the energy efficiency of historic buildings developed by the Italian Ministry of Culture published in 2015 (Buda & Pracchi, 2020), as well as the guidelines of the Croatian Ministry of Culture of 2019 (Zloušić Idjaković et al., 2019). A different approach can be observed in Canada, where conservation services have issued guides containing indications of good practice. The Canadian guidelines are not normative, even though conservation services developed them at the national and regional levels (Accroître la résilience, 2016).

The restrictive conservation guidelines often discourage Polish investors, affecting buildings' soft comfort of use, low energy efficiency, and high operating costs (Renovation of a monument: nobility obliges, 2021). It results in a significant number of abandoned or neglected historical buildings. A chance for their preservation is sustainable revitalisation taking into account conservation guidelines and contemporary utility and environmental standards (Battisti, 2020). Giving new functions to historic buildings is an opportunity for their reconstruction while maintaining all the requirements of the applicable conservation doctrine. Adaptation to new utility requires the improvement of the functional values of monuments to modern standards in terms of comfort of use, energy efficiency and operating costs. This undertaking should be preceded by a thorough analysis of the existing factors and the revitalisation potential. Conducting these analyses solely based on conservation guidelines may discourage investors from renovating and adapting monuments to new functions. It is necessary to consider modern solutions to increase utility value, monuments' energy efficiency, and reduce future operating costs. It follows from the above that it is necessary to search for a compromise that would allow the preservation of historical values while increasing the value in use (Broström & Svahnström, 2011).

The multitude of aspects that appear at the interface between monument protection, economic development and functional improvement forces a holistic approach to cultural heritage management. For this to happen, the owners and managers of the facilities need to show great determination due to the limitations and high formal requirements imposed by the conservation services. Therefore, it is necessary to develop a model of management solutions to improve the functioning of the owners of monuments. The concept outline is part of the project "Application of pro-environmental solutions and new ecological technologies in adapting buildings under conservation protection on the example of the historic park and palace complex in Rzuchów".

Conservation of monuments and sustainable revitalisation

Proper understanding of the subject of sustainable retrofit requires the definition of the concept of monument conservation at the outset. "Conservation is aimed at healing, consolidating and strengthening the physical substance of the monument and its structure using appropriate methods developed based on natural sciences. The form of the monument should remain intact" (Arszyński & Tajchman, 1971). This definition was

quoted in the guidelines for conservation services issued in October 2018 by the Polish Ministry of Culture and National Heritage.

Conservation services in Poland, when issuing permits for works on monuments, are obliged to comply with the basic principles of conservation, including:

1. primum non nocere rules,
2. the principle of maximum respect for the original substance of the monument and all its values (tangible and intangible),
3. the principle of minimum necessary interference (refraining from unnecessary actions),
4. the principle according to which it is necessary to delete (and only that) what is destructive to the original,
5. the principles of legibility and distinguishability of interference,
6. the principles of reversibility of methods and materials,
7. the rules of performing and documenting all works according to the best knowledge and at the highest level.

The essence of monument protection is the preservation of historically or architecturally valuable material heritage. Objects that are well-preserved, unique or of priority importance for a given region are subject to the most restrictive conservation restrictions in interfering with their structure, surroundings and functions. According to the data as of 16 July 2021, the Polish registry sitecontains 78 789 objects under conservation protection (Rejestr zabytków nieruchomych, 2021). The palaces and manors, the subject of the research described in this article, constitute a significant group. Residential monuments are a very diverse group of objects, among which there are well-preserved examples of top-class architecture, as well as buildings of medium historical value in deplorable technical condition. For the latter, the method of rescue is sustainable revitalisation through adaptation to new functions.

The palaces suffered significantly due to the war and the Polish political system of the 20th century. The communist system ordered the nationalisation of estates with the area over 50 ha, which was associated with the expropriation of the owners of mansions and palaces. The facilities fell into disrepair, were rebuilt or were given new functions that devastated their historical values (Smoke, 2020). It is particularly evident in the case of nationalised rural estates and thoughtlessly rebuilt former German residences. In the latter, elements indicating the German origin of the building were often destroyed (Kozak, 2008).

