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Article

Assessing Cultural Heritage Adaptive Reuse Practices: Multi-Scale Challenges and Solutions in Rijeka

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Abstract: Cultural heritage is recognized as a driver and enabler for sustainable development, and its role within the circular economy and circular cities is gaining attention. Its adaptive reuse plays a significant role in this while prolonging the heritage lifespan, preserving the values associated with heritage assets, and creating shared values. The adoption and implementation of the adaptive reuse of cultural heritage practices present challenges at multiple levels. This research aims to identify these challenges and propose solutions to overcome them, considering the post-industrial port city of Rijeka, Croatia, as a case study. The adaptive reuse of cultural heritage practices was assessed through a stakeholder engagement workshop performing a multi-scale analysis using the Historic Urban Landscape approach as an assessment framework. Forty-nine themes were identified by content analysis of the challenges and solutions identified by stakeholders involved in adaptive reuse practices and decision-making in the city. The five most mentioned themes refer to aspects relating to participation, capacity, regulatory systems, economics-finance, and knowledge. These findings provide evidence of challenges for policy- and decision-makers to be addressed in policy-making. Solutions are also suggested to facilitate the adaptive reuse of cultural heritage in the city of Rijeka and similar contexts, such as introducing policies to support participatory decision-making whose absence is a barrier.

Keywords: adaptive reuse; challenge assessment; city of Rijeka; circular city; circular economy; cultural heritage; historic urban landscape approach; solution identification; stakeholder engagement



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1. Introduction

Resource scarcity, rapid urbanization, and climate change threaten ecosystems and human wellbeing. These threats challenge the livability of human settlements [1,2]. To tackle these threats, sustainable development [3] and a transition toward a circular economy are seen as crucial [4,5]—the circular economy includes processes of production and consumption that minimize environmental impacts and waste production by extending the lifespan and reducing the consumption and waste of products and materials [6], while “creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations” [7] (p. 225). Furthermore, to address the threats posed by resource scarcity, rapid urbanization, and climate change, the built environment is a key sector to act on. In fact, the built environment consumes about half of the materials extracted every year, and it is responsible for nearly 40% of energy-related carbon dioxide (CO₂) emissions [4,8].

Within the built environment, cultural heritage is receiving attention because it is recognized as a driver and enabler for sustainable development [1,9–11] and a key to ensure urban livability [12,13]. Cultural heritage consists of nonrenewable resources inherited from past generations that express people’s values, knowledge, and traditions [14]. Over time, heritage broadens from the concept of “monument”—object-based, top-down, static, and prescriptive—to “cultural heritage”—process-based, also bottom-up, dynamic,

and an expression of values and “social choice” [15–20]. Along this evolution, the intangible dimension of heritage gained recognition and the range of categories of heritage expanded [19,21]. For these reasons, “cultural heritage” is preferred here to “built heritage.” This choice of terminology avoids the limitation of the investigation to narrower possible definitions of built heritage that disregard its intangible dimension [18]. Reflecting the expansion of the concept of cultural heritage, heritage management shifted toward being understood as a “management of change” [16,22], opening up to a wider variety of stakeholders and disciplines [23], and recognizing a plurality of heritage practices and approaches [19,24,25]. Particularly, Bullen and Love pointed out that the role of conservation has shifted from preservation toward “being part of a broader strategy for urban regeneration and sustainability,” which demands a broad participation and interdisciplinarity [26] (p. 411). Hence, conserving both tangible and intangible heritage plays a role in sustainable development [27–30].

In parallel to sustainable development, the role of cultural heritage within the circular economy is gaining attention. Particularly, its adaptive reuse is regarded as “the entry point for implementing the circular city,” i.e., “the spatial/territorial aspects of circular economy” [31] (p. 245). Adaptive reuse of cultural heritage is defined as the process that conserves heritage by providing the site/building with a new function [26,32]. Thus, the adaptive reuse extends the life cycle of heritage [33,34]. This extension aligns with the circular economy goal of reducing environmental impacts by reusing resources over time [35,36]. Furthermore, the adaptive reuse of cultural heritage can implement circular models in its management, such as circular business and governance models [34,37–39], and include nature-based solutions, e.g., rainwater reuse [34].

Previous research has found that the adaptive reuse of cultural heritage can contribute to sustainable development [40,41]. This contribution is due to its environmental [34,42,43], social [44–47], cultural [32,44], and economic [26,42] benefits when negative impacts, such as unplanned gentrification, are averted [48]. Examples of these benefits are conserving the embodied energy, bypassing the waste production associated with demolition [29,43], and retaining tangible and intangible values of cultural heritage [24,44,49]. Besides these benefits, at the local level, the adaptive reuse of cultural heritage can promote climate change mitigation within the built environment by integrating climate mitigation and adaptation strategies [32,34,50]. Due to these benefits, the adaptive reuse of cultural heritage can contribute to the achieving of sustainable development and circular cities [31,44,48,51,52].

Even though previous research has indeed identified the potential of the adaptive reuse of cultural heritage for sustainable development, it has also found that these reuse practices face several challenges [29,32,53,54]. Here, “challenges” are understood as all the factors hampering these heritage reuse processes, i.e., negative factors including barriers, obstacles, and constraints. Previous studies identified the challenges to the adaptive reuse of cultural heritage, mainly from the perspective of architects and project managers (Table 1). Overall, these challenges can be categorized as “compliance with codes and regulations” and “current design requirements” [32] (p. 508).

Table 1. Challenges to the adaptive reuse of cultural heritage as defined in the literature.

