Institute of Transport Economics
Norwegian Centre for Transport Research


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## Incorporating sustainability in cultural heritage reuse processes – Literature review

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5057 - RUVIVAL (5057), WP4 – task 4.1 (Literature review)

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# Contents

# 1 Summary

This working document is part of work package 4 of the project RUVIVAL – *Rural VItalization through Various Adaptations of cultural heritage and Landscape*, which is funded by The Research Council of Norway. In collaboration with several research and non-research partners, the project seeks to produce tools and knowledge that supports cultural heritage adaptive reuse processes in ways that preserve cultural heritage values while contributing to sustainable development of rural environments. One of the targets is to develop and test a framework/tool to facilitate consideration of sustainability principles and elements in the design, implementation and evaluation of cultural heritage reuse projects to both guide decision-making processes and demonstrate their contribution to sustainable development.

This working document summarizes the literature reviewed conducted in 2021 and comprising searches in Scopus an key institutional websites. It documents the contribution of cultural heritage to sustainable development (section 5.1) and providing relevant insights to inform the initial design of RUVIVAL's sustainability framework/tool (sections 5.2 to 5.4). In addition, the document briefly introduces cultural management practices in Norway and RUVIVAL's four cases (section 6) to explore how the framework/tool can assist cultural heritage management in practice.

We find that the **relationship** between cultural heritage and sustainable development is documented through literature reviews and empiric case studies, partly contradicting previous research arguing that much of research studying this relationship is theoretical and lacks empiric-based evidence. Moreover, a substantial amount of the studies reviewed cover aspects across all four traditional dimensions of sustainability (cultural, social, economic and environment), thereby making reference to social, intangible and environmental impacts that were previously given less attention. Our review shows that studies tend to document positive rather than negative or conflicting impacts and that there are relatively fewer studies documenting the impacts of cultural heritage reuse in rural than in urban contexts, as well as few studies focusing on the Nordic region.

The literature reviewed provided also useful insights into the **process** of developing frameworks with sustainability purposes and their **content**. Most frameworks depart from a literature review, and a considerable number of them only relied on previous research. Some frameworks were applied in real-life heritage reuse cases and/or were develop drawing on consultation, although this was largely limited to experts, technicians and administration representatives. Very few of the frameworks incorporated broad stakeholder engagement in their development (e.g. in the selection of criteria or indicators); whereas more did it in their application (e.g. in ranging of heritage reuse alternatives). This despite that several of the frameworks reviewed comprise multicriteria decision-making methods that – in principle – facilitate consideration of multiple criteria and perspectives in selection and prioritization of projects. A further recurrent element included in the frameworks reviewed were criteria and indicators against which reuse of cultural heritage and environments can be evaluated. Interestingly, none of the frameworks retrieved by the review was designed to be used at different phases of the reuse project, which is what RUVIVAL's sustainability framework/tool.

On the other hand, the literature review did not cast much insight on the **practice** of implementing sustainability perspectives on heritage reuse processes in Norway. We could, however, draw some lessons from frameworks applications, EU projects and the experiences of rural municipalities working with integrating sustainable development in municipal planning or working with broad value creation strategies on the grounds of cultural heritage. Such experiences uncover opportunities and challenges as well as factors that are key to succeed. To the later belong engaged, trustworthy and legitimate facilitators, stakeholder participation and engagement, collaboration and networking, local anchoring and ownership, being aware of conflicts and dilemmas, and having access to guidance material, data and easy-to-use tools and methods, adapted to different needs.

Based on our review, we argue that (re)use of cultural heritage has the potential of contributing to various dimensions considered relevant for sustainable development. Yet, whether these impacts are positive or not depends on the selection of use functions in relation to their context and the buildings' characteristics as well as on how reuses are managed on the long-term. First and foremost, this substantiates the need for developing tools to enhance the contribution of reusing cultural heritage for sustainable development.

Building on findings, the framework/tool could tentatively consist of a set of criteria and indicators to evaluate how cultural heritage reuse processes (may) affect (either positively or negatively) dimensions relevant for sustainable development, followed by corresponding data sources and methods to evaluate those aspects (either quantitively or qualitatively); Multicriteria Decision Analysis methods (eventually in combination with bottom-up approaches) to integrate various stakeholders' perspectives; and an orderly compilation of guidance material to guide interested parties throughout the process.

To the best of our knowledge there is no guideline to holistically integrate sustainability considerations in cultural heritage reuse projects from design to evaluation. And, based on our review, various actors could benefit from RUVIVAL's sustainability framework/tool to evaluate and prioritize use alternatives of currently unutilized cultural heritage from a sustainability perspective; and to evaluate how using cultural heritage contributes to local and/or regional sustainable development; and increase awareness about it. Furthermore, if its application proves successful, RUVIVAL's sustainability framework/tool could also support integration of cultural heritage in local and regional planning processes; facilitate the collection of empiric-based evidence on the impacts documented in previous studies; and lower the threshold to use existing data and methods by making them more accessible to interested parties.

However, we also anticipate the challenges of developing RUVIVAL's framework/tool related to the identification of relevant sustainability criteria (and, thus, operationalization of sustainability); the selection of a manageable and relevant set of indicators that can provide a balanced and comprehensive picture; the facilitation of stakeholder engagement to uncover conflicting issues and foster inclusion of various perspectives; and its adaptation to fit cultural heritage management practices and potential users' needs.

To deliver a practically relevant framework/tool, findings presented in this document will be complemented by (and contrasted against) the needs from those working with cultural heritage management processes. These will be explored in interviews and a digital workshop whose results are documented elsewhere.

# 2 Background and overall goals

In line with international trends, cultural heritage policies in Norway have progressively broadened its scope from being initially focused on safeguarding cultural sites of a certain age and historic value to protecting a wider range of sites, environments and landscapes by making an active use of it (MD, 2013; MD, 2005). Additionally, both public engagement and participation and sustainability have become central cornerstones in international cultural heritage policies. These shifts are also reflected in Norway's current national policy goals, according to which a diversity of cultural environments should be preserved as a basis for knowledge, experience and use; everyone should have the opportunity to get involved and take responsibility for the cultural environment; and the cultural environment shall contribute to sustainable development through holistic planning (KMD, 2020, p. 7).

The practice of using heritage as a conservationist strategy already emerged during the 60s and 70s (Plevoets and van Cleempoel, 2019). Based on various definitions (e.g. Aigwi et al., 2020; Dane, Houpert and Derakhshan, 2019; De Medici, De Toro and Nocca, 2020; Zeren, 2015), such a strategy, often termed as 'adaptive reuse', reflects the aspiration to balance the adaptation of obsolete or underutilized cultural heritage to new conditions in order to extend its life cycle while preserving its intrinsic values. This can be challenging because different people may attach different values to cultural heritage and certain values may be less visible out of various reasons (e. g. difficulty to assess certain values in monetary terms; insufficient representation of perspectives in decision-making processes). Visualization of such 'hidden' values as well as indirect ripple effects is key to make sounded decisions.

