

CIRCULAR ECONOMY AND RELIGIOUS HERITAGE CONSERVATION: ADAPTIVE REUSE CHALLENGES

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Abstract:

Today, we seek to reduce the raw materials extracted and the volume of waste generated through circular economy practices. In this context, heritage buildings hold unique advantages, with multiple economic and environmental benefits. This paper presents the results of quantitative and qualitative analysis of challenges of repurposing sacred heritage places through adaptive reuse and aims to identify how circular economy practices are embodied within the process. The analysis of 23 papers and studies published in the past thirty years showcased challenges varying from materials reuse to support from the local community and users of the new purposed buildings. With insights into the challenges of circular economy strategies in adaptive reuse, a framework for circular economy practices in heritage buildings preservation can be developed.

Keywords: *adaptive reuse, circular economy, sustainability, heritage buildings, circular economy in architecture*

JEL classification: *O21*

1. Introduction

Nowadays, we seek to reduce the total resources extracted and waste through circular economy practices which we now employ in a variety of domains. Heritage buildings hold a unique position in the urban and rural landscape by embodying cultural and historic features that define communities and preservation works to conserve such sites holds multiple economic and environmental advantages benefits (Arlotta, 2018).

The aim of this research is to establish an understanding of the challenges of adaptive reuse and to identify how the circular economy practices are already embodied in this practice. In Romania there are about 5,700 protected religious sites, 24 under UNESCO flagship (Future for Religious Heritage, 2021). We know that at least 150 religious heritage buildings based in south-east Transylvania are five hundred years old and are waiting for a new purpose. Therefore, such investigation into challenge of repurposing such buildings can be of help for future repurposing activities. With this study we aim to demonstrate that is possible to associate preservation and waste management, opposite to preservation and waste generation, frequently associated with architecture projects. To serve this purpose, the authors performed a literature review related to religious sites revival with adaptive reuse technique. Through a review of 23 papers and studies published in the past 30 years, the authors seek to showcase the challenges met in adaptive reuse for religious sites and the circular economy practices embodied in the process. For this purpose, the research was organized in five parts: first, the literature review showcases the status of international research related to adaptive reuse in the context of religious heritage buildings. Second, the authors present the methodology employed to identify the challenges of adaptive reuse, focusing on how much the subject of circular economy practices is being mentioned: what is being said and done, how much is being said and done and where. Third, the authors dived into the analysis of the 23 papers and studies and divided the challenges in several categories Last, a series of conclusions and recommendations for better connection between the circular economy and adaptive reuse was

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formulated to avoid the challenges signaled in the papers and studies analyzed, to serve the development of circular economy practices in future religious heritage revival for future adaptive reuse projects.

2. Literature review

Resource consumption and waste generation in the field of architecture and construction were amplified by globalisation, a mechanism characterized by a linear consumption model. Both domains need innovative solutions derived from circular economy practices, as they consume resources and contribute to waste creation (Arlotta, 2018; Davey, 2021). Therefore, rethinking seeking value and encouraging reuse is vital for waste reduction and resource depletion. To adapt to the circular economy environmental-economic factors, stakeholders such as policymakers, investors, and architects explore the circular economy processes and redesign buildings within the concept of circularity (Rose, 2019; Haroun et al., 2019). The heritage is rich in waste reduction efforts, and the adaptive reuse field could support the development of more circular material supply chains: local renewable materials, recirculation of existing materials (Rose, 2019; Arlotta, 2018).

When engaging with heritage places revival there are a few directions to follow: preservation which is rehabilitation to maintain a building and all the changes incurred during its lifetime, opposite to restoration, which returns a building to its form at a certain point in time. Apart from these two directions, conservation is another practice which consists in an intervention into a building's design to ensure structural integrity related to new foundations, bricks repointing, the reassembly of scattered or fractured pieces. Adaptive reuse is a process of using an old building for a new, different purpose, by changing interior design plans and new construction, as a result a new form and function will be integrated in the community. An important characteristic is maximizing the reuse and retention of existing materials and structures (Foster, 2021; Shahi, et al. 2020; Arlotta, 2018; Plevoets and Van Cleempoel, 2011).