Challenge	Reference
Availability of reliable information	[32]
Availability of skilled tradesmen and compatible materials	[26,32,55]
Compliance with codes and regulation requirements	[32,55]
Conflict with the local community about the new uses of the heritage	[56]
“Continuity of local community life”	[29]
Effective and appropriate community engagement opportunities	[29]
Economic viability and costs	[29,57–59]
Handling of contaminations and hazardous materials	[58,60–62]
Identification of the new function	[48]
Minimization of change	[29,57,63]
Obtainment of the approval of the change of use	[32,56,64,65]
“Physical restrictions” (e.g., the structural grid)	[32,48,63]
Political circumstances	[66,67]
Prevention of values loss	[29,57,63]
Status of physical decay	[68,69]
Stigma associated with the building/site/area	[70] ¹

¹ Discussing adaptation of buildings in general without focusing on heritage reuse.

Yet, in identifying the challenges faced by the adaptive reuse of cultural heritage, three aspects were not included: The variety of stakeholders, the influences among scales, and the relationship between heritage and its context. First, most of the published research up to now has consulted architects and project managers. However, it has also been highlighted in the literature that these reuse practices are multidisciplinary [48] and involve a broad spectrum of stakeholders, including owners, building managers, developers, heritage consultants, local authorities, citizens, investors, among others [26,57,69,71]. This limitation of stakeholders in past research indicates the need to engage a broad variety of actors in identifying these challenges [32]. Thus, it can be assumed that a multi-stakeholder perspective may result in a wider range of recognized issues, reflecting the plurality of experiences and perspectives considered, which is limited in the literature. Second, research on the adaptive reuse of cultural heritage has identified challenges focusing on the site-scale, i.e., buildings and areas. Nevertheless, measures taken on other scales also impact the site, and adaptive reuse is not limited to individual sites [72,73]. Therefore, challenges to the adaptive reuse of cultural heritage might also be found at higher levels, such as the urban scale. Third, it is important to consider the relationships existing between heritage and its context [24] and to acknowledge the need for a holistic approach in heritage conservation [22,74]. Limitations in the stakeholders involved and the scales considered suggest the need for further research on factors hampering the adaptive reuse of cultural heritage.

This research, therefore, aims to identify the challenges to the adaptive reuse of cultural heritage including these three aspects. In particular, it aims to identify these challenges by engaging a broad variety of stakeholders, considering a multi-scale perspective, and using the Historic Urban Landscape approach as a framework for the identification. For this identification, a case study, i.e., the port city of Rijeka, is analyzed. This European post-industrial city is re-developing into a cultural city and urban tourist destination by implementing an urban regeneration program focusing on heritage conservation and adaptive reuse. Hence, this study answers the following research question: What are the challenges to cultural heritage adaptive reuse identified by stakeholders at the urban and site scale in the port city of Rijeka? This identification offers insights into the challenges to practitioners, policy- and decision-makers, and other actors dealing with the adaptive reuse of cultural heritage. Therefore, this research raises awareness of the factors hampering the adaptive reuse of cultural heritage. Furthermore, solutions to overcome these barriers are also offered. Identifying these challenges is the first step to facilitate these reuse practices, which promote sustainable development and constitute the entry point for circular cities [26,31].

2. Materials and Methods

This study identified challenges to cultural heritage adaptive reuse and solutions to overcome these challenges at multiple scales in the case study of Rijeka. The factors hampering heritage reuse were derived by content analysis of the data collected through a stakeholder engagement workshop. Here, “stakeholder participation” refers to the process of involving the broad variety of actors of heritage reuse in producing the knowledge that informs the data collection. However, participation is mentioned in the results as the various processes of stakeholder collaboration [75,76] in the adaptive reuse of cultural heritage. This second meaning encompasses the varying degrees of democratic participation in the decision-making [14,76,77].

2.1. Participants

Thirty-five stakeholders (hereafter participants) participated in the study. They were selected by purposeful sampling [32,78,79] to engage relevant stakeholders in identifying the challenges encountered in the adaptive reuse of cultural heritage and solutions. As the adaptive reuse of cultural heritage is a multi-disciplinary [48] and multi-actor [32,80,81] practice—interlinked with heritage, urbanism, and sustainable development—the participants were sampled among stakeholders from the public, private, knowledge, and NGO sector and experienced in adaptive reuse, heritage conservation and management, circular cities, and sustainable urban development fields within Rijeka or Europe. The participants were representatives of (i) the Municipality of Rijeka with expertise in energetic renovation and entrepreneurship development; (ii) the Port Authority of Rijeka managing the industrial heritage building of the docks; (iii) the Natural History Museum of Rijeka, hosted in a reused villa and castle; (iv) the Rijeka2020 Agency engaged in reusing several heritage sites on occasions of the year as the European Capital of Culture; (v) the tourist board; (vi) cultural associations and institutions, e.g., CTK Rijeka; (vii) an architecture firm; (viii) a consulting firm for urban regeneration; (ix) a waste management company; and (x) researchers, NGOs, and local/regional authorities involved in the CLIC project. Hence, this variety of participants allows the engagement of a broader range of actors in identifying these challenges. Considering these other views better reflects the spectrum of heritage reuse stakeholders and addresses their limited variety in previous identifications, as also highlighted by Conejos and co-workers [32].

The Municipality of Rijeka—the local partner in organizing the workshop—invited the stakeholders. The stakeholders that accepted the invitation voluntarily took part in the workshop and received the informed consent form used by the CLIC project, the EU funded Horizon2020 project framing this study. Furthermore, the data collected were anonymous.

2.2. Framework for the Identification of Challenges of Cultural Heritage Adaptive Reuse

To identify the challenges, the participants were provided with a framework guiding them in scrutinizing the adaptive reuse of cultural heritage. In other words, participants used a framework to assess heritage reuse practices and identify their challenges, hereafter “identification” or “assessment framework”. This framework was based on the Historic Urban Landscape (HUL) approach and a multi-scale perspective.