Increasing people's engagement in conservation of cultural heritage, particularly the youth has also proven to be difficult. Today, volunteer work makes a substantial contribution to cultural heritage's conservation in Norway, but it often relies on passionate aged individuals and struggles to reach out to younger populations. Initiatives to engage the youth such as "The Cultural Backpack" play a too small role in the curriculum in the Norwegian schools. Yet, in addition to being a policy goal itself, increasing societal engagement is key to ensure broad participation and consider various perspectives in cultural heritage reuse processes, even though this can also make it difficult reaching consensus.

A further challenge is initiating and implementing cultural heritage reuse processes in ways that contribute to sustainable development. The comprehensiveness, elasticity and multidimensionality of the concept of 'sustainable development' make its operationalization generally challenging. And this is not different, when it comes to reuse of cultural heritage, where it can be difficult to ensure preservation of heritage intrinsic values, while allowing modern use attending to sustainability dimensions (Blagojevic & Tufegdzic, 2016; Bullen & Love, 2010, 2011; Yung & Chan, 2012). Tensions may, for instance, emerge between preservation objectives, on one hand, and energy efficiency goals (Loli & Bertolin, 2018) or measures to ensure commercial use (Oslo Economics, 2017), on the other hand.

In sum, attainment of national policy goals is challenging and requires gaining a deeper understanding on the processes of reusing cultural heritage and their implications. This is especially the case in rural Norway, where cultural heritage is particularly prone to physical decay, as socio-economic and demographic changes can lead to their functional, social and/or economic obsolescence, and can also be accelerated by the effects of climate

change, especially if preservation demands constrain the adoption of necessary climate change adaptation measures. In view of the policy goals and challenges, cultural heritage reuse processes should be particularly attentive to:

- increasing awareness about the wide range of cultural heritage's values, including non-consumptive and public good values as well as generated indirect ripple effects
- developing methodology and tools for encouraging proactive participation and good collaboration processes
- consideration of sustainability elements and principles in their design, implementation and evaluation

This working document is dedicated to the later point, but next section provides an introduction of the project in which it is embedded.

## 2.1 The project RUVIVAL

The project *RUVIVAL - RUral VItalization through Various Adaptations of cultural heritage and Landscapes* aims to produce tools and knowledge that supports cultural heritage adaptive reuse processes in Norway in ways that preserve cultural heritage values while contributing to sustainable development of rural environments and that can help decision-makers to rank and prioritize conflicting alternatives in cultural heritage reuse processes.

RUVIVAL's primary objectives are: A) Improve knowledge on how cultural heritage reuse processes can incorporate heritage values, human needs, societal trends/challenges, and sustainability elements/principles B) Develop tools to effectively engage civil society in such processes, improve collaboration practices and evaluate the socio-economic implications of various cultural heritage reuses as well as its contribution to sustainable development C) Strengthen the capacity of cultural heritage managers/owners to facilitate adaptive reuse of cultural heritage and environments in participatory and collaborative ways. RUVIVAL's secondary objectives encompass: 1) Support recently adopted national policy goals; 2) Facilitate economic assessment of non-marketed heritage functions 3) Increase attractive-ness and liveability of rural communities 4) Widen the scope of potential reuses of cultural heritage and environments.

As depicted in figure 1, RUVIVAL's approach is grounded on a dynamic understanding of cultural heritage values, challenges and ways to satisfy needs. As each of them evolves, new reuse alternatives will emerge. Moreover, RUVIVAL proposes a 'sustainability performance-based' approach to design, implement and evaluate cultural heritage adaptive reuse projects. Such an approach "*aims at establishing a system of rules to evaluate the existing buildings, considered as 'organisms able to evolve and live in symbiosis with the needs of the people' (through which) what to preserve and what to transform (is chosen) through an iterative process of information/decision*" (De Medici et al., 2020, p. 12).

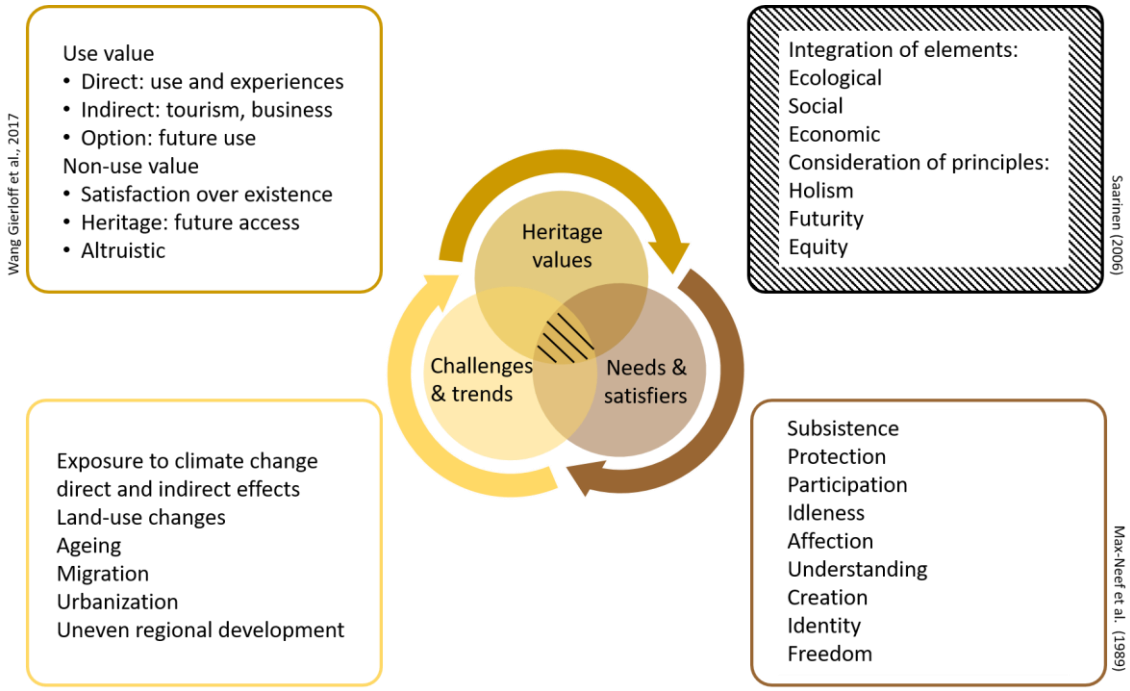


*Figure 1: RUVIVAL's approach to adaptive reuse processes*

RUVIVAL is a collaborative project led by the Institute of Transport Economics (TØI). The project's partners are the Norwegian Institute for Cultural Heritage Research (NIKU) and Norwegian University of Life Sciences (NMBU) as research partners. Collaborating partners are Regional Parks in Norway, The Norwegian Federation of Cultural Heritage Organisations, The Norwegian Directorate for Cultural Heritage, Innlandet County Municipality, and The Norwegian Trekking Association. The project runs from May 2021 until April 2025. The total budget comprises NOK 9 482 000, of which NOK 8 159 000 are funded by The Research Council of Norway.

The project will build on relevant literature and perform fieldwork, surveys, interviews and workshops in three cultural heritage cases in Norway: Abborhøgda in Finnskogen Natur- og Kulturpark, Hemnesberget in Økstindan Natur- og Kulturpark, and the lighthouses of Obrestad and Tungenes in the county of Rogaland. RUVIVAL seeks to investigate adaptive reuse projects at these cases in relation to a broader regional context. Although the project is case-based, RUVIVAL scopes to deliver tools and guidelines that are useful for cultural heritage managers beyond the project's lifetime and selected cases.

