Építés – Építészettudomány 51 (2023) 1–2, 139–161
DOI: 10.1556/096.2023.00081

AKADÉMIAI KIADÓ

Environment Protection – Monument Preservation

András Veöreös

Department of History of Architecture and Urbanism, Széchenyi István University, Egyetem tér 1, H-9026 Győr, Hungary. E-mail: andras.veoreos@gmail.com

ORIGINAL RESEARCH ARTICLE

Received: 19 October 2022 • Accepted: 30 January 2023
First published online: 27 February 2023

SUMMARY

The preservation of existing buildings is desirable not only for the purpose of saving architectural values, but equally important is that it is an environmentally friendly–environmentally conscious activity as well, since by renovating existing houses less waste is generated, the environmental impact from transport decreases, the material and energy invested in the structures already built do not get lost and no additional energy is needed for demolition.

KEYWORDS

preservation of monuments, sustainable use of built environment, long-term interest, non-renewable research, monument value, re-utilization, environmentally friendly solutions of historic architecture, renovation of old buildings

1. INTRODUCTION

It is worth starting the discussion about the relationships between conservation of monuments and environmental protection by recalling the work of Francis of Assisi, an important figure of world history instinctively associated with both areas. One of the first acts of Francis was to restore a ruined chapel near Assisi, to fill the abandoned building with function so he did conservation and environmental protecting work at the same time by means of reusing an existing building. Due to his back-to-nature mind expressed also in the Canticle of the Sun, Pope John Paul II inaugurated him as Patron Saint of the Environment.

The aim of architecture, human constructing activities is, as in each period of history, to create spaces which can fulfil functions determined by communities or individuals and include people and activities. In order to do this, every community and every era uses the avail-

able building materials and technical solutions. Building activities can be implemented by means of erecting new buildings or reusing existing buildings or parts of buildings or only building constructions or materials. The present study compares the environmental, sustainability issues in the reuse of existing buildings, building constructions (sustainable application of built environment) with the other important social motivation of preservation, conservation of monuments.

In the fields of environmental protection and preservation of monuments it is common that both of them prioritize the long-term interests of a larger group of society instead of personal, short-term economic interests. Listed buildings, similarly to other, non-renewable resources, can only be preserved with careful attention, and without this, they will continue to decline. However, if preserved, it will improve the life quality of the users in the long run and it can also provide economic profits. The idea of joint protection of the two areas is not a recent one; in 1972, the common desire to preserve cultural and natural heritage gave rise to the concept of Outstanding Universal Value regarding the World Heritage and the assets proposed for protection.[1]

The notion of an unutilized property for many means ruined, at least broken-down, unoccupied buildings unable to satisfy comfort demands of today, which – for economic application – have to be demolished and replaced with new, modern, comfortable buildings which can be cheaply operated and where the members of the builder community feel comfortable. It is worth, however, contemplating if the factors establishing human welfare are really restricted to cheap building and low operating costs or – as architecture thinks of itself – a building is a technical creature and a work of art at the same time, so it has an important effect on the system of emotions of the persons using it. In the present study an attempt is made to evaluate the material existence of old buildings together with their effect on the human system of emotions. In the context of the utilization of buildings the idea of complete demolition only rarely arises in connection with listed[2] monuments since Hungarian regulations (in principle) do not allow their total demolition. Preservation of monuments focuses on the intention to protect buildings on an emotional basis: *"Monument value includes all buildings, historical gardens, historical burial grounds or monumental areas as well as their remains, additionally their ensemble or system duly belonging together which are historical, artistic, scientific and technical monuments of national importance from the point of view of the past of Hungary and an awareness of nationality of the Hungarian nation or other community, together with components, accessories and built-in fixtures or in relation to certain named values of them."*[3] At the same time, the protection of old buildings, before the beginning of monument preservation in the 19th century, was based primarily on practical aspects: buildings or parts of buildings built by previous generations were simply integrated into the new ones for practical reasons – this is why we find medieval parts in Renaissance-Baroque and Baroque parts in buildings from the 19th century *(Fig. 1)*.

It could be done because the technical requirements set for buildings (not to collapse, not to leak, thermal insulation requirements) were essentially unchanged for centuries, only beginning from the second half of the 20th century has there been a radical change (mainly of administra-

[1] UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage, 1972. In *Karták könyve.* 2002. 343–353.

[2] The protection of the monumental values is governed by Act No. LXIV of 2001. Law on the protection of cultural heritage, and Gov. decree No. 68/2018. (IV.9.) on the regulations of cultural heritage management.

[3] Act No. LXIV of 2001. Law on the protection of cultural heritage 7. § 17.

Figure 1. Intertwining centuries on the façade of a historic house.
The building was rebuilt using parts of the previous building (Photo: the author)

tive character) in this respect. Today's environmental problems turn attention again to the importance of preserving the existing stock of buildings, to the rational analysis of and practical approach to the issue. Preserving an existing building, keeping the built-in materials in a conservation-oriented way requires far less energy investment and is much more advantageous from a waste management point of view than a demolition–new building alternative, which is otherwise more convenient, therefore more advantageous, concerning the momentary, short-term economical aspects.

Naturally, due to space limitations, the present study cannot cover the topic in depth, it can only focus on raising the most important problems of the field.

2. IDEOLOGICAL BACKGROUND OF PROTECTION OF MONUMENTS

"The present can only be built on an appreciation of the past" – said István Széchenyi.[4] Based on the thought of the Greatest Hungarian it can be stated that preservation of monuments is not a goal in itself. Activity in monument preservation goes far beyond saving the materials and structures of buildings so it is an important means for society to build a livable future on the basis of the past. It requires the collective and coordinated work of several players. Protection of values can be achieved by close cooperation between the owner (investor), designer and specialized planners, researchers and authorities.

The healthy identity of society and of the individual within it needs the roots, the past and knowledge of these. Tangible memories and evidence of our past are monuments produced by the previous generations with human effort. In today's wording, the expression "heritage management" is often used but in addition to the protection of monuments, it also includes the protection of archaeological relics and movable cultural assets. The concept of preservation of the built heritage, however, covers the protection, conservation and utilization of all buildings, edifices that can be kept within reasonable frames. Preservation of old buildings, monuments is a social activity based on scientific foundations, accumulating, and using experiences of centuries, for the benefit of the next generation, which goes far beyond the current economic aspects of using buildings in the long run.