2.2.1. Historic Urban Landscape Approach

To identify challenges, the participants’ assessment of the adaptive reuse of cultural heritage was framed by the six steps of the HUL approach, hereafter HUL steps (Table 1). The UNESCO Recommendation on the Historic Urban Landscape proposed a holistic and integrated approach to heritage conservation and management [21,22]. Thus, the HUL approach considers the wider urban context without being limited to the heritage site, it adopts an interdisciplinary perspective, and it recognizes the complexity and layering of the landscape [74]. This approach acknowledges the need to integrate conservation in the wider goal of sustainable urban development and vice versa and manages “thoughtful change” [74] (p. 3). At the local level, the HUL steps (Table 2) guided the establishment of

several action plans for heritage conservation and management [82], e.g., a workshop in Zanzibar to identify actions to integrate conservation and planning [83]. Hence, they can be adopted as a framework to analyze conservation processes. As the adaptive reuse is a strategy to conserve cultural heritage, the HUL steps were selected to frame the assessment of this process to identify its challenges.

Table 2. Identification framework: The six Historic Urban Landscape (HUL) steps.

Short Name	HUL Step Description ¹
Mapping	Mapping natural, cultural, and human resources
Consensus	Reaching a consensus on what values and related attributes to protect
Vulnerability	Assessing the vulnerability of the identified values and related attributes to change and development
Integrate	Integrating values, related attributes, and their vulnerability in urban development framework
Prioritize or Prioritization	Prioritizing actions for conservation and development
Partnership	Establishing local partnerships and management frameworks for each of the actions

¹ Adapted from [84–86].

2.2.2. Multi-Scale and Case Study

The identification of challenges to the adaptive reuse of cultural heritage considered multiple scales: Site scale, the urban scale, and “elsewhere”. This multiscale perspective was adopted to include the impacts of measures and practices at various levels that influence adaptive reuse [72,87]. The scale “elsewhere” signified scales wider than the urban level, e.g., national, or contexts for knowledge transfer. The participants were asked to further specify this scale [88].

For the site scale, the RiHub building was selected for the case study. It is a multi-functional space that serves as the information center for the Rijeka European Capital of Culture 2020, operational center for the Rijeka 2020 Agency, and venue for the participatory programs [89–92]. It also hosts a co-working space for professionals active in the cultural and creative sector, the first of the city [89,93]. The historic building was designed by Luigi Luppis, prominent architect in Rijeka, and it is an example of Art Nouveau architecture in the city [94,95]. It was built at the beginning of the 20th century as the first nursery of the city and for housing. After the nursery was closed, several commercial activities followed one another until, in 2018, RiHub was inaugurated [89,90,95]. The building is currently owned by the Municipality of Rijeka [95]. RiHub was selected as the site case because (i) of its historic and architectural values; (ii) part of the space will need a new function, once the program of Rijeka European Capital of Culture is concluded [96]; and (iii) it received the Croatian Architects’ Association “Bernardo Bernardi” award for the interior design [97].

The urban level considered the city of Rijeka as a whole. This post-industrial port city, located in the Northeast Adriatic, is the third Croatian city and the principal port of the country. Its urban landscape includes a medieval core and the developments of the 19th and 20th centuries [98–100]. In the 19th and 20th centuries, the port and the industry activities drove the growth of the city until it was halted by the Croatian War of Independence and the consequential political and economic changes. Several industries were closed, and the port activity was downsized, leaving the city of Rijeka to adapt to the mutated conditions [100,101]. This city was chosen as a case study as it is an example of a European post-industrial city with a vast heritage, and an urban regeneration strategy focusing on heritage conservation as part of its plan to develop into a cultural city and urban tourist destination [98,101–104].

2.3. Data Collection: The Historic Urban Landscape (HUL) Workshop

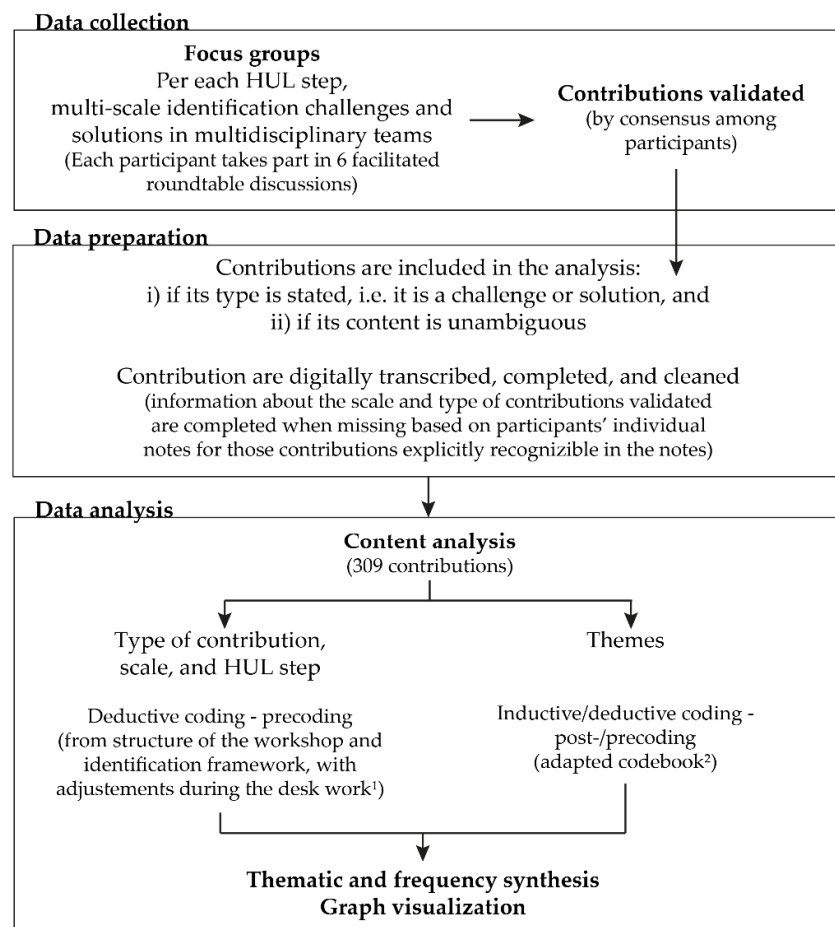
Focus groups were employed for the data collection that was performed during the HUL workshop, held in Rijeka in March 2019, within the CLIC project—Circular models leveraging investments in Cultural Heritage Adaptive Reuse. This method was chosen because it is a participatory method that “collects data through group interaction on a topic determined by the researcher” [105] (p. 130). Focus groups were selected as the data collec-