The project is organized in six work packages. Besides the project's administration (WP0) and project's dissemination and communication of results (WP5), RUVIVAL builds on four work packages that aim to identify participatory approaches to effectively engage civil society in heritage reuse processes (WP1); assess both monetized and non-monetized impacts of the heritage reuse cases (WP2); provide recommendations on collaboration processes and suggest collaboration models (WP3); and develop, test and evaluate tools to guide design and implementation of cultural heritage reuse processes in ways that contribute to sustainable development (WP4) and facilitate their assessment.

This working document summarizes part of the work conducted within WP4, which is also introduced in next section.

## 2.2 WP4: Incorporating sustainability in heritage reuse processes

The relationship between cultural heritage and sustainability has been increasingly acknowledged in policies. Already in 1964, the Venice charter (ICOMOS, 1964) called for the conservation and restoration of historic buildings highlighting the role of adaptive reuse of cultural heritage for socially useful purposes. But it was first in 2002, when the Johannesburg Declaration on Sustainable Development (UN, 2002) acknowledged cultural heritage as a dimension of sustainable development. Approximately a decade later, both the International Council on Monuments and Sites (ICOMOS) (2011) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) (2013) recognised the value of cultural heritage as a driver for sustainable development, and UNESCO (2015) has also called for the integration of a sustainable development perspective into World Heritage Convention processes.

Since then, cultural heritage has become a key cornerstone in sustainable development and its role for sustainable development has been acknowledged in European (e. g. CoE 2014, 2015, 2017; EC 2014, 2019; Potts, 2021) and in Norwegian policies (KMD, 2020).

As stated in the 2030 Agenda for sustainable development, strengthening efforts to protect and safeguard the world's cultural and natural heritage (11.4) is a key target within the goal of making cities and human settlements inclusive, safe, resilient and sustainable (UN, 2015). Cultural heritage is also explicitly or implicitly linked to the goals of food security, decent work and economic growth, sustainable production and consumption, water management, sea life and life on land by Labadi et al. (2021) and regarded central to implement the European Green Deal by e.g. contributing to emissions savings, promoting a culture of reuse and documenting past adaptation to climate change (Potts, 2021).

In Norway, the Directorate for Cultural Heritage states that cultural monuments and cultural environments can also contribute to UNs SDGs goals 4, 8, 11, 12, 13, 14, 15, 16 and 17 (RA, undated_a). Cultural heritage plays an important role in Norwegian district policy as a tool to strengthen life quality and attractiveness of small and large towns as well as to provide environmental and climate benefits (KMD, 2021). Municipalities and counties in Norway are expected to ground municipal and regional planning on UN's sustainability goals (KMD, 2019), and such expectations comprise the integration of cultural heritage in municipal and regional planning ensuring its active management to safeguard it as a resource for knowledge, experience, use and reuse that contributes to sustainable development.

Yet, despite increased awareness of the opportunities embedded in the relationship between cultural heritage and sustainable development and increased political and public interest to exploit the contribution of cultural heritage to sustainable development, it has been argued that more research is needed documenting the contribution of cultural heritage to sustainable development (e.g. Bullen & Love, 2010, 2011; Calder, 2015). In addition, as introduced in previous section, operationalization of sustainability in cultural heritage management practices and reuse processes is challenging, as it demands consideration of many (sometimes conflicting) aspects for which data may not be readily available.

Against this background, in work package 4 (WP4), RUVIVAL aims to develop and test a framework/tool to facilitate consideration of sustainability principles and elements in design,

implementation and evaluation of cultural heritage reuse projects to both guide decision-making processes and demonstrate projects' contribution to sustainable development. Additionally, WP4 seeks to answer the following research questions: *how can adaptive reuse contribute to sustainable development? In which ways do choices in heritage reuse processes facilitate/compromise sustainable development?*

The framework/tool will be designed by combining top-down and bottom-up approaches and incorporate quantitative and qualitative indicators, as well as attempt to balance contextual relevance and applicability across cases. WP4 comprises three main tasks, each of which consists of several sub-tasks, as depicted in figure 2.

| | *2021* | | | *2022* | | | | *2023* | | | | *2024* | | | | *2025* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WP4: Incorporating sustainability** | 2Q | 3Q | 4Q | 1Q | 2Q | 3Q | 4Q | 1Q | 2Q | 3Q | 4Q | 1Q | 2Q | 3Q | 4Q | 1Q | 2Q |
| *T4.1 Design of an initial framework* | | | | | | | | | | | | | | | | | |
| M4.1 (a) Document analysis | | | | | | | | | | | | | | | | | |
| M4.1 (b) Interviews | | | | | | | | | | | | | | | | | |
| M4.2 1st online workshop | | | | | | | | | | | | | | | | | |
| M4.3 Elaboration of guidelines | | | | | | | | | | | | | | | | | |
| *T4.2 Implementation of the framework* | | | | | | | | | | | | | | | | | |
| M4.4Testing use of guidelines | | | | | | | | | | | | | | | | | |
| M4.5 Analysis | | | | | | | | | | | | | | | | | |
| *T4.3 Final framework and guideline* | | | | | | | | | | | | | | | | | |
| M4.6 2nd online workshop | | | | | | | | | | | | | | | | | |
| M4.7 Publication guidelines | | | | | | | | | | | | | | | | | |
| M4.8. Submission papers | | | | | | | | | | | | | | | | | |

*Figure 2: Work package 4 tasks and timeline.*

Task 4.1. will design an initial framework/tool to facilitate integration of sustainability elements and principles based on existing relevant literature, data gathered through interviews with stakeholders working with cultural heritage management in and beyond selected cases and discussions of potential alternatives in an online workshop. Task 4.2 consists in testing the implementation of the initial sustainability framework/tool. This will require previous identification of potential users. Task 4.3. will develop the final sustainability framework/tool based on the experiences from task 4.2, insights from other work packages (WP1, WP2, WP3) and a second online workshop with interested parties working with cultural heritage management. Both workshops will be designed based on knowledge developed in WP1 on participatory methods.

This working document summarizes the first sub-task: the literature review and document analysis, which in practice was prolonged throughout 2021 (contrarily to what is stated in figure 2) to follow up input retrieved during the interviews and the workshop.

# 3 Aim of the literature review

The literature review documented in this publication attempts, primarily, to ground the initial design and development of RUVIVAL's sustainability framework/tool and, secondarily, to respond to calls for gathering evidence, on the contribution of cultural heritage to sustainable development. More specifically, the literature and document review and analysis was initiated with the aim of:

- finding evidence on *how can adaptive reuse contribute to sustainable development* (section 5.1)
- getting an overview of methodological approaches that can inform the initial design of RUVIVAL's sustainability framework/tool (section 5.2);
- identifying elements to be included in RUVIVAL's sustainability framework/tool (section 5.3)
- learning from cases where attempts have been made to systematize and operationalize sustainability in cultural heritage reuse processes (section 5.4)

The process of developing RUVIVAL's sustainability framework/tool is at least as crucial as its content, as it will reflect the interests and understandings of those involved in its design and development. Therefore, the literature review also seeks to gather information on the approaches for designing and developing RUVIVAL's sustainability framework/tool, briefly discussing their advantages and disadvantages. These insights will be relevant for subsequent tasks in the project, and possibly for updates of RUVIVAL's sustainability framework/tool beyond the project's lifetime.