The perception of monuments as objects of limited use influences investors' decisions, who therefore give up renovation activities. The consequence of this approach is the growing percentage of neglected buildings of historical and landscape value. From the conservator's point of view, the fundamental issues are the historical and aesthetic values and the antiquity of the object. The utility function is of secondary importance, which, however, cannot be ignored. For most former residences, adaptation to new, socially valuable functions is necessary for their survival (Pawłowska & Swaryczewska, 2002). The individual characteristics of the building determine the historical, artistic and scientific value of a monument, and the public interest dictates its protection.

Monuments are a testimony to the past and an essential element of the modern economy (Lis, 2020). One opportunity to preserve and effectively protect decaying residences is to increase their adaptation potential through solutions increasing the utility value of the buildings. The critical aspects are improvement of energy efficiency, optimisation of running costs, and improvement of the comfort of use.

One of the crucial reasons for the modernisation of historic buildings is the climate policy. The European Green Deal aims to achieve climate neutrality by 2050. One of the areas of activity is building and renovating in energy and resource-saving ways (The European Green Deal, 2019). European Union law defines energy efficiency standards for new and existing buildings (Directive 2002/91/EC). The directive allows for a derogation from the guidelines for objects under conservation protection, which aims to protect historical values. The investors' need is functional and economic optimisation, which means increasing utility value, maximising user comfort and reducing running costs. These needs are related to improving energy efficiency and the use of blue-green infrastructure in water management. Adapting monuments to environmental standards and maximising energy and economic efficiency is in the investors best interest. However, it is not obligatory for them, as stated in Art. 4.3 of Directive 2002/91/EC. The Polish Act on the energy performance of buildings (Ustawa z dnia 29 sierpnia 2018 r. o charakterystyce energetycznej budynków) presents a similar position. It stipulates that owners of buildings under conservation protection are exempt from the obligation to prepare energy performance certificates.

The research subject is the sustainable management of palaces and manors, constituting 6.84% of objects under conservation protection in Poland. It is the fifth-largest group in terms of the original function of the building. The largest group (27.69%) are residential buildings that face similar problems.

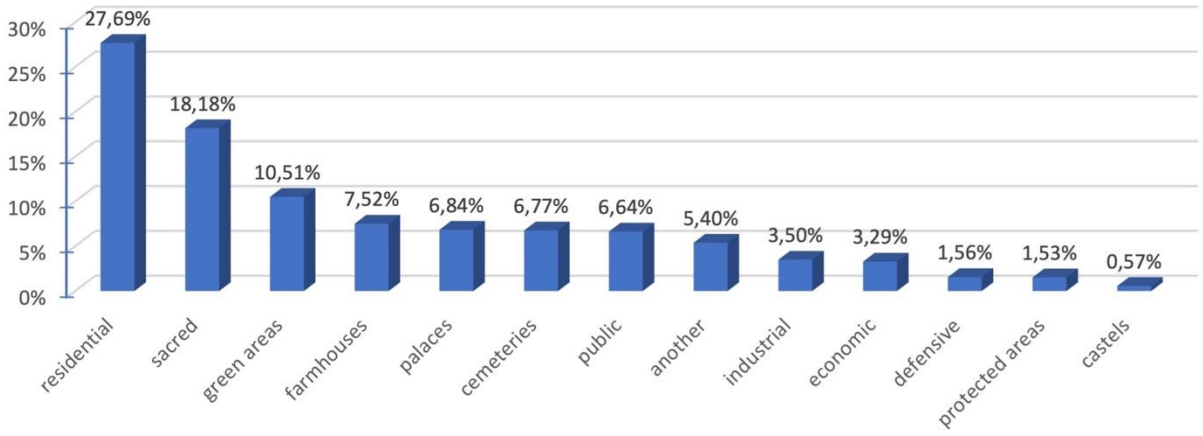

Fig. 1 Structure of the Register of immovable monuments in Poland according to the primary function
Source: work, based on Report on the conservation of immovable monuments in Poland, NID 2017