tion method because they allow the harvest of information based on group intelligence and entails mutual learning [106]. On the one hand, participants also benefit from joining the workshop. On the other hand, the research benefits from the data validation by consensus, and from the interaction among participants that stimulates their reflection [107]. Furthermore, as Landorf points out, “stakeholder participation offers a mechanism to gain a holistic understanding of a social problem” [30] (p. 496). The workshop was structured as a series of six sessions of parallel focus groups.

In multidisciplinary teams, participants identified challenges and proposed solutions in six sessions of parallel focus groups. The workshop started with a plenary session introducing and explaining the research activity. In other words, participants were presented with the framework for the identification of challenges of cultural heritage adaptive reuse and the structure of the workshop. The aim was clarified, i.e., identifying challenges to the adaptive reuse of cultural heritage in Rijeka at multiple scales and proposing solutions to tackle these issues. In the room, there were six tables with six chairs each. Every table was dedicated to a specific HUL step and had an assigned facilitator. At the start of each session, participants joined one of the tables. As they were asked to try to avoid sitting with representatives of the same organization or project, this ensured multi-disciplinary and multi-stakeholder discussions. Once a table was joined, participants identified challenges to cultural heritage adaptive reuse, focusing on the multiple scales considered and the HUL step addressed at that table. Each focus group session was structured in three phases and lasted 20 minutes. First, the facilitator re-introduced the HUL step framing the identification. Second, the participants had a few minutes to individually identify the challenges and gather their own thoughts. Finally, the facilitated roundtable discussion took place and the group collectively identified the challenges and proposed solutions. The facilitators took notes reporting the contributions made by the participants. Afterward, participants joined another table. The contributions were agreed and validated by consensus among the participants, and they constitute the data analyzed in this study.

2.4. Data Analysis

To analyze the data set, content analysis techniques were employed [108]. Prior to the analysis, the corpus was prepared [109] by translation and transcription of the contributions, removal of abbreviations, and exclusion of ambiguous wording. The contributions that could be identified neither as challenges nor as solutions ($n = 2$) by the authors were also removed from the sample. A manifest analysis [110] was conducted on the prepared corpus, including both inductive and deductive coding, resulting in a frequency and thematic synthesis (Figure 1) [108,110,111]. This coding was validated by peer-debriefing [112].



¹ During the analysis of the data collected the contributions associated with the scale code “elsewhere” were recoded as “general”, to better reflect the use participants did of the code: providing contributions as general without specifying the referred context or scale. Furthermore, contributions for which the scale was not specified were assimilated to “general”.

² Pintossi et al. 2020

Figure 1. Overview of data collection and analysis processes.

3. Results

A comprehensive identification of challenges is key to facilitate the adaptive reuse of cultural heritage. This study identified such challenges based on primary data reflecting the participants' experience and opinions. The participants involved in the workshop also proposed solutions to tackle these challenges at multiple levels. The first part of this section presents an overview of the themes revealed by the content analysis. Afterward, the five most mentioned themes, i.e., those with higher frequencies, are discussed in further detail describing the challenges they refer to. These themes are participation, capacity, regulatory systems, economics-finance, and knowledge. Altogether, they represent a subset of 40% of the contributions analyzed.

The content analysis was performed on 309 contributions. Thematic synthesis of the coding resulted in the identification of 48 themes. These themes encompassed both challenges identified and solutions proposed (Figure 2). Besides offering an overview of the themes revealed by the analysis, the graph in Figure 2 illustrates their distribution by scale and contribution type. The themes associated with the most frequent codes concern participation and participatory practices ($n = 33$). This graph highlights that challenges referring to the same domain are encountered at different scales.