As one of the objectives of WP4 is to test the framework/tool (task 4.2), the review also seeks to gain insight into potential ways to practically apply RUVIVAL's sustainability framework/tool in cultural heritage reuse processes. This requires finding relevant stakeholders that can benefit from (and may, thus, be interested in) integrating RUVIVAL's sustainability framework/tool in their management practices and decision-making processes pertaining cultural heritage. A brief description of current cultural heritage management practices in Norway and at selected cases is, therefore, also provided, based on which we identify potential areas where RUVIVAL's sustainability framework/tool could be useful (section 6).

# 4 Literature search

The literature search and review was mainly conducted between June 2021 and December 2021. The search for relevant literature has comprised:

- two searches in Scopus database (described below)
- a screening of websites from key institutions such as The Directorate for Cultural Heritage, the Nordic Minister Council, the Norwegian government, the European Commission, UNESCO, ICOMOS and Distriktsenteret[1]
- a request to collaborating partners to provide documentation on relevant documents and projects

These searches have been supplemented with a partial screening of relevant references contained in the studies retrieved by these three searches. A full screen was not possible due to resource limitations. Altogether 84 documents are included in the review. Section 8.1 comprises the full references to these documents.

**On the Scopus search.** Keywords employed in the Scopus search (in the fields of tittle, abstract, keywords) conducted in July 2021 were:

'cultural heritage' and ('reuse' or 're-use' or 'transformation') and ('sustainability' or 'sustainable development')

In total, 234 documents were retrieved. One of them was duplicated. Screening of abstracts showed that 36 of the retrieved documents were not available and 141 focused on themes that were less relevant for RUVIVAL WP4's scope such as natural heritage; intangible heritage, festivals and events; policy analysis in non-Nordic regions; tourism as a tool to sustainable development and computational/digital science. 56 documents were, thus, further selected to be reviewed. One of the documents included in the literature review (yet not retrieved through the Scopus search) is the report from the project 'Cultural Heritage Counts for Europe' (2015). This EU-funded project collected and analysed existing and accessible evidence-based research and case studies evaluating economic, social, cultural, and environmental impacts of cultural heritage in order to assess its value. Thus, out of these 56 documents, we chose to exclude those published before 2015 because we assume[2] that they were included in this review. We also excluded documents that refer to the relationship between cultural heritage and sustainability in too general terms, without substantiating how this contribution may take place (e.g. the mere statement that cultural heritage contributes to sustainable urban development). 37 of the documents retrieved in the Scopus search were finally selected to be included in the review.

The Scopus search was updated in December 2021 using the same criteria. This search retrieved 38 new documents. 25 of these were considered relevant after screening the

[1] 'Distriktsenter'is a national competence center whose work seeks to strengthen municipalities and regions' ability to develop attractive and fast-growing local communities, https://distriktssenteret.no/om-distriktssenteret/

[2] No list of reviewed documents was found

abstracts, but six of them were not available and further 12 documents were considered not relevant. Thus, seven were finally selected to be included in the review.

The review process is summarized in figure 3.

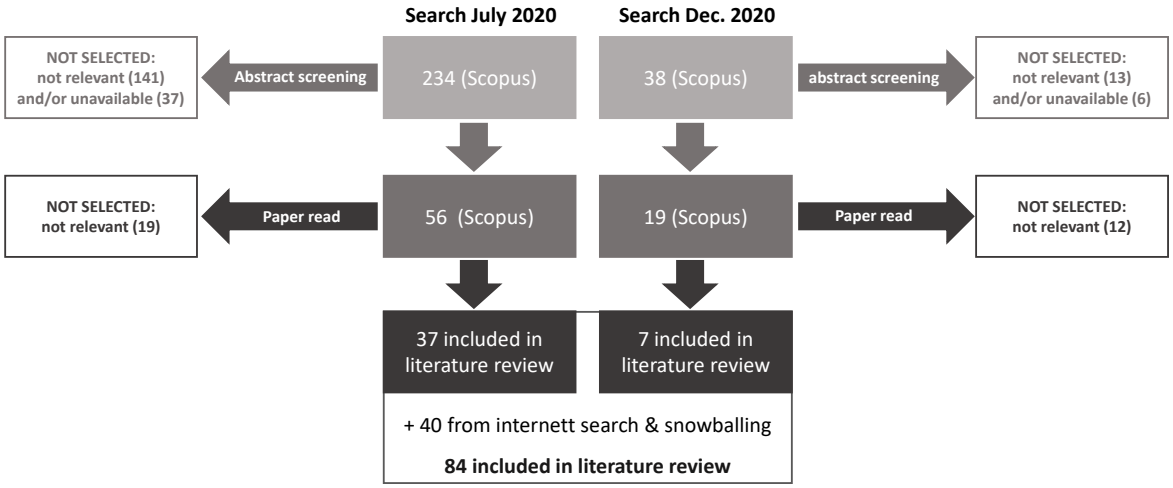


*Figure 3: Literature search process*

# 5 Main results from literature review

## 5.1 Reuse of cultural heritage and sustainable development – the relationship

Soini and Dessein (2016) propose a framework that describes the relationship between culture, including heritage, and sustainability in three distinctive ways that are yet open to be intertwined. The first representation of this relationship is termed 'culture in sustainability' and understands culture as a key pillar of sustainability, a result of sustainable development that focuses on culture's intrinsic value. The second approach is 'culture for sustainability', in which culture is understood as a resource for sustainable development whose intrinsic values become instrumental for achieving that development. The third approach is 'culture as sustainability' and understands development as a cultural process. In applying this framework to past policies, one may argue that the Johannesburg declaration (UN, 2002) viewed heritage as a pillar of sustainability, whereas recent policies (e.g. ICOMOS, 2011; UNESCO, 2013; CoE 2014, 2015, 2017; EC, 2014, 2019) have increasingly viewed cultural heritage also as a tool for sustainable development[3].

These and further policies (e.g. Potts, 2021; KMD, 2020) suggest that cultural heritage can contribute to several dimensions that are relevant for sustainable development. However, research also suggests that much of this contribution is insufficiently documented by empiric-based evidence (e.g. Bullen & Love, 2010, 2011, Calder, 2015) and/or that impacts are narrowly understood. For instance, Guzmán et al. (2017) find that the inclusion of cultural heritage in urban planning is mainly grounded on an understanding of cultural heritage as a capital asset whose conservation enables to address tangible social and economic needs such as housing and recreational spaces, whereas the relationship between cultural heritage and environmental or intangible aspects is still unexplored, despite increased recognition of cultural heritage as a key resource in sustainable urban planning and development.

Against this background, we have reviewed recent studies to explore what kind of impacts have been documented by latest research. By 'recent', we mean studies published after 2015, when results from the comprehensive review conducted by the EU-funded project 'Cultural Heritage Counts for Europe' (CHCfE) were published.