The sustainable revitalisation of historic buildings is a prerequisite for the adequate protection of monuments. For many of them, adaptation to new functions and raising the utility value by increasing energy efficiency and reducing running costs is the only chance for rescue. Due to the diversity of monuments and the complexity of the problems related to granting them new functions, there are no universal methods of monument revitalisation (Sowińska-Heim, 2018). Scientists, working with practitioners, analyse the renovation capacity of buildings in different areas. It is evidenced by the research projects undertaken, such as ENBAU "Energie und Baudenkmal" (Polo Lopez & Frontini, 2014), RIBuild – Robust Internal Thermal Insulation of Historic Buildings (Written…, 2020) and the Polish-Croatian project "Mitigation of climate change in historic buildings" (Mitygacja…, 2021).

Renovation management requires an individual approach and a thorough, multidimensional analysis. When planning the revitalisation or adaptation of a monument to a new function, the existing factors and the revitalisation potential of the building should be analysed. The method of assessing the revitalisation capacity of monuments developed by Terlikowski considers nearly 100 technical and non-technical sustainable factors. Technical factors, such as the structure of the building, necessary installations, energy demand, are compared with social, environmental, functional and economical aspects (Terlikowski, 2018). In-depth analysis allows for the application of solutions that do not adversely affect the aesthetic and historical values of the monument. A comprehensive, individualised diagnosis of the condition and potential of a building is necessary for the proper course of sustainable adaptation (Terlikowski, 2016). Therefore, revitalisation is a process in which it is necessary to verify the various conditions.

Material and methods

The analysis of the existing factors is the basis for determining the revitalisation potential. The basis for further activities is the determination of the future function and method of use. It enables to design solutions that raise the standard of building and optimise future operating costs. At this stage, the possibilities of implementing new technologies and pro-environmental solutions should be considered. In historic buildings, it depends on existing environmental and cultural factors that are the framework for sustainable revitalisation.

Among the issues to be acknowledged the following should be considered:

- historical conditions,
- state of preservation,
- the degree of conservation and the form of legal protection,
- the existing and potential functions of the facility,
- architectural values,
- natural features (topography, weather conditions, local climate, water conditions, potential and actual vegetation, forms of nature protection in the vicinity),

- landscape values, including scenic values (the physiognomy of the monument's surroundings).

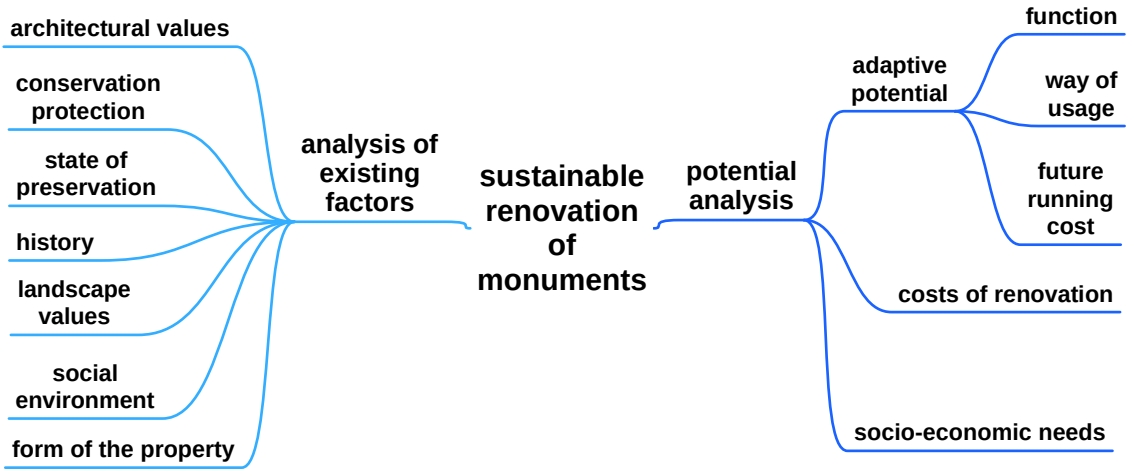

Fig. 2 The essential factors for sustainable revitalisation
Source: own work

The next stage of work is the analysis of available pro-environmental technologies that can be implemented in a given historic building, excluding unacceptable ones (Litti et al., 2013).