The roots of professional preservation of monuments date back to the middle of the 19th century, when the European states awakening to national consciousness tried to discover their self-identity in their past.[5] Historical research, which had been present already in the 16–18th centuries, became more and more scientific, and the demand for revealing the memories of the past resulted in the formation of new scientific branches (archaeology, art history). The explored past brought along recalling the historical forms in arts and in architecture as well. Two artistic styles of different forms and patterns arose from the same social inspiration: classicism using the ancient forms and romanticism rooted in the Middle Ages. The efforts to use the forms accurately required getting familiar with and researching the "original" medieval and ancient memories, which later led to a desire to preserve them as the physical evidence of the glorious national past, as objects propagating the century-old or a thousand-year-old history of the nation. The earliest document summarizing the principles about restoration of monuments, the Carta del Restauro, was published in Italy in 1881. The principles related to the restoration of monuments were summarized by Camillo Boito. These principles lived on in the Italian monument protection law drafted by Gustavo Giovannoni in the 1930s and in the Athens Charter of 1931.

The internationally followed principles of modern monument protection were set out by the Athens Charter[6] of 1931 and the Venice Charter[7] of 1964: *"Imbued with a message from the past, the historic monuments of generations of people remain to the present day as living witnesses of their age-old traditions. People are becoming more and more conscious of the unity of human*

[4] The sentence can be read on the Székely gate next to the railway station building of Hidegség, which is currently unused according to its original function.

[5] The background of preservation of monuments, development of organized monument protection is tangibly described in Hungarian by Gerő 1959, Császár 1983 and Román 2004. At the international level, the most important summary is given by Jokilehto 1986.

[6] *Karták könyve* 2002. 13–15.

[7] *Karták könyve* 2002. 13–15.

values and regard ancient monuments as a common heritage. The common responsibility to safeguard them for future generations is recognized. It is our duty to hand them on in the full richness of their authenticity."

In Hungary, Act No. LXIV of 2001 on the protection of cultural heritage (Kötv.) lays down the most important rules of the protection and preservation of monuments and archaeological sites.

So far, in line with international trends, the preservation of monuments has become part of heritage management, but it is still important to ensure that this activity is adapted to its specificities. While heritage management is a general activity aiming at broader intellectual culture, the most important aim of monument protection is to preserve protected buildings in their material (thus to serve heritage management). Monument preservation sees the building not only as an architectural work, but also as an authentic historical document. The activity range of monument preservation has broadened both in time and space during the last one and a half century. While initially only ancient and medieval monuments were considered as value, today also Renaissance, Baroque, classicist, Romantic, historicistic secessionist (Art Nouveau), early modern and sometimes even buildings from the second half of the 20th century are treated as monuments. Spatial growth means that instead of the protection of one building today monument complexes, protected parts of settlements, moreover, even historic regions including several settlements are mentioned.[8]

The need to preserve "antiquity" in today's society, which can hardly give up comfort, has given birth to a kind of antiquated contemporary architecture, copying traditional forms, but not respecting the old building structure as a historical document. As a result, medieval castles that were destroyed centuries ago are being rebuilt in Hungary, but we can also mention the reconstruction of the historical buildings of the Buda Castle with modern structures, more or less identical in form.

By preserving and utilizing old buildings and constructions, by using local building materials and traditional building technology, heritage management contributes not only to the protection of built environment but to the environmental activities in general. By means of traditional, artisanal building techniques, monument protection supports society's mission to create jobs. From an environmental point of view, it is naturally irrelevant if these buildings are legally protected or not, as the preservation, renovation instead of demolition, and building of non-protected buildings can be performed in the same way.

In connection with the preservation and sustainable utilization of the building stock the emotional impact of old buildings on society is a non-negligible issue as well. Sustainability should be about improving the quality of life, about healthier, more fulfilling human lives. In relation to buildings this aim cannot be entirely achieved by means of decisions based on purely rational considerations (e.g. to reduce gas bills), excluding the human emotional side.

There are basically two reasons for renovating old buildings: to improve the technical parameters because of run-down conditions or due to the need for modernization, or because of the emergence of new functional demands. Economically, renovation is a value-adding investment. In order to be able to interpret the value-adding effect of renovation, it is worth analyzing the concept of value in connection to historic buildings. The still effective value categories relating to historic buildings, which can actually be applied to any building, were drawn up by Alois

[8] Máté 2018. 43–49., Act No. LXIV of 2001 on the protection of cultural heritage, § 38.

Riegl, an Austrian art historian at the beginning of the 20th century.[9] He basically divided the values of a building into two parts: present value (Gegenwartswert) and historical value (Vergangenswert). Present value includes the use and artistic values of a building, while historical value means the antiquity (Historischer Wert) and memory values (Gewollter Erinnerungswert). Use value is determined by the location, size and technical state of the building. On the other hand, artistic value means the aesthetic characteristics of the building, which can be determined in a much more subjective way. What they have in common is that both of them can be reduced and increased artificially, since the technical state can be improved, the artistic, aesthetic value can also be changed and the value of the building can be increased by means of added artistic values. In contrast, historical value can only be artificially changed in a negative direction, it cannot be added to, it can only be subtracted from, since the antiquity value only increases over time, while the memory value can be attached to some significant historical event or person and this, too, only becomes a value after a period of time.

Among the above values, from an economic point of view, the use and artistic values are easier while the antiquity and memory values are more difficult to interpret. Nevertheless, the countries of the "civilized world" have maintained educational institutions and research institutes, regulated the protection of monuments with legal means, spent money and energy on preserving old buildings for about one century and a half. The preservation of old objects, buildings is legitimized by the subjective, emotional side of individuals, since the restoration of ruined, deteriorated materials, dealing with buildings of lost functions cannot be rationally explained, from a purely material and economic point of view.

The reason for the deterioration of historic buildings is the decomposition of the building materials used. Due to fungi and insects settling in it, under the impact of moisture or the sunshine, the wood becomes destroyed. The metal elements get rusty, the structures made of stone, bricks, concrete and plastered surfaces are ruined by moisture and the dissolved salts leaking in the cracks or creeping into the capillaries. Material is not eternal. Nevertheless, in addition to the physical ageing you can often see morally or purely administratively aged buildings as well.

Moral ageing means primarily the loss of function of a building. There are many architecturally or artistically valuable buildings, which no longer serve their function justifying their creation, and in many cases new, fashionable buildings squeeze out the old buildings built in an outdated style. In addition, a character which is typical of the whole society of the 21st century is added: lack of respect for old things. An old object (building) is often considered a useless junk even if it can be excellently matched to its purpose in its original form or rebuilt even today. In many cases, the loss of old buildings and building elements is caused by the intention to install a modern building structure without examining the preservation of the old structure.