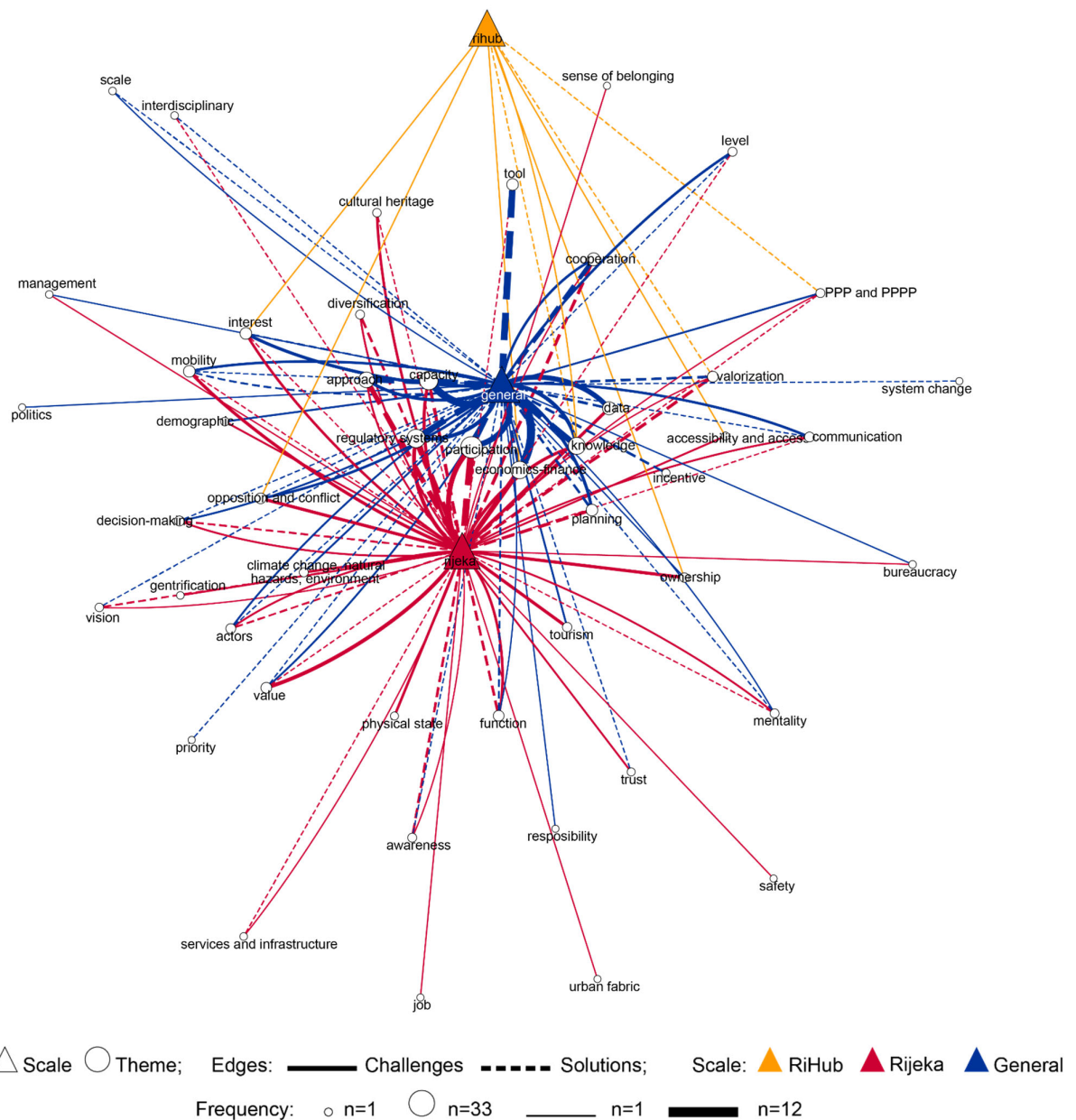


Figure 2. Overview of the challenges and solutions themes identified by content analysis. Themes are mapped using a two-mode, nonsimple, and multiedge graph with loops represented using a Prefuse Force-Directed layout with the number of contributions for each theme as the directing force. Graph created using Cytoscape 3.8.0 [113].

3.1. Participation-Related Challenges

In this study, participation challenges refer to the stakeholder engagement in the adaptive reuse of cultural heritage both at the urban level and as general issues. These challenges encompass the absence or limitation of participatory initiatives, and difficulties in implementing participation processes (Table 3). Some of the challenges were identified both at urban level and in general.

Table 3. Participation-related challenges.

Overarching Challenge	Challenges	Site Scale	Urban Scale	General
Absent or limited participatory processes	Lack of participatory decision-making		x	
	Lack of spontaneous participatory initiatives, they are limited to the one organized by institutions			x
Implementation of participatory practices	Lack of or limited participation, low willingness to participate		x	x
	Lack of or limited representation of certain groups, e.g., community, citizens		x	x
	Stakeholders' perceived lack of qualification to participate		x	x
	Timing of participation		x	x
	Stakeholder engagement		x	
	Implement participation at various scales			x

In some cases, the challenge causes were also identified. For example, the low or complete lack of participation in Rijeka is due to the absence of a “culture of participation”, the excessive bureaucracy, and trust issues toward institutions. Furthermore, engaging stakeholders is a challenge that derives from the stakeholders' perceived lack of qualification to take part in such processes, as well as from the low willingness to participate.

Based on these results, we noticed that challenges presented certain interdependencies. For example, the absence of participatory decision-making is due to the limited capacity available for bottom-up decision-making in Rijeka. Similarly, the lack of the willingness to participate also influences the lack of representation of certain groups while reinforcing the challenge of engaging stakeholders.

3.2. Capacity-Related Challenges

Challenges referring to capacity encompass the lack of capacity and limitations in the available capacity in terms of expertise, skills, and human resources for the adaptive reuse of cultural heritage both at the urban scale and in general (Table 4). In other words, a need for capacity building and limitations in available human resources and time available were identified. In addition, the absence of financial resources prevents the attraction of the needed expertise and tradesmen from other areas. This suggests that some financial- and capacity-related challenges are interdependent.

Table 4. Capacity-related challenges.

Overarching Challenge	Challenges	Site Scale	Urban Scale	General
Lack of capacity	Absence of guidance for adaptive reuse of cultural heritage		x	x
	Lack of local expertise and skilled tradesmen		x	x
	Loss of traditional skills and provision of youth with skills			x
Limitation available capacity	Limited time available from available human resources		x	x
	Limited competence/specialization in the public sector			x
	Limited human resources			x

3.3. Regulatory-Related Challenges

The adaptive reuse of cultural heritage also faces challenges that are linked to existing regulatory systems, encompassing regulations and policy documents (Table 5). In the city of Rijeka, some challenges specifically refer to the port area where several industrial heritage buildings and infrastructures, awaiting adaptive reuse, are located. Participants mentioned the difficulty of complying with the local regulations. For example, the use of the “same materials and craft skills” (contribution 107) is required in the adaptive reuse of the vessel *Galeb*—the formerly floating residence of the Yugoslav statesman Josip Broz Tito to be reused as a museum [114]. The results (Table 5) suggest the existence of a relation between the bylaw governing the procedure to apply for funding and some financial issues affecting the adaptive reuse of cultural heritage (§3.5).

Table 5. Regulatory-related challenges.