Main findings on the relationship between cultural heritage (reuse) and sustainable development documented by the studies reviewed (n=24) are summarized in table 1 (in which negative impacts are written in red). To follow up on suggested shortcomings , table 1 provides information on the type of studies documenting impacts, i.e. whether they are empiric-based or reviews[4]. Moreover, considering that RUVIVAL focuses on reuse of cultural heritage in rural contexts, table 1 also provides information on the regional focus of studies.

[3] RUVIVAL's sustainability framework/tool attempts to unite both understandings building on past research.

[4] We did not make a systematic cross-checked of studies comprised in reviews, partly because this was not possible. For instance, we could not find a complete list of the studies reviewed by the project 'Cultural Heritage Counts for Europe'.

*Table 1: Impacts of cultural heritage (reuse)[5] documented by studies reviewed*

| Impact | Type of study | Regional focus | Method/ data used | Source |
|---|---|---|---|---|
| Reuse of the Transiberiana railway line (after suspension for regular services) as a touristic railway and rehabilitation and reuse of some of its material heritage (e.g. stations) for new purposes (e.g. visitor orientation centres, rental point, commercial activities) contributes to revitalize artistic and cultural activities and artisan traditions, and is considered to be a tool for territorial enhancement and a driver for local economies. Moreover, it has led to reconsideration of reopening the line for commuting purposes | Empiric | Railway infrastructure in Abruzzo and Molise regions (Italy) (rural) | Case study[6] | Amato et al. (2021) |
| Calculations on energy use and emissions are affected by underlying assumptions and can differ greatly between the analyzed buildings. Yet, on average, in the selected cases, upgrading measures would reduce energy use by 41 per cent. Moreover, in a considerable number of cases upgrading would result in lower greenhouse gas emissions than demolishing and constructing new buildings meeting regulatory demands (TEK17)[7] (12 of the 19 buildings that are heated), as well as in lower costs (20 of 24) | Empiric | 24 buildings located in 'Innlandet' county (Norway) (mainly rural) | Scenario-based estimations based on observation, interviews with owners and available data | Asplan Viak & Energibygg AS (2021) |
| Reuse of military heritage brings along positive impacts for the real estate sector and wealthy population segments that can afford living in the redeveloped spaces. But the profit-driven orientation neglects public interests, local community needs and local sustainable development. It results in non-inclusive reuse that fails to create cultural and tourism opportunities, enhance local entrepreneurship, provide benefits for local communities and preserve important (in)tangible heritage values | Empiric | Six military barracks located in Florence, Rome, and Turin (Italy) (urban) | Desk research, observation and interviews | Camerin et al. (2021) |
| Adaptive reuse cases contribute to the creation of knowledge intensive companies and innovation institutions, energy savings/efficiency, reduction of waste and land consumption, improved governance models and financial mechanisms, better accessibility and affordability, enhanced community participation, social inclusion, safety and security, increased awareness about heritage's values, creation/conservation of cultural identity, preservation of cultural heritage, increased attractiveness and proliferation of cultural activities | Empiric | Heritage objects in a sample of European cities (urban) | Literature review, mapping, fieldwork (work-shadowing and mentoring visits) | Dane et al. (2019) |
| Reuse of two ancient heritage sites has contributed to improve the conservation of buildings and urban spaces, improvement of the area and preservation of local identity and cultural value. Reuse cases also contributed to triggering new investments, satisfying local community needs and reducing crime rates, although significant differences were found between both projects | Empiric | Two heritage sites (market and basilica) in Siracuse (Italy) (urban) | | De Medici et al. (2020) |
| Reuse of traditional houses as lodging and cultural facilities contributed to preservation of heritage, aesthetic and artistic values, local construction traditions and cultural identity; energy and resource savings; increased tourism activity/returns and generation of employment opportunities; business development; | Empiric | Eight refunctioned traditional houses in Demirel comples, | Case study (descriptive analysis)[8] | Durukan et al. (2021) |

[5] Some of the studies (e.g. ICOMOS, 2019 and Labadi et al., 2021) do not explicitly refer to cultural heritage reuse projects but to impacts of cultural heritage, including – but not only – reuse cases.

[6] Materials and documents used/reviewed were not clearly stated

[7] In three of these 12 buildings, however, demolishing and building new buildings aligned with passive house standards would result in lower emissions than upgrading existing buildings.

[8] Materials and documents used/reviewed were not clearly stated

| Impact | Type of study | Regional focus | Method/ data used | Source |
|---|---|---|---|---|
| diversification of cultural activities; promotion of local food; and increased civil participation. Yet, local communities have also experienced increases in energy and local resources' prices and decreased purchasing power | | Islamköy (Turkey) (rural) | | |
| Positive impacts documented comprise increased attractiveness and competitiveness of regions, cities and neighbourhoods; tax revenue generation and attraction of investment; job creation; social inclusion; community engagement; stimulation of education and learning; sense of belonging; civil pride; provision of a unique identity; innovation and creativity; energy use and emissions savings both directly (embedded energy) and indirectly (reducing urban sprawl); waste reduction; effective resource management; improved quality of life; social capital and social cohesion; and improved cooperation. Negative effects documented comprise increased property prices, gentrification, displacement and social exclusion, tourism congestion and pollution | Review | Europe (-) | Evidence-based research studies | Europa Nostra (2015) |
| Cultural heritage has informational, social, economic, aesthetic and environmental benefits for climate change mitigation and adaptation. It provides technical and traditional knowledge about past land use and resilient structures (e.g. flood risk management); it fosters cohesion, sense of place and enhances cultural identity, collective history and shared memory; it supports heritage conservation and drives tourism; it improves spatial qualities and makes environments more attractive; and it reduces carbon footprint | Empiric | (Netherlands) (not specified) | Interviews with experts observation data and document review (policies, press, grey literature) | Fatoric & Egbergs (2020) |
| Reuse of cultural heritage can contribute to circular economy objectives by reducing materials extraction, waste and land use, preserving tangible and intangible assets and skills, stimulating cooperation, participation and engagement, increasing attractiveness, enhancing knowledge, social cohesion and place identity, stimulating creativity and innovation, developing cultural activities and heritage-based products, creating jobs and economic spillovers, generating financial returns, stimulating local business and improving environmental qualities, safety and quality of life | Review | International (urban) | Circular economy and circular city studies | Gravagnuolo et al. (2021a) |
| Touristic use of industrial heritage contributes to strengthen social cohesion and identity, as well as fosters cross-sectoral cooperation, dialogue between stakeholders and product diversification. However, it shows little positive impacts on environmental and economic dimensions. The lack of economic development is attributed to the peripheral character of the region | Empiric | Industrial heritage in Steiermark county (Austria) (rural) | Secondary data, surveys (tourists and residents) and interviews with regional stakeholders | Harfst et al. (2021) |
| Cultural heritage can contribute to all UN's Sustainable Development Goals and, thereby, to the well-being of people and the planet, the prosperity of communities, achievement of peace and the creation of partnerships | Review | International (-) | Working group's expertise, documents and case studies | Labadi et al. (2021) |
| Cultural heritage can help to increase public awareness about climate change and the need for action, provide knowledge on mitigation and adaptation strategies, encourage community involvement and participatory governance, maximize the use of existing materials/resources and embodied energy, reduce carbon emissions, and contribute to resilience building | Review | International (-) | Working group's expertise, literature and case studies | ICOMOS (2019) |