An important obstacle to the utilization of existing buildings is an unreasonable regulation which disregards the aspects of value preservation and environmental consciousness and is based on responsibility drift.[10]

In many cases our old buildings apparently cannot meet the present standards of load bearing capacity or fire protection. Although based on practice and technical survey these buildings are in working order, in several cases it is necessary to replace or rebuild these buildings or con-

[9] Riegl 1903.

[10] About the authorities for the monument preservation see Veöreös 2021. 23–40.

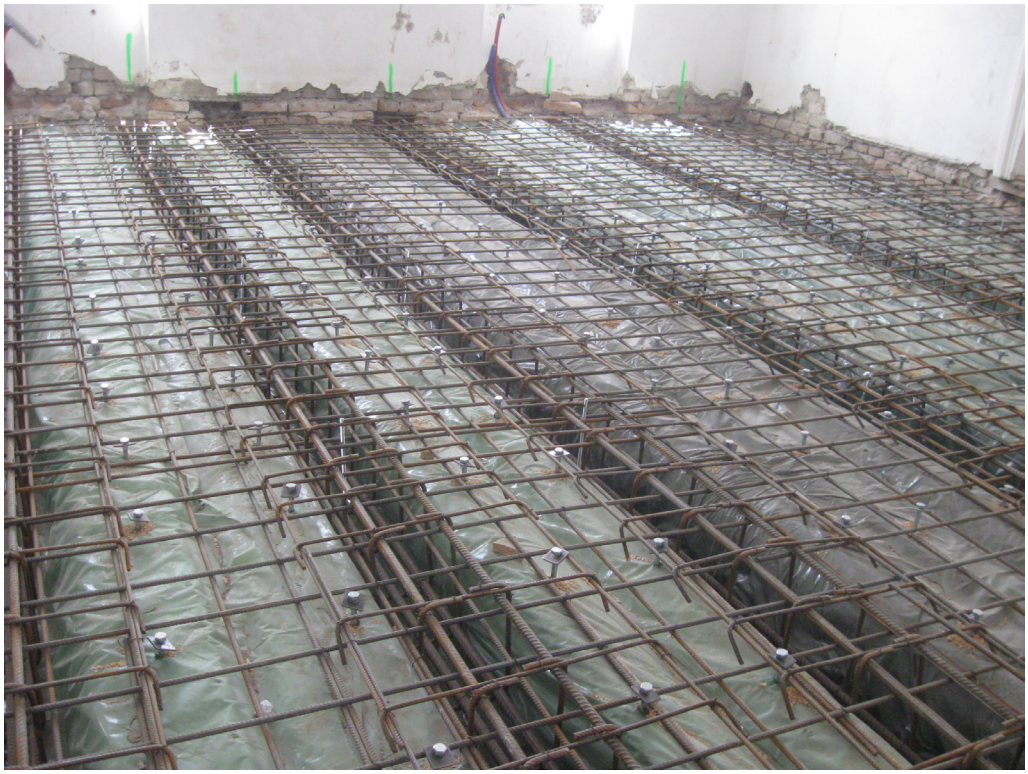

Figure 2. Administrative obsolescence. The hundred-year-old wooden floor meets requirements both technically and functionally – yet it is doomed to be demolished because it cannot meet administrative terms (Photo: the author)

structions at the expense of great energy investment. This phenomenon is named administrative obsolescence *(Fig. 2)*.

Considering that monument preservation is a combined process, its effects on the economy can be evaluated only in a complex way, taking the long-term effects into consideration. It is worth reviewing the environmental impact of monument preservation in terms of the building materials and building technology used, as well as the reusing aspects of certain building types.

3. EFFECTS OF SETTLEMENT STRUCTURE AND URBAN FABRIC

The structure of a historic settlement (its network of streets and plots), its oldest heritage as the least varying historical element is one of the most important monument values. The development direction, transport and subsequently the magnitude of environmental load caused by traffic are basically determined by the settlement structure. The urban fabric of historic towns,[11]

[11] Act No. LXIV of 2001 on the protection of cultural heritage, § 39.

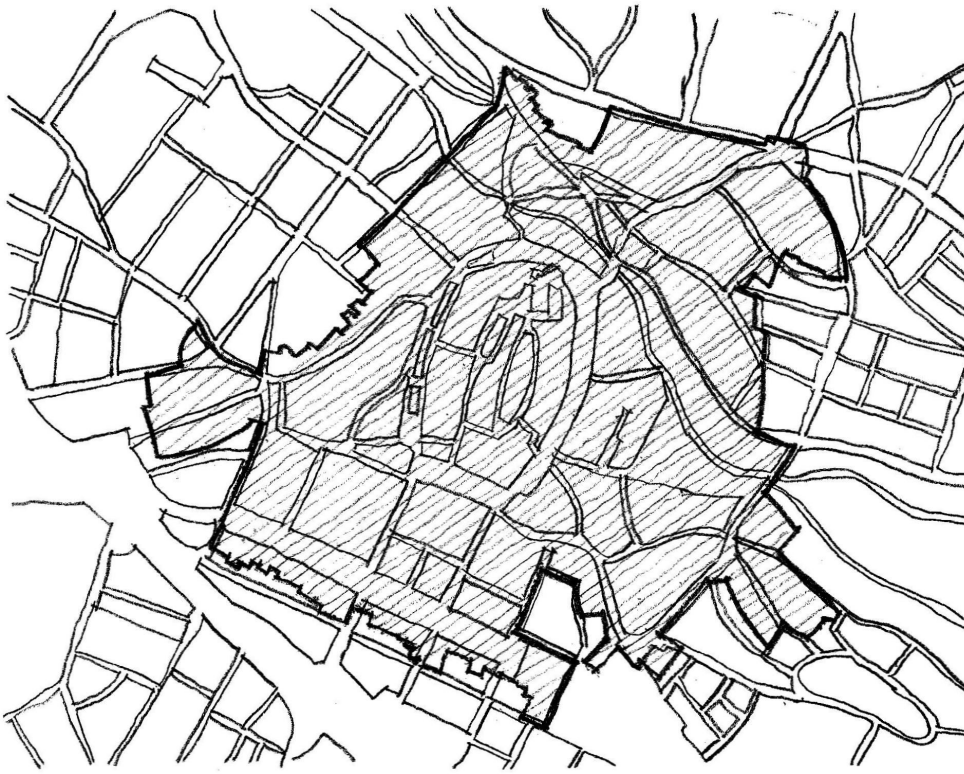

Figure 3. Site plan of a historic downtown. Narrow, winding streets, densely built-up areas. It severely restricts transport options, but it is also an important monument (Drawing: the author)

developed for centuries, is sometimes listed, which can significantly slow down through traffic and affect the accessibility of central destinations *(Fig. 3)*.