The overriding goal of monument conservation is to preserve its authenticity. This approach limits the catalogue of solutions that can be used in historic buildings. The activities authorised by the Polish conservation services are presented in a guide prepared by the employees of the Provincial Office for the Protection of Monuments in Olsztyn (Bakalarczyk & Szymański, 2018). The stage of designing the revitalisation of the facility, based on the catalogue of conditions, creates space for modern technologies. When planning work, should be taken into account:

- thermo-modernization,
- sources of electricity and heat,
- air exchange installations,
- water management.

The dynamic development of ecological technologies and new possibilities for the revitalisation of monuments encourage research on the degree of implementation of pro-environmental solutions in historic buildings. The results will allow the development of a revitalisation management model, taking into account conservation recommendations and environmental requirements.

The works undertaken by the author of this article include questionnaire research and the analysis of the obtained material in the context of conservation conditions. The conclusions of the study will enable the development of a model of sustainable revitalisation management. An extensive questionnaire was developed to examine the awareness and approach to sustainable retrofit of the owners of historic palaces and mansions for the research. In order to narrow down the research sample, a group of 300

residential monuments from all over Poland was selected. The questionnaire consists of 78 questions in six subject areas:

1. basic information and contact details,
2. the location of the monument and the characteristics of the surroundings,
3. state of preservation and technical condition,
4. building functionality – past, present and planned implementation of pro-environmental solutions,
5. relations with the social environment and local administration.

Results

The research discussed in the article is in progress, and its completion is scheduled for the third quarter of 2022. The expected research results will analyse the conditions favourable to implementing pro-environmental solutions and identify the most common barriers to using such technologies. They will also allow for the analysis of four aspects of the sustainable revitalisation of monuments formulated in the form:

1. analysis of conditions conducive to the use of pro-environmental solutions,
2. classification of problems related to the implementation of sustainable solutions,
3. statements of the benefits of using pro-environmental solutions,
4. analysis of the investor's relationship with conservation services, local authorities and the social environment.

The observations obtained during the survey will help develop guidelines for investors planning to adapt a historic building to a new function. The above aspects can be seen in the example of the palace in Rzuchów. The revitalisation of this facility is a case study of the comprehensive management of sustainable retrofit through the implementation of pro-environmental solutions in a historical building.

Defining market needs in pro-ecological technologies applicable in historical buildings allows for developing an innovative knowledge-based economy. The interest of the owners of historic buildings in improving the energy efficiency of the building and other pro-ecological solutions is the starting point for further considerations on the subject of sustainable revitalisation.

The palace in Rzuchów

The Palace in Rzuchów is a space for sustainable revitalisation. In this example, as part of the "Implementation doctorate" program, research is carried out on the application of pro-environmental solutions.

The residence in Rzuchów was constructed in 1888 by Heinrich Himml. The building was raised on a rectangular plan in an eclectic style. The façade was faced with yellow brick. Characteristic elements are the richly decorated windows frames topped with a semicircular pediment in the shape of a shell. There is a semicircular portal at the entrance supported by two columns, decorated with a cartouche with the monogram of the first owners. Decorated windows and dormers are placed in the mansard roof, covered with handmade copper tiles. The buildings usable area is approximately

1600 m^2, has four utility storeys: basements, representative level, residential level and attic.