In the field of architecture, the circular economy concepts associated with adaptive reuse encourages the reuse of architectural elements and materials in site preservation. However, the relationship between the concept of circular economy and the reuse of architectural elements can be further developed by examining the literature connected to the existing practices in the field, and its challenges. Adaptive reuse has many challenges: first, there have been noticed limited engagement in heritage and preservation literature with topics connected to the circular economy (Haroun et al., 2019). Second, decision-makers lack knowledge of adaptive reuse environmental and economic benefits and are not equipped with the tools to implement these projects. Third, recent EU strategy Green Deal asserts the need for architecture, engineering, construction to develop more sustainable practices to address economic and environmental challenges through better building material reuse. Fourth, designing or redesigning for the circular economy encounters multiple challenges: lack of innovative features of architectural solutions, absence of adequate standards, ineffective new business models, longer design phase, additional costs (Kozminska, 2020).

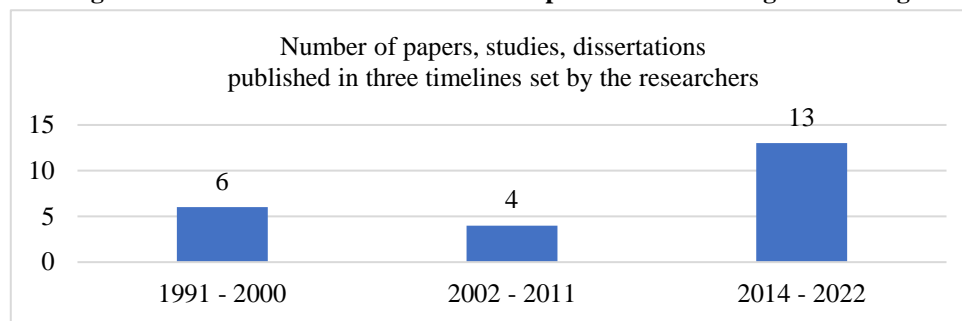
This research aims at establishing an understanding of the challenges which arise during adaptive reuse and on how the circular economy strategies are embodied in this practice.

3. Methodology

The research draws from a comparative approach. The paper reviews a body of literature on architectural preservation of religious heritage buildings with adaptive reuse technique.

To get insight in the scholarly literature on adaptive reuse of religious cultural buildings, we reviewed contemporary literature on the subject published in the past thirty years (figure 1). As it can be seen in figure 1, the most important body of literature was published with the past eight years, which may coincide with the development of the circular economy concepts and practices.

Figure 1: Timeline of literature related to preservation of religious heritage



Source: Authors' own research

We made the inventory of the data comprised in 23 sources of literature, which were characterized by country of origin of the university where the researchers are affiliated, and the publishing year, to emphasize a diverse interest for the topic. Most of the literature resources (table 1) have origin in Europe, followed by the United States and the United Kingdom, Egypt, Iran, and Canada.