The width of the streets is fixed; they cannot be widened between existing buildings because the limiting walls are the protected buildings. In several cases there is not enough room for two-way traffic or for separating the motor and pedestrian traffic nor for developing bike paths; it is particularly difficult to build up a multi-lane line for the fast motor traffic. The line of the streets in an organically developed settlement structure is winding making the transport of larger vehicles difficult. Because of these facts, downtown streets cannot become the main transport arteries of towns, today's ever-increasing traffic has to go on other routes.

Another environmental point of view is the size and location of green areas in a settlement. Deriving from the historic city structure the possibility to develop new green areas in these inner settlements is rather limited, green areas can be formed primarily by means of alleys located in streets, on squares.

However, it should be noted that the compact, dense development of a historic settlement is much more cost-effective than modern, sprawled suburbs (garden cities) *(Fig. 4)*.

In historical settlements all the necessary functions (housing, shops, services, culture) can be found in the center, usually within a walking distance, making a car-free, much more sustainable life form possible. The settlement structures developed in the course of history have been re-

placed by modern systems designed according to the traffic needs only beginning from the 20th century. Among the planned cities and districts of the 20th century we can find economically sustainable settlement parts which are designed in a complex way. Good examples are the housing estates built in Hungary in the sixties and seventies, where in addition to housing you can find several other functions for life (commercial, educational, servicing institutions, parks, etc.). In contrast, the recent developments in residential districts are incidental, with investors only looking to maximize profits.

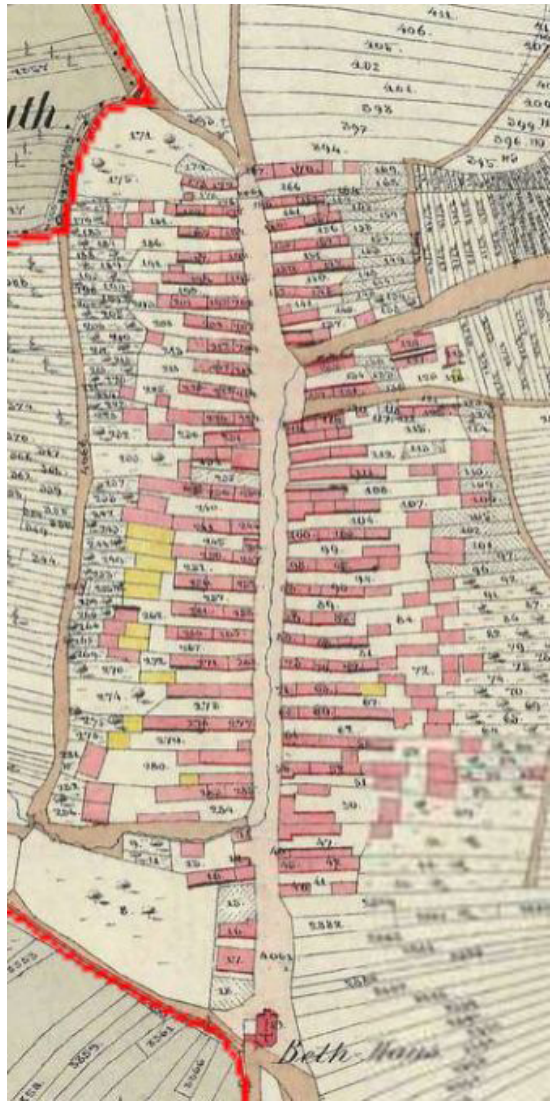

Figure 4. 19th century map of a historic village.
The compact, dense housing is excellent in terms of both economy and sustainability
(Source: 19th Century map of Hungary. www.mapire.eu [Accessed 1 November 2021]).

In a town, you can get around on foot or by vehicle (scooter, bicycle, car, public transport). The most important long-distance means of transport is railway. Each form of transport also raises specific environmental issues.

Freeing historic downtowns from vehicle traffic is befitting the historic town and provides adequate space for pedestrians to use the town functionally and to take in the townscape by walking and stopping every now and then along the streets. By restricting car traffic and developing pedestrian zones, the increasing pedestrian traffic results in higher utilization rate of city shops, restaurants and pubs and in the long run it will help to fill the historic city centers – which lost their function – with vitality. To this end, municipalities can apply various legal and economic incentives *(Fig. 5)*.

The key to affordability of downtown pedestrian zones is the accessibility of the downtown by public transport and bypassing parking. Urban public transport mostly passes through the center so access to the downtown is generally provided, while parking in historic city centers is usually difficult. This situation can be solved by means of building underground parking lots or multi-story car parks requiring considerable resources. This is why it is important to develop livable, walkable towns and neighborhoods in historic towns by concentrating functions.

Figure 5. Making local downtowns livable and attractive is a joint task of local businesses, the population and the municipality. The flower stand and plant in front of the shop are an opportunity for the actors to cooperate: the municipality provides the flower stands and the businesses buy the plants. Instead, many municipalities see it only as a way of collecting public space charge (Photo: the author)

The most environmentally friendly means of transport to cover longer distances within a settlement is the bicycle. Its safe use, however, requires a bikepath network well separated from vehicles and pedestrians. In larger cities many people choose a car for daily transport due to the lack of conditions for cycling. Environmentally friendly cycling can easily be integrated in the historic urban fabric, but special attention has to be paid to embedding the accessories of the bikepaths and bicycle traffic (traffic signs, resting spots) in the historic environment.

Motor vehicles generally have a rather high environmental impact on both the natural and the built environment. Noise pollution affects the natural environment more, but the issue of air pollution and vibration is quite a detrimental factor with consideration to the building stock too. The direct deposit of pollutants on buildings is local, the damaging effects of acid rain caused by pollution arise countywide. Polluted air causes a premature destruction in the traditional building materials and damage in or destruction of the monuments' values. Salting of roads is also in the interest of transport, but it leads to damages in buildings.

A typical urban problem is to solve parking and car storage. The increasing number of underground parking lots and multi-story car parks in historic downtowns attenuate this problem, but a solution could only be achieved by making alternative forms of transport (public transport, cycling) attractive and overcoming people's love of comfort. In historic settlements, the construction of underground car parks is often hampered by archaeological obstacles, while multi-story car parks are difficult to build from an urban planning point of view. Parking problems can be alleviated, for example, by providing short-stay (Kiss & Drive) stops near schools to avoid dangerous stopping of vehicles on the road, pavements or bikepaths.