| Impact | Type of study | Regional focus | Method/ data used | Source |
|---|---|---|---|---|
| Reuse of cultural heritage in the historic centre of Naples as accommodation (bed and breakfast) is correlated with the stabilization and increase of residential market values. It is argued (but not empirically analyzed) that it also contributes to increased attractiveness, tourism and awareness about heritage values, care and renovation work, sense of community renewal and jobs generation | Empiric | Historic centre of Naples (Italy) (urban) | GIS analysis on market values of residential buildings | Iodice, Toro & Bosone (2021) |
| Revitalization and reuse of a group of tenement buildings for multi-use purposes contributes to community cohesion and consolidation of social networks, strengthened sense of belonging and enhanced appreciation for cultural heritage, but also some displacement and gentrification. Reuse of a group of tenement buildings to host innovative art and creative industries contributes to the creation of public spaces and events, a consolidated sense of place, promotion of new business and creativity. Both cases illustrate that reuse contributes to increased residential property prices in neighborhoods and enhanced public participation | Empiric | Two groups of 1920s tenement buildings in Hong Kong (urban) | Case studies, hedonic pricing analysis | Kee & Chau (2020) |
| Protecting, maintaining and using Røros' historic centre contributes to increased visitors and property values, employment generation, increased money transfers and enhanced competences within heritage protection and building preservation, enhanced sense of belonging and of community, creation of meeting places, improved walkability, and civil engagement. Negative impacts comprised dissatisfaction among residents with visitors-oriented events and shops and neglection of Sami culture (in favor of an image built around the mining landscape) | Empiric | Røros historic centre (Norway) (urban) | Observation, interviews and analysis of grey literature and media | Lillevold & Haarstad (2019) |
| Rehabilitation of existing buildings has large environmental benefits in terms of greenhouse gas reductions due to the life extension of their embodied emissions (emissions from rehabilitation er half of the emissions from new construction) and waste reduction | Review | International (-) | Norwegian and international case studies | Mamo Fufa et al. (2020) |
| Transformation of a fortress into a museum generated some positive social impacts for local community and the society in terms of access to tangible resources, local capacity building, community involvement, employment, well-being, engagement and cultural value, but also certain environmental burden (mainly in terms of respiratory inorganics, emissions, consumption of non-renewable energy). | Empiric | Uncastillo (Spain) (rural) | Life Cycle Assessment (LCA) and social LCA | Mohaddes Khorassani et al. (2019) |
| Culture-led regeneration projects contribute to increased tourism, increased property values, job creation, economic spillovers and tax generation, proliferation of creative, cultural and innovative activities. Less well documented effects comprise those on the promotion of traditional local production, preservation of cultural heritage and the environment, resource, energy, emissions, land and waste savings, cultural identity and sense of belonging, social capital, cohesion and inclusion, climate change resilience and wellbeing in terms of e.g. housing and services quality, security and health. Negative effects can also occur such as congestion and touristification, increased prices, negative impacts on the integrity and authenticity of heritage, gentrification and degradation (but these are related to the touristic use of heritage) | Review | International (-) | 40 international case studies | Nocca (2017) |
| Cultural environments can contribute to climate change mitigation, as embodied energy and as a source of knowledge on traditional sustainable building (prioritizing use of local materials) and planning (emphasizing mixed used, human scale and integration of green and blue infrastructure). Yet, the relation between cultural heritage and climate issues is inconclusive and demands more research | Empiric | Nordic region (not specified) | Expert workshops | Norden (2014) |
| Adaptive reuse has spatial (revitalization of public spaces), environmental (reuse, land regeneration, increased awareness about the importance of recycling), social (increased liveliness, social inclusion, reducing | Empiric | three heritage buildings in | Document analysis, field work and | Radosavljević et al (2019) |

| Impact | Type of study | Regional focus | Method/ data used | Source |
|---|---|---|---|---|
| migration of the youth, foster education and creativity, preservation of traditional values, local participation and community networking) and economic (increased land value, support local products and use of local resources, empower local associations) impacts | | Kikinda (Serbia) (rural and urban) | interviews | |
| Reuse of historic buildings has environmental benefits in terms of greenhouse gases and pollutants emissions reduction; energy, resource and waste savings; as well as improves knowledge on traditional land management and building design (passive heating, cooling and ventilation, locally sourced materials) | Review | Australia (-) | National and international literature | Redden & Crawford (2021) |
| Cultural heritage has direct and indirect economic effects, improves regional attractiveness, increases housing market values, provides tourism revenues and creates employment, generates investments and enhances identity. However, the study also shows that positive impacts may not take place and that one should not obviate negative impacts (e.g. wear and tear) | Review | Nordic region (-) | Nordic studies | Storrank (2017) |
| Heritage's physical (e.g. architecture) and intangible (e.g. atmosphere) attributes and its reuse for performing activities (e.g. food, art) contributes to recreational attractiveness (which is also influenced by heritage's natural and regional environment) and generates self-growth (e.g. learning, reflection), health, social (e.g. promotion of social interactions) and cultural (e.g. sense of belonging) benefits | Empiric | Nine adaptive re-used heritage sites in Taipeh (Taiwan) (urban and sub-urban) | Analysis of interview data collected from visitors | Tu (2020) |
| Transformation and reuse of a brewery into a museum contributes to land conservation avoiding urban sprawl, protection of cultural heritage, community action, involvement and empowerment, preservation of local memory and cultural identity, environmental management, public environmental awareness and education and improvement of life quality[9] | Empiric | Industrial heritage case in Athens (Greece) (urban) | Fuzzy Dematel model based on expert evaluation | Vardopoulos (2019) |

Source: own elaboration

When it comes to the regional focus, table 1 shows that there are fewer studies focusing on rural than on urban contexts. Definitions of rurality typically vary from country to country. Thus, here, rural means areas far from regional centers (as it is the case in Amato et al., 2021), peripheric areas (as in Harfst et al., 2021) or rural contexts (as in two of the cases studied by Radosavljević et al., 2019). Moreover, there are few studies in the Nordic region, as also commented by Storrank (2017) and Norden (2014).

Table 1 also illustrates that the relationship between cultural heritage and sustainable development is documented through both literature reviews and empiric case studies. 16 of the 24 studies included in the table are empiric-based studies, adding to the insufficient empiric-based evidence upon which some scholars (e.g. Bullen & Love, 2010, 2011; Calder, 2015; Nocca 2017) have raised attention.

Moreover, table 1 shows that studies cover a wide range of impacts. In what follows, we have attempted to group the impacts investigated by the studies contained in table 1 by sustainability dimension, although – as commented by Bosone et al. (2021) when working with indicators – categorizing impacts into one dimension was not straightforward[10].

[9] In addition to these factors, the contribution of the following factors (which were also extracted from a literature review) were tested but were assessed to be less influential and/or important: economic growth, tourism growth, enhancement of local value and technological innovation.

