



The new technology era requirements and sustainable approach to industrial heritage renewal



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ABSTRACT

Nowadays, developments in technology and the introduction of the philosophy of sustainable development have led to significant changes in theory and practice of preservation and development of historic areas and buildings. Modern presentation of their cultural values and use require improving their condition and making them compliant with standards and requirements applicable to newly constructed buildings and spaces in terms of energy efficiency. However, this makes the task of preserving the authenticity and integrity of historic spaces and buildings and their basic historical and cultural value challenging. The idea of sustainable development, which in addition to environmental and economic dimensions also contains an equally important social dimension, has also brought to the fore the cultural heritage as a non-renewable resource. In this sense, historical areas and buildings should be regenerated and adapted to the needs of modern times by providing them with adequate purpose and continuous maintenance.

Based on a case study and analyzed main aspects and optimization of sustainable use of industrial architecture, i.e. the Zrenjanin brewery, this paper strives to point out the need for their modernization and improvement, in accordance with respect of their integrity and authenticity during the renovation process.

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1. Introduction

Despite the fact that nowadays the protection of cultural heritage is still primarily based on the 1964 Venice Charter [1], during the last decade a need emerged for some ideas, recommendations and protection measures defined by the charter to be reconsidered in more details and harmonized with the modern era. Important international documents were issued by the UNESCO [2], ICOMOS [3], Council of Europe [4] and other international organizations on which modern approach to protection and restoration of historic areas and buildings has been based throughout the international community. They have brought fresh ideas and significantly improved the theoretical framework and philosophy of protection, significantly expanding its focus (from buildings and totalities towards cultural landscapes) and the evaluation criteria, stressing the importance of not only ancient and monumental buildings, but also traditional vernacular, modern and industrial

architecture. Modern contemporary philosophy and practice of protection have been specifically influenced by the introduction of the concept of historic place, which indicates the importance of intangible heritage (spiritual, cultural, ethnographic etc.) and tradition, the concept of cultural landscape which reflect the need for devoting greater attention to the mutual relations between tangible and intangible heritage, and the natural environment. The focus is specifically on the need for preserving the authenticity and integrity of cultural and built heritage in the era of globalization, as well as its place and role in sustainable development of society.

It is the widespread acceptance of the philosophy of sustainable development in all spheres of life and human activity which has led to new approach and modern principles of protection and improvement of natural, cultural and architectural heritage. The most important international institutions in the field of conservation of natural and cultural heritage were obliged to respond to the dramatic changes brought about by the modern era and a new millennium. Although modern technological development enabled significant improvement of all areas of human life, it also contained challenges in terms of the ecological balance of natural environment, which has been undermined by the excessive

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use of natural resources; likewise, it enabled public and social values, spiritual and cultural identity of communities, traditions and peculiarities of historical settlements and architecture to be preserved in the era of globalization. A question arose as to the role and importance of local historical forms of cultural and architectural heritage in modern technological society without borders.

Although the fact that modern technologies have great significance for the improvement of technical measures of protecting, presenting and using historical cities and buildings that should be respected, it also is necessary to underline the negative impacts of fast industrial development, technological progress and urbanization on the natural and cultural heritage, inadequate re-modulation and modern use of historic sites and buildings, which leads to loss of their fundamental values. This is particularly true in the field of preservation the old industrial architecture, which was once the main driver of progress, contributing to the advancement of society and development of settlements, is also now commonly abandoned due to obsolete technology and outdated energy sources used to power the machines, such as coal and oil.

At international level, however, there are many examples of industrial heritage that were regenerated through modern ways of presentation and new purposes which justify the large economic investments in their preservation and presentation as monuments of technical culture [5].

2. Methodology – systematic approach to sustainable renewal of built heritage

Meeting the needs of the present without compromising the ability of future generations to meet their own needs development becomes sustainable [6]. Ten years after sustainability was conceived of in terms of the three pillars of economic viability, social responsiveness and respect for the environment [7] culture was recognized as the forth pillar of sustainable development [8]. As a component of human environment and a part of the cultural heritage, historic buildings with specific values become a generator of sustainability. In recent decades, a special role in the sustainable development of society and the city received the industrial heritage [9] (Table 1).