By increasing the popularity of urban public transport, car traffic, which damages the historic downtowns, might certainly be reduced. The utilization rate of public transport can surely be increased with the introduction of supply-side schedules and favorable fares (free transfer, daily ticket, book of tickets, combined railway ticket).

Environmentally friendly, cost-efficient railway transport has played an important role in connecting towns and handling traffic from outside since the middle of the 19th century. In addition to their role in transport, the railway network, engineering facilities and buildings belonging to the railway are also important monuments of cultural history, which are worth reserving. In several cases, the railway network considerably influenced the development of city structures because the railway lines separate the districts off from each other and the large railway stations are independent organizing buildings.

The first interregional tram-railway line between Szeged and Hódmezővásárhely has been operational in Hungary since 2022. It provides a direct, environmentally-friendly, non-stop connection between the two city centers.[12]

4. ECONOMIC USABILITY OF BUILDING TYPES

In the course of history, considering the large number of buildings, practically neither material use nor building technology changed until the beginning of the 20th century and people's demand for comfort in buildings remained unchanged as well, so the comfort level of the buildings built in the Middle Ages–modern era was convenient until the end of the 19th century–middle of the 20th century.

[12] Vörös 2021. 2–3.

During the last decades, however, an extreme increase can be noticed in the level of expectations, tolerance of society is lower and lower, and the demand for a comfortable life is higher and higher. At the same time, the nature of manual labor has changed as well: human labor is increasingly being replaced by energy-intensive machines. A comfortable lifestyle and the buildings serving it place a much greater burden on the environment than traditional houses both during their construction and operation and at the end of their life cycle as well.

As regards the compliance of buildings with external environmental impacts, the environmental impacts arising due to climate change which were not typical at the time of the creation of our historic buildings also have to be mentioned. Extremely big temperature fluctuations even within a short time, extremely strong winds and sometimes flood-like rainfall all have an impact on historic buildings which could not have been anticipated and considered when they were built.

Excessive heating of buildings – although a bit less polluting – consumes lots of energy, but even more energy is demanded by cooling in the summer, often only due to the lower and lower tolerance level of people. Saving energy justifies the thermal insulation of existing buildings. However, it is worth calculating the payback period for the money and energy invested in insulation. In the case of several monument buildings subsequent frontal insulation can lead to irreversible loss of image that is also a loss for the townscape and even for the whole community. From a thermal point of view neither frontal insulation nor the replacement of doors and windows approximates the profit generally achievable by means of heat insulation of uninsulated attic floors, which generally does not damage the monument's value. Regarding cooling and air-conditioning it can be said that in the traditionally built thick-walled, vaulted buildings there is almost no need for artificial cooling, the thick masonry constructions can provide favorable thermal conditions in themselves, but it is worth carefully studying the natural ventilating solutions of public buildings of the 19th century.

For new buildings the energy-efficient design is already an essential requirement. The same heat insulation capacity cannot be expected of houses built with traditional structures, but the heat insulation capacity of old buildings can be improved in several ways. The largest cooling surface of the heated spaces is the ceiling, so the most important thing is to improve the heat insulating capacity of the roof-slabs, but in case of an overall renovation, thermal insulation of the floor structures being in contact with the ground is similarly important *(Fig. 6)*.

The heat insulation capacity of the building can be significantly improved by renovating and fitting the windows, installing sealing profiles, possibly by building in specially coated glass.[13] Installation of multi-layer thermal insulating glazing causes a problem because of the large weight of the glass since the profiles and hardware sized for lighter glass cannot support the larger weight so the window has to be rebuilt. It is important to note that the window surfaces of historic buildings are proportionally much smaller than those of modern houses, so the heat loss on the window surfaces is less significant when the whole building is considered as a unit.

Thermal insulation of the plastic, articulated façades or the timber-frame (fachwerk) houses widely used in Western Europe with an external insulating layer cannot be realized without damaging the monument values. Taking off and then reproducing sections on the heat insulated façade are incompatible with the principle of preserving the monument in its material. Thermal insulation on the internal side can be an alternative, a disadvantage of it being that the work has

[13] Ódor 2014.

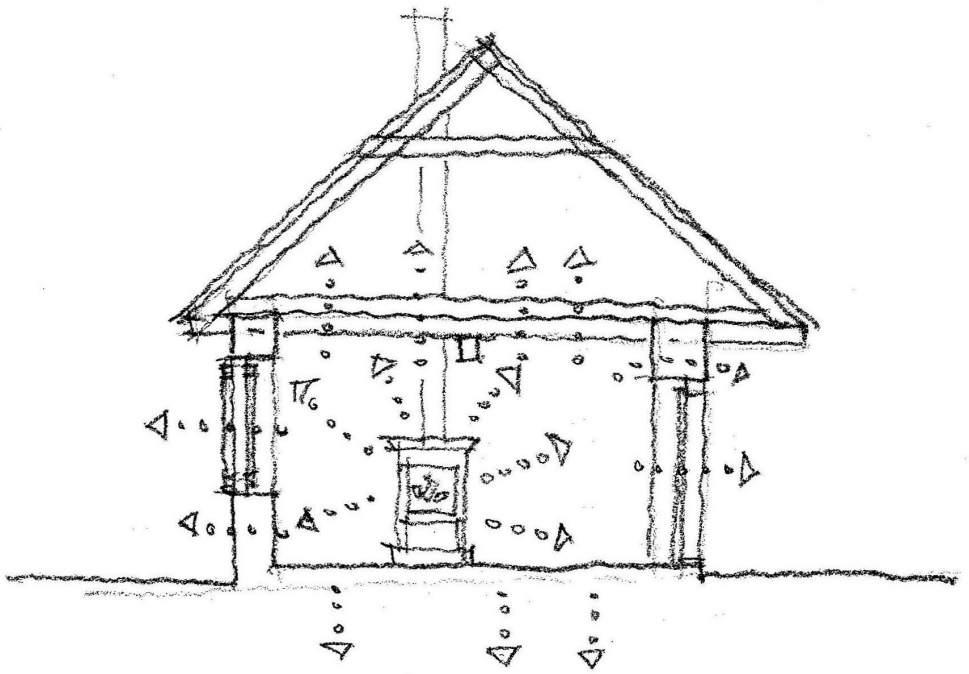

Figure 6. Thermal losses of a building built with traditional structures. The most important thing is to insulate the roof-slab, but it can be easily repaired without damaging the monument values. Thermal insulation of façades is more difficult to solve. The thermal insulation capacity of the doors and windows can be significantly improved by renovating and fitting the windows and possibly replacing the glazing (Drawing: the author)

to be carried out in the interior space of the building and the useful ground space is reduced by the strip along the wall occupied by the insulation.