Overarching Challenge	Challenges	Site Scale	Urban Scale	General
Variety of strategy documents	Broad variety of strategy documents, need for integration		x	x
Compliance with regulations	Land management plan for the port area		x	
	Requirements of local regulation for adaptive reuse		x	
	Limitations/restrictions posed by the planning regulation			x
Procedures	Authorization of permits		x	x
	Strict regulation for concessions for the port area		x	
	Regulation to access funding			x

3.4. Economics-Finance-Related Challenges

The economics-finance-related challenges encountered in the adaptive reuse of cultural heritage included the lack of funding to implement these interventions, as well as their financial sustainability over time, the perceived mismatch between the expenses and the results of some projects, and financial losses (Table 6). These issues are identified for all levels. At the site scale, the reliance of RiHub on the European Capital of Culture funding challenges its long-term viability after its termination. Similarly, concerns on the financial sustainability derive from the predominant reliance on European funding for other adaptive reuse projects and regeneration programs in Rijeka. The lack of financial resources is also a challenge for some heritage sites whose management was delegated by the national government to the local government without providing funding to support such a task. In addition, financial resources are also lacking to avert the decay of heritage that causes a financial loss because its worsening increases the costs of future interventions of restoration and repair. The lack of funding directly and indirectly hampers adaptive reuse. It indirectly affects processes, such as building capacity, creating additional challenges for heritage reuse (§3.2). Besides showing the existence of influences among challenges, these results reveal the dynamic interlinkage among them. An example of this interlinkage is found among the lack of funding, the aggravation of the heritage decay, and the increase in intervention costs.

Table 6. Economics-finance-related challenges.

Overarching Challenge	Challenges	Site Scale	Urban Scale	General
Financial loss	Financial loss due to worsening of the decay of heritage		x	x ¹
Financial sustainability	Reliance on EU funding	x	x	
	Lack of long-term revenue stream	x		
Lack of or limited financial resources	Lack of financial resources for coordination among local authorities and among departments		x	x
	Lack of financial resources for maintenance and repair works, to implement adaptive reuse		x	x ¹
	Lack of financial resources for specific activities (e.g., mapping, keep information updated)			x
	Lack of financial resources for the adaptive reuse of rural heritage			x
	Lack of financial resources to build capacity among youth, to import experts, to attract professionals			x
Mismatch investments-results	Perceived high costs and expenses compared with the results obtained		x	

¹ This challenge refers to the national scale, i.e., the Republic of Croatia.

3.5. Knowledge-Related Challenges

The knowledge-related challenges refer to issues concerning what is known in relation to heritage and its adaptive reuse. These challenges, identified at the site and urban levels and as general ones, span from the lack of knowledge to its acquisition and loss (Table 7).

Table 7. Knowledge-related challenges.

Overarching Challenge	Challenges	Site Scale	Urban Scale	General
Loss of knowledge and threat to transmitting knowledge to succeeding generations	Loss of memory, stories, history, traditions, and meaning of heritage	x	x	x
	Threat to historic relation of the city with the sea		x	
Lack of knowledge	Lack of knowledge about the status of the heritage resources			x
	Lack of knowledge (without specification)			x
Lack of integration	The knowledge acquired by mapping lacks integration within urban planning			x

4. Discussion

Given the role of the adaptive reuse of cultural heritage as the entry point for circular cities and its contribution to cultural heritage conservation and sustainable urban development, the current study aimed to identify the challenges to the adaptive reuse of cultural heritage at multiple scales engaging a broad variety of stakeholders in a European case study, i.e., the port city of Rijeka. This challenge assessment can be regarded as a first step to facilitate the adaptive reuse of cultural heritage and thus harvests its potential for circular cities and sustainable development. The challenges were pinpointed by content analysis and frequency and the thematic synthesis of the data collected during a stakeholder engagement workshop. This workshop adopted the HUL approach and the World Café method. Participants in the study also suggested ways to overcome these hampering factors. In this section, these solutions are presented as recommendations (Figure 3). The analysis identified 48 themes (Figure 2) of challenges and solutions. Particularly, the five themes more

frequently mentioned by participants were: Participation, capacity, regulatory systems, economics-finance, and knowledge.