The turbulent history of the palace led to far-reaching devastation. In 2010, the building was purchased by a private investor who established the Foundation for the Protection of Cultural Goods. Currently, the Foundation manages the building and conducts revitalisation activities, including renovation of the building and cultural and educational activities (Mackiewicz, 2019).


Photo 1-2. The Palac in Rzuchów 2018 vs. 2021
(Author: E. Mackiewicz)

Conservation works have been carried out since 2011, and their intensification took place in 2018–2021. Currently, the palace is undergoing a comprehensive retrofit aimed at its adaptation for scientific and cultural purposes. The basis of the adopted revitalisation program is an interdisciplinary analysis of architectural, historical, economic and environmental conditions. A bold and innovative approach will create an energy-independent building with high energy efficiency and comfortable conditions of use. The works started in 2011 took into account the use of pro-environmental solutions from the very beginning. The most important element is an innovative energy system based on photovoltaics and hydrogen energy.



Photo 3-5. Panoramic views of the palace, the roof containing a hidden terrace in the middle and the flat part intended for the photovoltaic panels, 2020
(Author: M. Giba)

Due to the poor technical condition of the roof structure, it had to be replaced entirely in 2012-2014. A decision was made to accommodate photovoltaic panels on the flat part of the mansard roof. Additionally, a recessed (hidden) terrace was prepared on the roof to hide the external ventilation and air conditioning elements. Thanks to this, modern technologies will not infringe the monument's historical, architectural, and scenic values. Renovation works are carried out not only to restore the splendour of the palace in Rzuchów but also to set a new direction of activities at the interface between the protection of monuments and environmental protection. The design of an energy-autonomous building characterised by zero emissions and ecological solutions in a historic facility indicate the synergy of environment and cultural heritage protection.

Discussion

For over ten years, the international community has recognised the need to integrate pro-environmental solutions with the renovation of monuments. It is evidenced by the topics discussed for years at international conferences such as the World Renewable Energy Congress (2011), Congreso Internacional Eficiencia Energetica y Edificacion Historica (2014). The protection of cultural heritage based on the principles of sustainable development is also reflected in the policies of the protection of monuments in individual countries. The examples of guidelines and guides cited above show different approaches to this topic.

An essential part of the research is the survey of positions presented by conservation services. At the turn of 2020/21, a letter to the Provincial Conservators of Monuments was sent. It was answered by 7 out of 16 respondents. The obtained answers emphasise the need for an individual approach and an in-depth analysis of the potential benefits and threats to the monument. Monika Bogdanowska of the Lesser Poland Provincial Conservator of Monuments presented an extensive position. She presented "a list of doubts and concerns regarding the threat to the historic – non-renewable – substance, the authenticity of which we are obliged to protect in the first place, because, according to the definition, it constitutes the basis for the value of the object". The use of the so-called pro-ecological solutions may lead to the destruction of monuments. "It is justified by a thorough observation contained in the letter of 4 January 2021, which concerns renovation and thermo-modernization activities of monuments in the Lesser Poland region. Using the example of applications submitted to the Office for the Protection of Monuments, Bogdanowska identified the primary areas of energy efficiency improvement:

- replacement of windows and doors,
- thermal modernisation of walls and horizontal partitions,
- assembly of new technical infrastructure (heating, ventilation, air conditioning,
- photovoltaics.

The long-term adverse effects of applying immediate thermal modernisation solutions, such as plastic windows and thermal insulation, are presented using the dry-light method, in which polystyrene or mineral wool are used. The service life of such

solutions is determined for 20–30 years, which from the conservator's point of view is an ineffective and harmful solution due to the necessity to dispose of the materials used. The issue of interfering with the structure of the monument through the use of technical infrastructure is also raised: "technical progress and constant changes in functions mean that technical innovations quickly turn out to be obsolete, another renovation and introduction of new devices are necessary".

The above restrictive approach softens the voice of Maria Fornal, the head of the delegation in Zamość, the Provincial Office for the Protection of Monuments in Lublin. Quoting the letter of 30 December 2020, "The Conservation Office accepts the use of renewable energy sources, blue-green infrastructure and information technologies in the process of adapting historic buildings to new functions, which will lead the monument to a good condition". She noticed that any interference and technology implementing "should be carried in a non-accidental and space-justified manner".