For insulating a building, the most important aspect is to maintain the compatibility of each structure. Disruption of the harmony between the structures can easily lead to development of thermal bridges, which can cause condensation that is damaging to health and the structure.

Energy efficiency can also be significantly improved by upgrading the "input" side, installing more efficient boilers or environmentally friendly energy sources.

Renewable energy resources: wind turbines, solar panels, both in nature and in the urban landscape, are novel and not part of the historic townscape, so in the case of protected settlements or districts it means that their use requires careful preliminary planning. Placed in a way that they are not visible from the main view of the protected buildings, for example in the side of the internal courtyard, their location is generally acceptable – the question is if it is feasible concerning the orientation of the solar panels. According to a professional guideline of the State Secretary for Architecture of the Ministry of Construction and Transport dated December 8, 2022, *"solar panels may not be placed on individually protected monuments, in the immediate vicinity of the monument, together with the monument (...). No solar panel can be placed in an area of historic importance in a way that affects the visibility of the territorial value.*" Due to the significant size of the structures, wind turbines can be visible even from a long distance, their

Figure 7. A windmill placed in the main view zone of a high-priority building in a World Heritage Site (Photo: the author)

location in a protected, cultural landscape is allowed only after examining several aspects, and they should not be placed in the most important view zones *(Fig. 7)*.

In smart cities evolving with the technological development significant energy saving can be achieved by means of information flow, the optimized utilization of research results.

Reasonable preservation of real estate is one of the important pillars of long-term sustainability, environment protection. And the fundamental condition for the economic maintenance of the buildings is that they are in use. As a result of their architectural features, the majority of the monuments can be (or have been) restored, with many buildings being used for purposes different from the original. In the following, the relationship between value preservation and the environmentally conscious utilization is reviewed with consideration to the monuments and old buildings, by monument type.

4.1. Sacral monuments

A significant part of the listed buildings falls into this category. Churches, monasteries, synagogues, vicarage-parish buildings form the largest part of monuments but the roadside sculptures, stone crosses, historic churchyards can also be listed in this group. In Hungary, churches of the Christian communities mostly operated according to their original function, their use is

usually solved. Synagogues, which lost their communities after World War II, usually get utilized – if they had found a new function – as buildings for cultural purposes. Buildings of sacral purposes but not built directly for liturgical purposes and having lost their function, e.g. monasteries, vicarages, can be utilized mainly as residential buildings, accommodation buildings or public buildings. Buildings in cities or tourist-favored locations can be easier utilized for such purposes than those in villages with a decreasing population.

4.2. Castles, open-air museums of ruins

In the case of our castles – mainly of medieval origin – that remained in ruined form and open-air museums of ruins showing typically Pannonian memories their practical utilization as buildings is not possible, the function of the buildings in them is to operate as tourist attraction or event venues. Their operation requires regular maintenance, i.e. energy investment. The less expensive, value-rescuing preservation of the archeologically excavated ruins is covering them with earth.

4.3. Palaces, mansions, manors

The larger ones of the imposing rural residential buildings of the nobility also lost their function during the social regrouping after World War II. Some of the buildings have been reused as museums and cultural buildings, and most of them are still utilized as such, financed by tourism revenues, program implementation and generally from supplementary subsidies. However, schools or social institutions have been housed in many buildings. These institutions generally do not have the required funds for the operation of the obsolete buildings; modernization of the buildings, renovation of the engineering systems and electrics, reduction of energy consumption are important tasks. The question is, however, how these developments can be synched with the interests of the monument. Replacing historical doors and windows instead of renovating them, placing solar cells on visible roof surfaces, thermal insulation of the façades can be realized only in a very careful way, following a thorough preparation and planning without damaging the values of the monument.

Smaller mansions can be utilized as residential buildings.

4.4. Historic gardens

The historic gardens are typically associated with palaces, but also urban parks can be found in this category of protection. Their most important role from an environmental point of view is due to their aging flora. Preservation of the green surfaces covered with vegetation plays an important role in the livable, sustainable development of settlements.

4.5. Residential buildings

Historic residential buildings can be diverse in size and location as well. The scale ranges from rural vernacular houses to the multi-story, urban apartment buildings.

Vernacular monuments

The residential-farming lifestyle that brought the rural housing stock to life practically disappeared in Hungary. Both the historic plot sizes and the building types are morally obsolete. Preservation is made difficult by the fact that the village buildings were almost solely built from local, natural, cheap but at the same time extremely vulnerable building materials, and without continuous maintenance they deteriorate extremely quickly, without regular use and care, physical deterioration of these buildings is almost immediate. The farm buildings belonging to the vernacular monuments also lost their function due to the disappearance of animal husbandry and farming, their maintenance and re-utilization is not easy.

Special professional guidelines have been developed for the specific issues related to the preservation of vernacular monuments.[14]

However, the way vernacular architecture is thought of is extremely significant from the sustainability point of view, considering material use and architectural design. By using local, natural, slightly modified materials (earth, wood, reeds) cheap, sustainable, environmentally friendly buildings with no harmful substances can be developed, so it is (would be) very important to know and adopt this way of thinking.

Urban residential buildings

The urban residential buildings – whether they are single-story citizens' houses or multi-story apartment houses with court and open corridor – generally keep on operating according to their original function as residential buildings. Opening-separation or floor plan rearrangement of the flats can be realized easily without damaging the values. In our experience, an extreme increase in the number of flats, and thus the emergence of residents with no emotional attachment to the building, is not favorable for its long-term survival. Regular maintenance fails to happen resulting in the destruction of values in addition to the deterioration of technical conditions.

For economical operation, the building has to be treated as a complex unit in all cases. The common, frequent procedures (replacement of doors and windows in some flats, thermal insulation of some sections of the façade, mechanical modernization of some flats) cannot effectively improve the energy performance of the building and they usually endanger the monument value as well. Disunited property relations generally make both professional and sustainable renovation difficult. From the point of view of energy efficiency, efficient solutions not endangering the monument values have to be underlined: to preserve, renovate and fit the – mainly two-layered, outswinging-inward swinging casement box-type or inward-inward swinging box-type – windows, to seal the clearance between the case and the casement and improve the thermal insulating capacity of the glass surface and to equip the roof-slabs with thermal insulation. From a monumental point of view, thermal insulation of façades can be realized only in case it does not involve any changes in the architectural appearance of the façade.