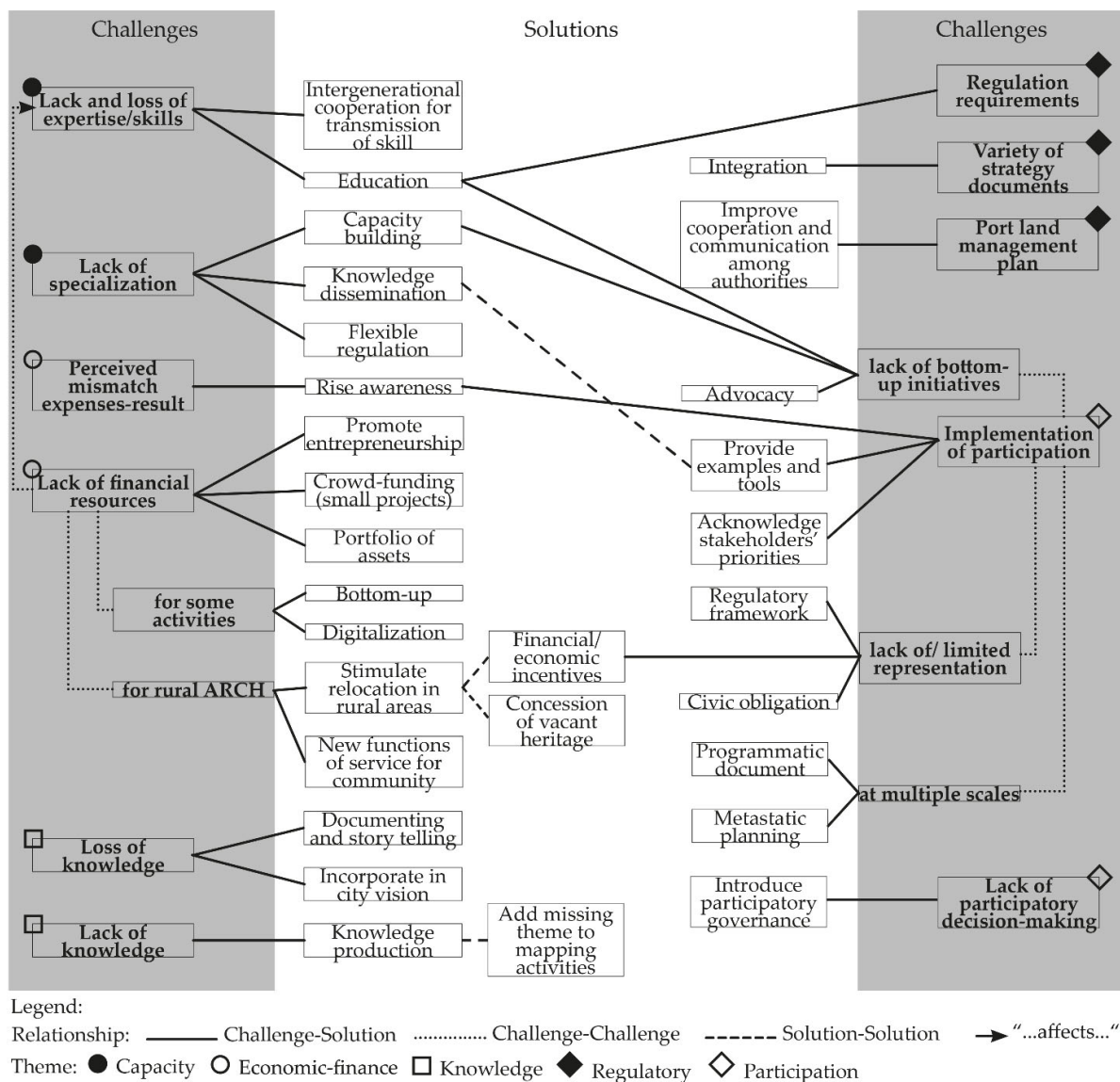


Figure 3. Concept map illustrating solutions to the five most mentioned challenges.

Notably, the novel challenges identified expand the range of factors hampering the adaptive reuse of cultural heritage beyond design concerns and compliance with codes and legal requirements. These novel challenges are:

- The absence or limitation of participatory processes,
- The implementation of participatory processes,
- The lack of guidance for the adaptive reuse of cultural heritage,
- The limitation of available capacity,
- The variety of strategy documents,
- The long-term economic sustainability (operational phase),
- The lack of financial resources for cooperation and capacity building,
- The loss of knowledge and traditional skills and the threat to transmitting them to succeeding generations,
- The lack of integration among sources of information,
- The depopulation.

The literature mentions local communities in relation to challenges concerning conflicts about the new uses of the heritage, as well as ensuring the “continuity of local community life” [29] (p. 358). Yung and co-workers reported that community participation is absent in the decision-making without identifying it as a hindrance to reuse per se. Conversely, this study identified the absence or limitation of participatory processes as a challenge. In addition, the present findings indicate that challenges related to the implementation of participation (Table 3), such as the low willingness to participate and the limited representation of certain groups, are encountered beyond communities only. Yung et al., found that experts deemed the community participation problematic if its members lacked “an understanding of conservation, urban planning and cost analysis” [29] (p. 359). However, the present study suggests that the challenge to implement participation lays in the doubt of stakeholders about their own qualification in taking part in the adaptive reuse of cultural heritage processes. Concerning capacity-related challenges (Table 4), such as the lack of guidance for the adaptive reuse of cultural heritage, they add to the barrier posed by the availability of skilled tradesmen [26,32,55]. This availability issue was also identified by this study. In the literature, the economic viability as a challenge entails the conversion costs, the return on investment, and the lifecycle costs mentioning maintenance and running costs [29,57,58], whereas less emphasis is placed on the long-term economic sustainability of the adaptive reuse of cultural heritage projects, such as the reliance on certain sources of funding or ensuring a long-term revenue stream (Table 6). Previous research highlighted that heritage reuse is hampered by the availability of reliable information [32]. The present findings also suggest that the lack of integration among sources of information challenges the adaptive reuse of cultural heritage processes (Table 7). Furthermore, this study pinpointed that the heritage reuse is challenged by the loss of knowledge and traditional skills, as well as the threat to their bestowal to future generations (Table 7). These issues relate to minimizing the change and preventing the loss of values that are barriers already identified in the literature [29,57,63].

These findings support the hypothesis that engaging a broad variety of stakeholders of the adaptive reuse of cultural heritage is beneficial. We gathered a more extensive overview of the range of challenges encountered in these practices but only reported in detail the five most mentioned ones as part of this study. In addition, the numerous challenges identified at the urban scale provide evidence that the adaptive reuse of cultural heritage is hampered not only by site-specific challenges.

In addition, this study also identified challenges that had already been reported in the literature (Table 1). This suggests the transferability of the results presented in literature considering case studies in East Asia, Oceania, and North America (e.g., [29,32,56,115]) to the port city of Rijeka. It is confirmed that design-oriented challenges, e.g., compliance with regulations and codes, also apply to this case study. Yet, the challenges identified by the participants subsume characteristics that are context-specific [116]. For example, in Rijeka, the challenges are associated with the compliance with the land management plan for the port area instead of the zoning in general [32].

Among the challenges that had already been identified in the literature, it is worth mentioning the one posed by the stigma associated with the site also reported by Wilkinson [70]. This challenge refers to the intangible dimension of the heritage to reuse. Particularly, in Rijeka, some stakeholders contest the adaptive reuse of Galeb—former floating residence of the Yugoslav statesman Josip Broz Tito. The reason for the contestation is that the “difficult history is still alive”. On the one hand, this challenge exemplifies that cultural heritage is not devoid of conflicts, contestation, and contradiction [17,21]. On the other hand, it suggests the importance of the intangible dimension of heritage in its adaptive reuse.