A positive attitude towards solutions that does not conflict with the principles of conservation protection is presented by Łukasz Konarzewski, the Silesian Provincial Conservator of Monuments. In the letter of 29 December 2020, he points out that solutions that "allow better use of monuments and the extension of their existence are not only acceptable but also recommended". A similar statement applies to the change in the way of use, which "contributes to the extension of the monument's life".

The Polish conservation services noticed that permissions for historical buildings retrofit should be carried out in the context of climate policy challenges and investors' needs. In 2020, two documents relevant to the sustainable revitalisation of monuments were developed. The General Conservator of Monuments has published guidelines for the protection of cultural heritage in the process of improving the energy performance of historic buildings (Guidelines ..., 2020). Assumptions have also been developed for the standardisation of conservation procedures, including the issuance of permits for photovoltaic installations in historic buildings, in the vicinity of a monument and protected areas (Marcinek et al., 2020). The document results from the National Program for the Protection of Monuments and the Preservation of Monuments for 2019–2022 (Monitor Polski 2019 item 808) postulate conservation standards and methods evaluation. One of the elements is the standardisation of conservation procedures in photovoltaic installations in historic buildings and their surroundings. In the light of the data provided by Bogdanowska, standardisation is necessary, as 80% of applications for the installation of photovoltaic installations in historic buildings are considered positively. The development of standards by the conservation services is a signal that applying pro-environmental solutions in historic buildings is gaining more and more importance in conservation practice.

The survey research cited in this article will make it possible to identify the needs of the owners of historic buildings in the scope of implementing pro-ecological solutions. The conclusions of the questionnaire will be an important voice in the discussion on effective and sustainable heritage protection. The position of owners and investors should be taken into account as an important factor in protecting monuments. Conservation services should consider the needs of administrators because the entry in

the Register of Monuments is a rigorous form of protection that interferes with the right to property (Lis, 2020).

The research results will enable the development of guidelines for investors who, by undertaking the renovation of monuments, plan to increase the utility values of buildings through the use of modern technologies. It will allow for improving communication between the investor and the conservation services, and at the same time, for more effective protection of the cultural and natural heritage.

Conclusions

Activities in the field of monument protection require intuition and specialist knowledge. In order to limit irreparable damage, the retrofit must be carried out according to conservation guidelines. In many cases, the investor's interest is limited by restrictive maintenance rules. The inability to increase utility values and reduce future running costs for many facilities means that the investor resigns from renovations activities, and in extreme cases, leads to the abandonment of the monument. Conservation services in Poland are beginning to notice the necessity to adjust the guidelines to the investors' needs while maintaining conservation standards and upholding the cultural heritage. The literature on the modernisation and implementation of pro-environmental solutions in historical buildings presents mainly an approach based on conservation guidelines. Moreover, many publications are devoted to technical aspects of thermal modernisation and pro-environmental technologies. The research undertaken aims to balance the conservation requirements with the needs of the owners and users of monuments. The analysis of the investor's needs as a foundation for revitalisation planning is the opposite of the current conservation approach.

The development of a revitalisation management model supports investors undertaking the renovation or adaptation of a historic building to new needs. It will be a tool that will facilitate the conscious analysis of the necessary factors and prepare consistent project documentation and effective work management.

Preparation of a guide containing tips and examples of good practices for investors/owners of monuments will optimise the renovation process. It will also contribute to an increase in the number of saved monuments, which, thanks to adaptation, will have received a new life. Thus, they become an essential harmonising element of the landscape.

Work on the management model is in the initial phase. The experience in the renovation of the palace in Rzuchów and the developed tools (database of residential monuments and research questionnaire) will enable a multi-faceted analysis of the conditions for the implementation of pro-environmental solutions in Polish cultural heritage sites.

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