Table 1: Literature related to adaptive reuse of religious heritage

Author(s)	Paper, dissertation, report title	Country of researcher(s)'s university affiliation	Year of publication /Year of accessing the resource
The European Network for historic places of worship	Adaptive Reuse of Fortified Churches in Transylvania: Challenges and Opportunities	Belgium	2022
Vaida, E.	Report on the restoration of historic roofs of church monuments Saxon fortifications from Transylvania	Romania	2022
Interreg Europe	Adaptive reuse of religious heritage	Europe	2021
Gholami, G., Heidari, S., Hanachi, P.	Conservation and reuse of architectural heritage, an approach based on energy efficiency	Iran	2021
Foster, G. and Saleh, R.	The Adaptive Reuse of Cultural Heritage in European Circular City Plans: A Systematic Review	Austria, Belgium	2021
Dongez, N., Manisa, H., Basdogan, S.	Tendency to Circular Economy: Reuse of Architectural Elements	Turkey	2021
Akande, O.	Improving Environmental Sustainability in Reuse of Some of England's Churches: Challenges and Options for Sustainable Practices	Nigeria	2021
Huuhka, S. and Vestergaard, I.	Building conservation and the circular economy: a theoretical consideration	Finland, Denmark	2020
Iodice, S., De Toro, P., Bosone, M.	Circular Economy and adaptive reuse of historical buildings: an analysis of the dynamics between real estate and accommodation facilities in the city of Naples (Italy)	Italy	2020
Lo Faro, A. and Miceli, A.	Sustainable Strategies for the Adaptive Reuse of Religious Heritage: A Social Opportunity	Italy	2019
Haroun, H., Bakr, A., Hasan, A.	Multi-criteria decision making for adaptive reuse of heritage buildings: Aziza Fahmy Palace, Alexandria, Egypt	Egypt	2019
Rose, C.	Systems for reuse, repurposing, and upcycling of existing building components	United Kingdom	2019
Arlotta, A.	Locating Heritage Value in the Reciprocal Relationship Between Preservation and Waste Management	United States of America	2018
Amayu, E.	New Uses for Old Churches: An Examination of the Effects of Planning Regulations on the Adaptive Reuse of Church Buildings	Canada	2014
Lueg, R.	Approaches to the Adaptive Reuse of Churches in Germany and the United States	United States of America	2011
Ahn, Y.	Adaptive reuse of abandoned historic churches: building type and public perception	United States of America	2007
Park, SC.	Respecting Significance and Keeping Integrity: Approaches to Rehabilitation	United States of America	2006
Douglas, D.	Building Adaptation	United Kingdom	2002
Latham, D.	Creative Re-use of Buildings	United Kingdom	2000
Sharp, D.	Modern Architecture's Place in the City: Divergent Approaches to the Historical Core	United Kingdom	1998
Byard, PS.	The Architecture of Additions	United States of America	1998
Murtaugh, W.	Keeping Time: The History and Theory of Preservation in America	United States of America	1997
Denslagen, W.	Architectural Restoration in Western Europe: Controversy and Continuity	the Netherlands	1994
Robert, P.	Adaptations: New Uses for Old Buildings	United States of America	1991

Source: Authors' own research

Moreover, this characterization points out the geographical areas where the topic of adaptive reuse is not being discussed yet: Latin America, Australia, Asia.

Each literature source in table 1 was read by both researchers, followed by a classification of the data from each source, into two categories: challenges or opportunities. The data was roughly introduced in an excel file, divided into the two categories, as it was presented in the literature source. After a second reading of the data collected in the two categories, sub-categories emerged, and the researchers continued to rearrange the data into sub-categories according to what was specifically said.

In term of challenges, 12 sub-categories were identified (table 2).

Table 2: Sub-categories for challenges of adaptive reuse of heritage buildings

Challenges characterisation	Sub-categories
	Choice of the sites to be reconverted using adaptive reuse
	Function and form
	Location: rural areas
	Physical (re)use
	Site conversion methods: techniques for adapting existing buildings
	Wise reuse
	Treatment success
	Design features
	Financing
	Stakeholders
	Circular economy

Source: Authors' own research

4. Main results

Some authors (Robert, 1991; Murtagh, 1997; Nelson, 2005) have concluded that among the challenges with many layers, determining the function and the form of a religious building within the context of adaptive reuse is one of the richest in obstacles: issues arise when it comes to deciding between old and new use and design (table 3).

Table 3: Challenges of adaptive reuse: reconversion function, form, location

Areas of concern	Challenges	Literature
Choice of the sites to be reconverted using adaptive reuse	Too many, not all of them can be saved	Ahn (2007);
Function and form	having a good match between new function and existing form; collision between original and new architectural integrities; client (and societal) expectation of new;	Robert (1991); Murtagh (1997); Nelson (2005);
Location: rural areas	too little involvement or interest on behalf of the local community;	The European Network for historic places to worship (2022)
	a lack of further funding resources;	The European Network for historic places to worship (2022)
	a lack of knowledge on income sources diversification;	The European Network for historic places to worship (2022)
	the scarce availability of human resources to implement and monitor the project;	The European Network for historic places to worship (2022)
	lack of shops and restaurants in rural areas where the monuments are located;	The European Network for historic places to worship (2022)
	safety and the sense of security for tourists;	The European Network for historic places to worship (2022)

Source: Authors' own research

Second, when it comes to location of religious sites for conservation, rural areas are rich in offers. In Romania, there are about 150 religious heritage building five hundred years old, based in south-east Transylvania, recognized by UNESCO. In rural areas the challenges are related to community involvement, financial resources, scarcity of human resources necessary to involve in the process of adaptive reuse, no functional ecosystem to support the new function of the previous religious site (table 4).