Renewal of built heritage, since ancient times rooted in social responsibility to cherish and safeguard cultural goods, nowadays should balance the historical values, implement efficient energy consumption and satisfy the user's comfort. Energy efficiency measures within built heritage require creativity in order to preserve embodied energy, modernize construction, and implement advanced energy systems. On the other hand, the requirements and behaviour of users should be ethically justified in order to preserve the historical values, authenticity and integrity of heritage. Sustainable renewal is the proper management of use and change in and around historic places and spaces, so as to respect and enhance their value to society [10, p. 214].

3. Approach – adaptive reuse as a method of sustainability

Adaptive reuse is the method of abandoned and underutilized buildings adjustment for further use, while retaining their historical/archaeological, visual/cultural, economic, functional, and psychological values [11, p. 3–10]. In the contemporary conservation practice the imperative in the process of reuse has been placed on different aspects of sustainability, ranging from authenticity and integrity preservation, through minimum intervention and reversibility, to energy efficiency.

3.1. Conservation principles versus user requirements

From the conservation point of view, authentication requires an individual critical approach to heritage. Authenticity defined as an essential qualitative factor in relation to the credibility of available sources of information and measure of the degree to which attributes of heritage truthfully and exactly testify to its importance [12], has three aspects: creativity, truth and cultural tradition [13]. True essence of built heritage lays in the integrated cognition of both, tangible and intangible, aspects of authenticity. Nevertheless, the greatest challenge is preserving the authenticity of a built heritage that has irretrievably lost its original purpose. Authenticity of a place, or rather material components of a built heritage, is the main factors in determining the vitality of its value presentation. However, without the third dimension of authenticity concept, referred to as cultural tradition by Jokilehto, heritage does not have the ability to transfer its importance to future generations.

Considerations regarding the physical/formal and the conceptual/ethical aspects of integrity within the framework of conservation theory are all pointing to the concept's complex nature. In the modern doctrine of protection, the adoption of numerous international charters has led to a growing number of dimensions of this concept: structural and technological, social, spatial, aesthetic, contextual [14, p. 30–31]. In recent theoretical debates crucial for the valuation of heritage, the structural, functional and visual aspects of integrity are also present [15, p. 2–3].

The most relevant for built heritage is the *functional integrity*, which provides a reference for understanding the various historical processes, but also for planning and managing its modern-day use, while structural integrity defines the current condition through the relation between elements that survived based on developing/deepening the functions remained from the past. In order to preserve the integrity, interventions on the monument should be reversible, reduced to a minimum, i.e. to the extent necessary for its survival, with a minimum loss in existing materials and clearly differentiating what is new and what is old [10, p. 95–98].

The largest interventions on industrial heritage are resulting from the continuous use, regardless of whether they are aimed at developing the original purpose or implementing a new purpose. In the international context, the issue of reuse has been discussed from the ethical point of view, in terms of minimum intervention, respecting the existing purpose and the compatibility of purposes, but also from the aesthetic point of view, in terms of integrity, character and harmony. The charters adopted are providing interpretations of minimal intervention in a quantitative manner, based on the ratio of the newly designed and original physical fabric, as well as in a qualitative manner, through assessing the degree to which aesthetic integrity has been preserved. Choosing a new purpose should be based on respecting the existing and original patterns of movement, plan/arrangement and decoration, while the new design should be in accordance with the general features of the old one. The relation between quantitative/formal and qualitative/conceptual elements is defined in charters for regulating the relation between formal elements based on *aesthetic integrity*, which is essentially a conceptual category. Moreover, the charters require assessing the new design based on the preservation of aesthetic integrity or coherence of the totality, where the totality consists jointly of the old and new. Thus, as outlined by the charters, aesthetic integrity regulates the relations among the individual formal elements, then it can be understood as a theoretical concept that describes the entirety of the building. Each historic building can be described in terms of its formal unity or totality, regardless of whether the totality represents an aesthetic value or not.

As manufacturing technology in the case of industrial buildings is a crucial factor that influenced the development of architectural characteristics (except for stylistic), the principle that unites all

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