One of the characteristic forms of the densification of settlements is the addition of the roof space of residential buildings. From a historical point of view, attention should be drawn to two aspects: on the one hand, the roof structure may constitute a historical value, in this way, the

[14] Charter of the Vernacular Heritage, 1999. *Karták könyve* 2002. 67–68.

attic space should be interpreted as a historical space; on the other hand, meeting the natural lighting needs of the different functions compared to the attic, the architectural design of the lighting windows appearing on the roof surface is a task to be solved. In the case of attic installation, of course, access to the newly created spaces must also be ensured, and the proportion of extra load that the new function will place on the building also must be taken into account. It is not recommended to create small-sized apartments, but rather to attract a wealthier group of owners who are able to take care of the long-term maintenance of the listed building. In the case of exclusive rooftop apartments, they can also contribute to increasing (or regaining) the prestige of the downtown building and the center of the settlement.

4.6. Public buildings

The historic buildings built for the purpose of public buildings (museum, theatre, administrative buildings, educational buildings) generally fulfil their original function until today. Their renovation for more economical operation, as that of residential buildings, can be carried out effectively according to complex designs and long-term development programs.

4.7. Industrial monuments

As a result of their position and dimension in the urban fabric, they have a special place within the built heritage. Typically, large halls and associated service buildings make up sometimes district size industrial areas. Their special constructions are factory chimneys, which lost their function due to the disappearance of their industrial use. The aspects of the industrial heritage are set out in a separate charter on protection of monuments,[15] and a professional organization[16] specialized particularly in this field deals with the possibilities of value-saving re-utilization.

In addition to demolition, good examples of utilization of the buildings can also be found: commercial facilities, exhibitions can be housed in the halls. From an environmental point of view, a value-saving modification of the existing administrative modifications (compulsory soil replacement) could significantly help the utilization of buildings.

4.8. Engineering objects

Within the frame of protected built heritage engineering objects, bridges, tunnels, railway lines form a separate group. In their case, naturally technical aspects have to be considered for their use and renovation.

[15] Nyizsnyij Tagil: Charter of the Protection of the Industrial Heritage, 2003. In *Karták könyve* 2002. 92–96.
[16] The International Committee for the Conservation of the Industrial Heritage (TICCIH).

4.9. Monuments of the 20th century

On the basis of their building construction characteristics and architectural features, monuments of the 20th century are generally treated separately but from a sustainability aspect these do not need other solutions than those mentioned earlier. It has to be mentioned, however, that the monuments of younger age are characterized by a high degree of integrity, i.e. soundness, since these buildings have the most of originally built building parts, at the same time the social acceptance regarding their protection is considerably low. It is extremely difficult to protect architecturally outstanding buildings from the 20th century. Firstly, most of these buildings were created right before the change of regime in 1989 and this period was unpopular (one could say hated) in terms of its political system. Secondly, the values of these buildings lack antiquity in the Riegl sense. Thirdly, recognition of the values of these 20th century buildings causes difficulty even for some of the architectural professionals, and in the absence of professional, value-preserving knowledge the average person sees them as completely ugly.

5. REGIONAL BUILDING MATERIALS AND TRADITIONAL BUILDING TECHNOLOGIES

The socio-economic effects of monumental activities arise in various forms. Environmentally the most considerable result is that in many cases usable buildings are produced from empty, functionless buildings. The relationship between built heritage and waste, i.e. environmental

Figure 8. Spanish imported stone built in the stone frame in the bailiff's house of the Palace of Fertőd (Photo: the author)

damage can be examined according to the three phases of the building's life cycle (construction, maintenance, demolition). So it is worth comparing the environmental impact of the new buildings with those of the existing ones.

Traditional buildings are characterized by the use of regional, natural materials (earth, reeds, straw, wood, bricks, stone). The production of building structures made of natural materials requires relatively little energy and produces no or very little polluting by-products, waste. The environmental impact of transport can be reduced by using local building materials. Unfortunately, most of Hungary's local clay processing brick factories have been closed, the Hungarian quarries work at minimal capacity, there is no reed farming, reed harvesting in our lakes, a minimal amount of wood from our forests is utilized for construction purposes. Instead, products of the globalized building material factories, foreign stone materials and expensive, energy-intensive construction products are available on the market, which produce a lot of waste at the end of their life cycle *(Fig. 8)*.

Building a new house requires a large amount of newly produced building materials and the transport of materials and structures, often over long distances. In contrast, for an existing building, the use of constructed and reused building components can be performed without investing in material and energy.

During maintenance, modern buildings can usually be operated more economically, i.e. using less energy (heating and cooling, lighting) than most listed buildings with mainly traditional

Figure 9. Demolished granary building. If it had been preserved and rebuilt, it could have served farming for a long time. Instead, it became an unnecessary hill of waste (Photo: the author)

structures – although cooling of the latter ones in summer usually does not require extra energy consumption just due to the large mass (thick walls, vaultings) of the historic structures. Today there are several technical solutions for improving the heat balance of historic buildings without damaging the monument values.

During the demolition of previously produced structures built using a lot of energy the built-in materials and energy are wasted. By preserving existing structures these materials and energy are also saved. Demolition of historic buildings made of traditional, natural materials typically does not generate environmentally harmful waste, while treating modern, heavily modified, polluting building materials as waste will pose an unknown and difficult task for future generations *(Fig. 9)*.

Modern building material industry is characterized by packaging the building materials so not only residues of building materials but also packaging materials appear as waste at construction sites.

Environmentally friendly solutions of historical architecture, the traditional building methods are almost completely out of practice today, they have been replaced by the products and building systems of the global building industry. Attempts have been made to spread sustainable building methods but the consumer society of the 21st century accepts them with difficulty *(Fig. 10)*.

The most evident environmentally friendly method for the building industry could be the re-utilization of existing, usable buildings, building parts and building elements. Most existing

Figure 10. Frontal isolation made of reed panels (Photo: the author)

buildings produced with a high energy investment and labor can still be used, and yet they are demolished in several cases. The materials of the demolished building – although they could be reused with a little attention and careful demolishing – end up as rubble or waste in many cases, which must be disposed of and treated by means of costly solutions.[17]

Building a new house instead of renovation often happens only for short-term saving of intellectual and manual labor. But the question is: how long a so excessively energy-intensive work method can be maintained and how wasteful it is? Preservation of existing buildings is desirable not only for saving architectural values, but it is at least as important that it is an environmentally friendly–environmentally conscious activity as well, since in the case of renovation of existing houses less waste is generated, the environmental impact from transport decreases, the material and energy invested in the structures already built do not get lost and no more energy is needed for demolition.