[10] Should, for instance, job creation, be understood as an economic or social impact? Is containment of urban sprawl beneficial for the environment alone or also for the social fabric? Should the diversification of cultural

- *Cultural impacts* comprise heritage preservation; preservation and/or revitalization of local artisan and construction traditions; increased awareness about cultural heritage's values; preservation of local memory and/or cultural identity; sense of place; enhanced competences within heritage and building protection; and contributions to education, learning, capacity-building and creativity. However, negative impacts such as loss of values (e.g. authenticity, integrity) and/or wear and tear may also emerge.
- *Social impacts* include creating/enhancing a sense of belonging and of community; fostering social cohesion and social inclusion; providing a sense of pride; building social capital; the revitalization/ diversification of cultural (and social) activities; the improvement of environmental qualities such as safety and security; provision and access to public spaces, tangible resources, infrastructure and services that also bring along health benefits and contribute to improve the quality of life and well-being of people; improved governance models; increased participation and engagement, cooperation and dialogue; and the empowerment of local communities. Negative impacts mentioned include exclusion, displacement (gentrification) and touristification.
- *Economic impacts* comprise the generation of economic spillovers; the creation/development of business and employment opportunities; tourism generation and related revenues; increased property and land values; generation of tax revenue and attraction of investments; cost savings; promotion of local products and product diversification; improved attractiveness; enhanced competitiveness; reduction of outmigration; and improved financial mechanisms. Yet, some negative economic impacts may also emerge for local communities whose purchasing power can be reduced as a consequence of a rise in prices.
- *Environmental* impacts include energy and emissions savings; reduction of waste and pollution; limited use of resources, materials, and land; increased use of local resources; and promotion of recycling. Maximizing the use of embodied energy, reducing emissions, and using knowledge on traditional land management and building design can also contribute to climate change mitigation and/or adaptation as well as increase resilience. Some negative environmental impacts may, however, emerge as a consequence of using cultural heritage such as congestion, pollution, increased emissions and energy use and environmental degradation.

Following the categorization of impacts into cultural, social, economic and environmental dimensions described above, we note that nine of the studies mention impacts across all four dimensions[11], although – admittedly – half of them are reviews. Further nine studies

activities be regarded as cultural, economic or social benefit? Similarly, should support of local products and use of local resources be categorized as a positive economic, environmental and/or social impact?

[11] Dane et al. (2019); Durukan et al. (2021); Europa Nostra (2015); Fatoric & Egbergs (2020); Gravagnuolo et al. (2021a); Labadi et al. (2021); Mohaddes Khorassani et al. (2019); Nocca (2017); Radosavljević et al. (2019)

focused on three dimensions[12]; whereas five studies focus on two dimensions[13] and one study on one dimension[14]. Table 2 summarizes the type of dimension covered by the studies reviewed.

*Table 2: Sustainability dimensions covered by studies reviewed*

| Study | Economic | Environmental | Social | Cultural |
|---|---|---|---|---|
| Amato et al. (2021) | X | | X | X |
| Asplan Viak & Energibygg AS (2021) | X | X | | |
| Camerin et al. (2021) | X | | X | X |
| Dane et al. (2019) | X | X | X | X |
| De Medici et al. (2020) | X | | X | X |
| Durukan et al. (2021) | X | X | X | X |
| Europa Nostra (2015) | X | X | X | X |
| Fatoric & Egbergs (2020) | X | X | X | X |
| Gravagnuolo et al. (2021a) | X | X | X | X |
| Harfst et al. (2021) | X | | X | X |
| Labadi et al. (2021) | X | X | X | X |
| ICOMOS (2019) | | X | | X |
| Iodice, Toro & Bosone (2021) | X | | X | X |
| Kee & Chau (2020) | X | | X | X |
| Lillevold & Haarstad (2019) | X | | X | X |
| Mamo Fufa et al. (2020) | | X | | |
| Mohaddes Khorassani et al. (2019) | X | X | X | X |
| Nocca (2017) | X | X | X | X |
| Norden (2014) | | X | | X |
| Radosavljević et al (2019) | X | X | X | X |
| Redden & Crawford (2021) | | X | | X |
| Storrank (2017) | X | | | X |
| Tu (2020) | X | | X | X |
| Vardopoulos (2019) | | X | X | X |

Source: own elaboration

Crucially, table 2 suggests is that conclusions reached by e.g. Europa Nostra (2015), Guzmán et al. (2017) and Nocca (2017) may be shifting. The EU-funded project Cultural Heritage Counts for Europe (CHCfE) documented that research on the impacts of cultural heritage has been traditionally focused on investigating economic dimensions with research on social and cultural impacts catching up, but still scarce evidence on environmental impacts. Importantly, only six per cent of the studies reviewed by the project were categorized as holistic, i.e. covered all four sustainability dimensions – economic, social, cultural and environmental (Europa Nostra, 2015, p. 97). Also, Nocca (2017) and Guzmán et al. (2017) concluded that there was a prevalent focus on economic and tangible impacts.

Tables 1 and 2 suggest, however, that both environmental, social and cultural aspects are receiving increased attention. Although far from all studies can be categorized as 'holistic',

[12] Amato et al. (2021); Camerin et al. (2021); De Medici et al. (2020); Harfst et al. (2021); Iodice, Toro & Bosone (2021); Kee & Chau (2020); Lillevold & Harstad (2019); Tu (2020); Vardopoulos (2019)

[13] Asplan Viak & Energibygg AS (2021); ICOMOS (2019); Norden (2014); Redden & Crawford (2021); Storrank (2017)

[14] Mamo Fufa et al. (2020)

various studies focus now on the implications of (reusing) cultural heritage for environmental aspects (e.g. energy, materials and land savings) and climate change mitigation and adaptation (by either reducing resource use and/or limiting emissions and waste or by providing an inspirational source of knowledge), as well as impacts on social aspects (e.g. sense of belonging, social inclusion and cohesion, quality of life, well-being) and further intangible dimensions (e.g. knowledge, awareness, participation, cooperation, creativity).

Interestingly, most of the impacts documented are positive impacts. Yet, some of the studies reviewed illustrate that reusing cultural heritage can also have negative impacts (e.g. Camerin et al., 2021; Durukan et al., 2021; Europa Nostra, 2015; Lillevold & Harstad, 2019). Moreover, impacts do not need to be either positive or negative, but can be both positive and negative, as illustrated by e.g. Durukan et al. (2021), who find that reusing traditional houses as lodging and cultural facilities also brings along rising prices that decrease locals' purchasing power, in addition to positive impacts. The outcomes of the reuse projects may also vary depending on the selection of uses and – not least – what motivates them. For instance, Camerin et al. (2021) show that a profit-driven orientation underlying projects to reuse military cultural heritage benefits wealthy individuals and real-state business but fails to create positive benefits for local communities and satisfy their needs. Moreover, the impact of cultural heritage reuse can differ, even when projects are quite similar as illustrated by De Medici et al. (2020). They argue that impacts of reusing cultural heritage depend on the selected use functions in relation to their context, the buildings' characteristics as well as on how reuses are managed on the long-term.

Acknowledging the limits of our literature review, based on the studies presented here, we argue that (re)use of cultural heritage has the potential of affecting various dimensions considered relevant for sustainable development. Yet, we cannot conclude that reusing cultural heritage always contributes to sustainable development. This will ultimately depend on how reuse processes are designed and implemented, what in turns, substantiates the need for developing RUVIVAL sustainability framework/tool.