It is difficult to decide on the new scope of the building because there are many controversial opinions among stakeholders: residential and retail sites are not preferred (table 4). However, this aversion might be a consequence of poor local territorial planning and stakeholders not aware of potential benefits of the new scope.

Table 4: Challenges of adaptive reuse of religious heritage: reuse challenges

Areas of concern	Challenges	Literature
Physical (re)use	residential and retail use is the least favourable; do not match with the original cultural symbolic characteristics of the churches, present fewer chances for keeping the openness of the original interior space; community reuse and abhors industrial reuse; turning the church in a residential building; when dividing an abandoned church into several flats to maintain the church's original architectural integrity and how the public perceives the converted church;	Latham (2000); Douglas (2002);
	poor territorial planning, poor tourism plan; poor cultural homogenisation; a lack of guidelines and sustainable governance models; poor public awareness of the potential benefits of adaptive reuse;	The European Network for historic places to worship (2022);
Site conversion methods: techniques for adapting existing buildings	adaptation work simultaneously with preservation and restoration of its exterior fabric or other special features; "changed" and "reused" not only as a whole but also as pieces of materials;	Ahn (2007); Douglas (2002);
	sustainable adaptation: profitability, flexibility, energy efficiency, and eco-friendly materials;	Douglas (2002); Haroun et al (2019);
Wise reuse	psychological and economic considerations given the context such as the neighbourhood or district; balance between conservation and valorisation;	Douglas (2002); Latham (2000); Robert (1991); Lo Faro and Miceli (2019); Akande (2019), Haroun et al. (2019);
	large volume of the interior, difficult to convert in an economical way; cost of new versus reused: low cost of new materials relative to labour; ack of economic legislative drivers;	Ahn (2007), Rose (2019); Huuhka and Vestergaard (2020);
	degradation caused by insufficient funds and vandalism;	Vaida (2022);
	the quality of natural light difficult to convert in an economical way;	Ahn (2007);

Source: Authors' own research

Another challenge observed by Douglas (2002) and Haroun et al. (2019) is the choice of techniques for adapting the old buildings. It is difficult to provide sustainable adaptation and wise reuse and through this concept we think of profitability, flexibility, energy efficiency, and eco-friendly materials. In what concerns a wise reuse of materials, the challenges are given by the volume of interior works, poor supply chain for quality and quantity of reused materials (table 5).

The list of challenges is rich and in this list the success of the site treatment is mentioned. The obstacle comes from poor development of rehabilitation standards and ambiguous guidelines. It has been observed that only minimal challenges are often impossible (Ahn, 2007) and architectural projects for adaptive reuse are often not followed.

Table 5: Challenges of adaptive reuse: treatment and design features

Areas of concern	Challenges	Literature
Treatment success	the development of standards for rehabilitation; general guidelines often consist of ambiguous terms and narrow definition of integrity;	Ahn (2007); Amayu (2014);
	minimal changes in original features often impossible	Ahn (2007);
	architectural projects not respected; tiles in good condition replaced with elements which do not have the same qualities as the historical ones; improper restoration performed at the level roof, lack of professional monitoring; poor site tracking;	Vaida (2022); Ahn (2007);
	poor materials management; not enough hand-produced tile to holds a certificate of conformity and warranty and can be used to restore churches;	Vaida (2022);
Design features	opponents of radical designs argue that the changes should be moderate to maintain the existing settings and reflect the flow of time;	Denslagen (1994); Byard (1998); Sharp (1998); Stephen and Hart (2001);
	misinterpreting projects restoration based on which the approval of the Ministry of Culture was obtained, insufficiently detailed;	Vaida (2022);
	proponents argue that radical designs are acceptable if they reflect radical change in time;	Denslagen (1994); Byard (1998); Sharp (1998); Stephen and Hart, (2001);
	design features to be preserved made principally based on the professionals' perception, experience, and skills; controversial contemporary building practices; Reusing materials –compliance and contractor influence on design;	Ahn (2007); The European Network for historic places to worship (2022); Amayu (2014); Rose (2019);
	churches are difficult to modify to meet up with current energy efficiency standard; provide healthy and thermally comfortable internal environments at an affordable installation and running cost;	Akande (2019);
	can include changes to a structure to accommodate a certain use, but should respect the existing fabric;	Lueg, R. (2011);
	new construction or additions should be differentiated from the historic building but preserve the building's integrity;	Lueg, R. (2011); Ahn (2007);