In order to preserve buildings in the long run and thus to protect the environment it is necessary to maintain the good technical condition of building structures as long as possible. Its

Figure 11. Tiles and gutters that have slipped due to lack of maintenance. Small jobs not performed can lead to much bigger damages (Photo: the author)

[17] Within the organization of the Office for Cultural Heritage Management until 2010 there had been an informal network among the historic building supervisors about the re-utilizable materials, structures found in the different parts of Hungary so the supply and demand could have been easily connected. It stopped because of disintegration of the organizational system.

most effective way is continuous, regular maintenance, taking care of the existing, built-in structures and materials. In the case of preservation and renovation of existing building structures there is no need to produce and install any new structure. The elementary maintenance work (repairing of painting or plaster, tightening of loose screws, cleaning and repairing of gutter) is low cost and demands little energy. In contrast, major renovations and rebuilding following the destruction of structures or buildings require much more financial and energy investments as well. For the time of renovation, the building is out of use and not profitable so this solution is disadvantageous also considering cost-effectiveness. Maintenance also ensures the preservation of monument values *(Fig. 11)*.

If we take environmental protection in a broader sense, we have to mention visual pollution caused by buildings not fitting into the natural or built environment. As a result of their age, historic buildings shape their environment and therefore fit it naturally. It can also be achieved in the designing of new buildings, if attention is paid and good-quality design is applied.

SUMMARY

In summary, it can be said that preservation of monuments aiming at conserving and utilizing the existing buildings and building parts regarded as value is at the same time also an operation protecting the environment, because the most environmentally friendly building is that which is not demolished but reused – preferable in-situ – as far as possible, thus extending the life cycle of aging buildings, which can be up to hundreds of years old, and the materials used to build them serve society as buildings rather than becoming waste.

Explosion in energy prices and supply disruptions caused by the coronavirus epidemic drew attention to the fact that the globalized, wasteful lifestyle of the 21st century society is not sustainable in the long term.

Instead, the economic management of existing resources, such as preservation and recycling of existing buildings, and regionalism, i.e. the use of local materials and building structures, are desirable.

In order to achieve this, knowledge of historical architecture and responsible specialists capable of thinking along long-term goals are needed, as well as a society capable of at least partially renouncing its own comfort.

REFERENCES

Act No. LXIV of 2001 (Kötv.) Law on the protection of cultural heritage

Császár, L. (ed.): *A műemlékvédelem Magyarországon* [Monument Preservation in Hungary]. Képzőművészeti Zsebkönyvtár. Képzőművészeti Kiadó, Budapest 1983.

Gerő, L.: *Építészeti műemlékek* [Architectural Monuments]. Műszaki Könyvkiadó, Budapest 1959.

Gov. decree No. 68/2018. (IV. 9.) (Övr.) on the regulations of cultural heritage management

Hámori, G. – Veöreös, A. – Sági, É.: A településszerkezet környezeti hatásai különös tekintettel a közlekedésre. In *Sopron város környezetvédelmi programja* [Programme of Environmental Protection of Sopron]. Kézirat. Soproni Egyetem, Sopron 2018.

Jokhileto, J.: *A History of Architectural Conservation*. University of York, 1986.

Kleemair-Wetl, R.: *Baukulturelles Erbe versus Klimaschutz und Morenität. Am Beispiel des Welterbegebietes Fertő-Neusiedler See*. Deparment für Bauen und Umwelt der Donau-Universität Krems, Hochschulverlag AG ETH, Zürich 2015.

Máté, Zs.: Az épített örökség táguló világa. [Expanding World of the Built Heritage]. *Transsylvania Nostra* 12 (2018) 48. 43–49.

Ódor, Z.: *Hagyományos szerkezetű fa ablakok hőszigetelési tulajdonságainak vizsgálata, korszerűsítési lehetőségei* [Renovation of Traditional Windows]. Thesis. Széchenyi István Egyetem, Győr 2014.

Riegl, A.: *Der moderne Denkmalkultus. Sein Wesen und seine Entstehung*. W. Braumüller Verlag, Wien–Leipzig 1903.

Román, A. (ed.): *Karták könyve. Műemlékvédelmi dokumentumok gyűjteménye*. [Book of Charters. Collection of the Documents for Monument Preservation]. Icomos Magyar Nemzeti Bizottság, Budapest 2002.

Román, A.: *487 bekezdés és 617 kép a műemlékvédelemről* [487 Chapters and 617 Pictures About Monument Preservation]. Terc Kiadó, Budapest 2004.

Speck, J.: *101 szabály az élhető városért. A sétálható város kézikönyve* [A Walkable City]. Magyar Műszaki és Közlekedési Múzeum, Budapest 2020.

Varga, G. – Veöreös, A. – Sági, É.: Építés, bontás és a vezetékes hálózatok környezeti hatásai. In *Sopron város környezetvédelmi programja* [Programme of Environmental Protection of Sopron]. Kézirat. Soproni Egyetem, Sopron 2018.

Veöreös, A.: Fiatalok és öregek a műemlékvédelemben (Generations in Monument Preservation). In Nagy, G. D. – Veöreös, A. (eds): *Fiatal Műemlékvédők Fóruma*. ICOMOS Magyar Nemzeti Bizottság Egyesület, Budapest 2021. 23–40.

Vólent, Zs.: *Szalmabála építészet*. [Buildings Built from Straw Bales]. Thesis. Széchenyi István Egyetem, Győr 2016.

Vörös, A.: Tramtrain. Mocorog a Stadler Citylink/vasvilla. Képriport. *Indóház Vasúti Magazin* 17 (2021) 2. 2–3.

Környezetvédelem – műemlékvédelem

ÖSSZEFOGLALÓ

A régi épületek újrahasznosítása nem csupán műemléki kérdés, hanem környezetvédelmi szempontból is ugyanolyan fontos tevékenység, hiszen a meglevő épületek felújításakor jóval kevesebb hulladék keletkezik, kisebb a szállításból adódó környezeti terhelés, és a szerkezetekbe korábban beépített anyag és energia sem vész el.

KULCSSZAVAK

műemlékvédelem, az épített környezet fenntartható használata, hosszú távú gondolkodás, műemléki érték, újrahasznosítás, régi épületek környezetbarát felújítása