Notably, this research also presents evidence of the interdependence, as well as the dynamic mutual interaction existing among some challenges, such as the lack of the willingness to participate influencing the lack of representation of certain groups. In some cases, participants also identified the causes of some challenges, e.g., lacking participation was due to trust issues. Based on these results, it is also suggested that for the adaptive reuse

of cultural heritage, the understanding of challenges needs to be performed with a systemic approach instead of in isolation. This is in accordance with the recommendation of prior studies on barriers to climate change adaptation [116], implementation of nature-based solutions [79], and heritage climate change adaptation [117]. To the best of our knowledge, this is one of the first studies reporting evidence on causes and interdependences among challenges to the adaptive reuse of cultural heritage. This study, based on manifest content analysis, limited the identification of interdependences to those explicitly presented in the data. Nevertheless, the literature on barriers in other domains suggests the existence of a broader network of interdependences. For example, it is found that funding barriers drive institutional barriers in heritage climate change adaptation [117]. Likely, it can be inferred that the limited availability of human resources for the adaptive reuse of cultural heritage identified in this study is due to a lack of financial resources. Therefore, the findings on the relationships among challenges are preliminary insights that raise questions about what other relationships exist and which ones prevail.

Based on the above findings, a reference framework to address the challenges identified is outlined in the form of a concept map (Figure 3). The solutions reported in this map are derived from participants. First, some solutions are common to more challenges. For example, on the one hand, activities raising awareness of the benefits of heritage reuse can help overcome the perceived mismatch between the expenses incurred for it and the results obtained. On the other hand, raising awareness of the benefits of participation in heritage reuse can facilitate its implementation. Second, a solution while directly tackling a specific challenge could also indirectly address challenges that are interlinked to the one directly tackled. Namely, resolving the lack of financial resources could also favor addressing the loss of expertise and skills. This suggests that synergies could be exploited in overcoming challenges. Hence, both challenges and solutions could benefit from a systemic approach combining actions and strategies, instead of addressing the challenges one by one.

This study illustrates the variety of challenges faced by the adaptive reuse of cultural heritage, identifying novel challenges and proposing solutions to overcome them. This overview informs policymakers, decision-makers, and stakeholders engaged in the adaptive reuse of cultural heritage processes. Raising awareness of the current challenges and their scale of application can help address them, thus facilitating the implementation of the adaptive reuse of cultural heritage. Outlining some of the interdependences existing among challenges offers insights into their co-occurrence. This suggests the need to address these issues in a systemic way, also considering the nonmutual exclusivity of some challenges. The insights into challenges coupled with the reference framework provide knowledge to develop actions, strategies, and policies to facilitate the adaptive reuse of cultural heritage practices. Besides informing these practices, the overview can also be of relevance to practitioners in the fields of heritage management and conservation, as well as urban planning and development.

Furthermore, the results presented can contribute to the expanding literature on the sustainable development and regeneration of port cities and areas [118–120] by presenting the adaptive reuse of cultural heritage within the port city of Rijeka. In fact, port areas are recognized as having a potential role in sustainable development starting with their heritage [59,62,121]. Yet, limitations are present to the applicability of these results as they are based on a case study.

Although this study offers an overview of the challenges to the adaptive reuse of cultural heritage in the port city of Rijeka, providing insights to the future adaptive reuse of cultural heritage practices and policymaking to facilitate them, it also presents some limitations. First, the transferability of the findings to other contexts was not tested. Second, the exploratory characteristics of this study rely on the participants' experiences. Particularly, as the findings are based on participants' consensus, contradictions among different actors might not be captured. In other words, a category of actors might consider a factor as a barrier, whereas another determines it as an opportunity [26,116]. Finally,

only a few contributions considered the site scale, whereas the majority focused on the urban scale or general factors. On the one hand, this might introduce a scale bias; hence, results were not discussed from this perspective. On the other hand, the extent of the generalizability of the general factors is to be further validated.

5. Conclusions

As a strategy for heritage conservation, sustainable development, and the entry point for circular cities, the adaptive reuse of cultural heritage is receiving increasing attention. However, the implementation of these heritage reuse processes is hampered by several challenges. This paper aimed to identify the challenges to the adaptive reuse of cultural heritage by engaging a broad range of stakeholders, as well as considering a multi-scale perspective.

Based on our research, stakeholders identified a variety of novel challenges for the adaptive reuse of cultural heritage both at the urban and site level, such as the implementation of participatory practices, the absence of guidance for the adaptive reuse of cultural heritage, and the economic-financial sustainability in the operational phase of reused heritage. This research not only introduces novel challenges to the adaptive reuse of cultural heritage, but it also proves the transferability of some of the issues reported in the literature to the city of Rijeka. In addition, these findings highlight that the use of a multiscale perspective and of a landscape-based approach provides more insights into the variety of challenges hindering heritage reuse practices. Solutions were also proposed based on the stakeholders' suggestions, and interdependences among challenges were revealed.

The results of this research suggest the need for a systemic approach coupled with a multi-scale perspective in addressing the challenges to the adaptive reuse of cultural heritage. The overview of these challenges and the proposed solutions raise awareness among the stakeholders involved in implementing heritage reuse, as well as provide evidence to policymakers and decision-makers. This is the first step to finding synergic strategies to address the challenges to the adaptive reuse of cultural heritage. Addressing these issues can facilitate these conservation practices that are key to circular cities and play a role in sustainable urban development.

Future research is needed to identify the relationship existing among challenges in order to identify those that are preconditions to tackle other challenges. Similarly, additional research is required concerning the solutions and their implementation to address the system of challenges outlined in the present study. Furthermore, as the challenges are context, time, and actor-specific, and as this study is based on a case study, future research can investigate the application of the present findings in other contexts.

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