Source: Authors' own research

Design features also present many challenges: stakeholders can be divided into two opposite categories who either require minimal or major changes in design; second, restoration projects insufficiently documented were misinterpreted by the authorities and approved for a different form and function than intended. Third, energy efficiency is an important issue because when changing the function, the need for energy might require extensive work to ensure thermal comfort (Akande, 2019). Last, if additional buildings are needed to serve the new purpose of the old building, there should be a strong connection between the old and the new (table 6).

Table 6: Challenges to access to resources: financial and human

Areas of concern	Challenges	Literature
Financing	limited opportunities for developers to get financial incentives for adaptively reusing old church buildings/lack of policy commitment for providing tangible financial incentives that encourage developers to undertake adaptive reuse initiatives;	Amayu (2014);
Stakeholders	the municipality needs to take a more proactive role in encouraging adaptive reuse projects; stimulate the cooperation between public, private, and social stakeholders;	Amayu (2014); Lo Faro and Miceli (2019); Lueg (2011);
	poor cooperation between church owners on the one hand and the new local communities, craftsmen and NGOs;	Vaida (2022);

Source: Authors' own research

We may notice that the challenges related to circular economy in adaptive reuse are a few. We may conclude that these are few because there is not yet a good understanding of circular economy practices when it comes to adaptive reuse. The elements of circular economy withing this technique are related to energy efficiency and wise reuse of materials (table 7).

Table 7: Circular economy challenges related to adaptive reuse

Areas of concern	Challenges	Literature
Circular economy	reusing materials: infancy of supply networks or lack of mature supply chain; lack of reliability in quantities and consistency of reused materials; lack of reliability in quantities and consistency of reused materials; lack of evidence of fitness for purpose energy efficiency: the nature of the materials from which they were built as traditional buildings, which affects their thermal performance in terms of heat loss requiring significant updating;	Akande (2019); Gholami et al. (2021); Rose (2019); Haroun et al. (2019);

Source: Authors' own research

The existing linear model of consumption of materials, decreases the utilization of existing structures and materials as it relies on continuous consumption and new production. This practice is completely against the principles of circular economy that is suggested the reduce, reuse, recycle of buildings and materials and has negative effects on the economy and the environment. In adaptive reuse, the research has concluded that the process of materials reuse is poor performed and the results are not consistent with the scope: for example, elements in good condition were replaced with elements which did not have the same qualities as the historical ones. Moreover, there was improper restoration performed for the roof, site tracking was lacking and the result on the forms was disastrous. The supply chain to facilitate material reuse is weak and cannot yet fully support the circular economy practices in terms of materials in adaptive reuse (table 7).

5. Conclusions and recommendations

The authors conclude that a practice gap rather than a theory gap exists when it comes to circular economy being embedded in adaptive reuse of religious sites. The approaches related to using old materials within the circular economy struggle with the low cost of virgin resource extraction and waste generation. The literature recognized that circular economy could be embodied in building conservation by adopting its vocabulary and methodology much more than it is currently being adopted.

Many papers recognize that adaptive reuse of religious heritage is facing more challenges than opportunities, and when it comes to circular economy practices in adaptive reuse, there are rare and connected only to materials reuse and energy efficiency. Therefore, since territorial planning is decided and guided by public authorities, policymakers need evidence-based information and recommendations to navigate the evolving policy environment to correctly formulate standard for adaptive reuse which embodies circular economy practices. To this end, the authors recommend expanding the article's dataset, incorporating new literature which presents case studies of adaptive reuse in the context of circular economy as they emerge. Future research directions should be based on investigating circular economy policy instruments set out in the European Green Deal, the European Union's framework for circular economy for religious site preservation.

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