## 5.2 Developing the sustainability framework – the process

The literature review shows that frameworks to integrate sustainability related criteria in cultural heritage reuse processes have been already proposed. Table 3 provides a summary of them in the literature and of how they were developed.

*Table 3: Sustainability frameworks and methodologies behind them.*

| Short description | Framework's purpose | Aspects/criteria included | Methodology to develop the framework | Real-case application (Validation) | Stakeholder engagement | Source |
|---|---|---|---|---|---|---|
| Performance-based framework comprising a set of criteria and a Multiple Criteria Decision Assessment (MCDA) methodology | Balance interests of multiple stakeholders and rank selection of historical vacant buildings to prioritize adaptive reuse interventions | Economic sustainability, built heritage preservation, sociocultural aspects, building usability and regulatory aspects (seismic resilience) | Criteria identified through a narrative literature review and fine-tuned to the New Zealand context | Framework validated in Whanganui (New Zealand), where focus group participants used it to weight criteria and score two vacant historic buildings based on criteria | Focus group participants included owners, developers and users of heritage buildings and legal, council and community representatives | Aigwi et al. (2019, 2020) |
| Three phase framework combining assessments of the context, user needs and buildings to establish heritage performance adequacy (*analysis*) and draft reuse strategies (*diagnosis*) aligned with resilience thresholds (*evaluation*) | Incorporate resilience thinking at an early stage of heritage reuse process to prevent the selection of functions that may compromise heritage's consistency, semantic coherence and/or physical existence | Contextual factors (e.g. accessibility, identity preservation), user needs (e.g. comfort, safety), regulatory and energy efficiency requirements and building's spatial, technological and environmental characteristics | Criteria and indicators build on previous research | No application/validation of the framework reported | None documented | Besana et al. (2018) |
| Five-step model consisting of (1) the discretization of urban systems into sub-systems to identify vulnerabilities; (2) stakeholders' identification; (3) participatory approaches to integrate results from (1) with local communities' views; (4) identification of critical issues and needs; (5) elaboration of indicators linking (4) to SDGs | Guide, monitor and evaluate the adoption of circular economy strategies in transformation processes of vulnerable heritage and landscapes | Vulnerabilities/ challenges and resources/solutions across economic, environmental, social and cultural sub-systems that are explicitly link to UNs SDGs, leading to a set of indicators across sustainability dimensions | The five-step methodological model is grounded in the human-centered approach literature; whereas the Human-Centred Evaluation Matrix and Indicators Framework are the result of a review of indicators and literature and the application of the methodological model at two specific case studies | Methodological model is applied at two urban cases: Ercolano (Italy) and Bronx (New York). Applications and cross-case comparison result in the elaboration of a Human-Centred Evaluation Matrix and Indicators Framework | Experts engaged in identification of vulnerabilities (1). Local communities (e.g. citizens, organizations) surveyed to map needs and issues to enhance well-being and local development and decision-makers (e.g. heritage and local authorities) interviewed to understand impacts on sub-systems (3) | Bosone & Ciampa (2021) |
| Ex-post evaluation framework consisting of 40 criteria across three circularity dimensions: regenerative, symbiotic and generative | Assess the impacts of cultural heritage adaptive reuse from a circular economy perspective | Economic, environmental, social and cultural criteria | Literature review and five focus groups with interdisciplinary groups of experts | No application/validation of the framework reported | Limited to experts | Bosone et al. (2021) |

| Short description | Framework's purpose | Aspects/criteria included | Methodology to develop the framework | Real-case application (Validation) | Stakeholder engagement | Source |
|---|---|---|---|---|---|---|
| Three-phase framework combining stakeholder analysis, Nara grid application and case studies' analysis (*intelligence* phase) based on which reuse alternatives are proposed (*design*) and evaluated ex-ante using Discounted Cash Flow and Multicriteria Analysis (*decision*) | Define and assess reutilization scenarios of an abandoned cultural heritage environment to accommodate various functions while retaining heritage significance with the paper focusing on defining and assessing the location of a health care facility | Social needs and expectations; heritage's artistic, historic, social, cultural and economic values; and functional, socio-cultural, environmental and economic sustainability criteria | Framework developed based on previous work and work gathered during the intelligence phase relevant for the specific case | Framework applied on a former hospital in Vimercate (Italy), where stakeholders were mapped and consulted, focus group participants used the framework to weight criteria and decision-makers designed and evaluated alternatives on those criteria | The needs of most important stakeholders (not clear which) according to a power/interest matrix are considered in drafting scenarios; whereas focus group's participants consisted of experts | Capolongo et al. (2019) |
| Framework comprising a set of criteria and Multicriteria Decision-Making method (MCDM) | Explore optimal reuse function alternatives for historic buildings | Economic, social, environmental, architectural and historical criteria | Criteria identified through a literature review and reuse alternatives based on analysis of case studies | Framework applied at a museum in Taipeh, where experts weighted/selected criteria; verify weightings and scored alternatives | Experts engaged through questionnaires | Chen et al. (2018) |
| Methodology based on analysis of building characteristics and a multi-scalar analysis of its context | Define adaptive reuse interventions under consideration of local development and community needs | Considers buildings' historical and technical characteristics and surrounding context at three levels: the local territorial context, the neighborhood, and the area of intervention | Methodology based on literature review | Methodology validated at an industrial heritage case in Valencia (Spain) using observation, historical analysis, technical measurements and simulations | None documented | De Gregorio et al. (2020) |
| Assessment framework based on selection of indicators to facilitate ex-post evaluations (aim of paper), but also ex-ante assessments of cultural heritage with respect to sustainable development | Understand the relationships between the implementation of adaptive reuse projects and their success (or failure) in terms of impacts on the buildings and on the urban context | Physical, cultural, social, environmental and economic | Indicators selected based on previous work and analysis of selected case studies and their urban context | Assessment framework applied at two heritage sites in Siracusa (Italy) using a survey | Institutional representatives, technical-professional organizations and adaptive reuse experts engaged through a questionnaire-based survey | De Medici et al. (2020) |
| Three-phase evaluation framework comprising identification of uses (*intelligence* phase) and MCDA combining an evaluation matrix (*design*) and sensitivity analysis (*decision*) | Evaluate and select cultural heritage reuse scenarios considering both on-site and off-site impacts as well as conflicting views | Social, technological, economic, environmental and political (STEEP) dimensions as well as on-site and off-site criteria and conflicts between stakeholders | Selection of MCDA techniques (e.g. NAIADE and SMARTER) based on literature review; use scenarios identified by case specific desk research and focus groups; criteria based on literature review but selected to fit the case | Model applied on a fortress in Milan (Italy), where focus group participants identified scenarios, weighted criteria and scored alternatives, and experts participated in results' evaluation | Focus groups participants comprised experts; and experts were also involved in evaluating results through a questionnaire | Dell' Ovo et al. (2021) |

| Short description | Framework's purpose | Aspects/criteria included | Methodology to develop the framework | Real-case application (Validation) | Stakeholder engagement | Source |
|---|---|---|---|---|---|---|
| Framework combining Multi-Criteria Analysis to rank alternatives and Discounted Dash Flow Analysis to verify financial feasibility of selected alternative | Optimize investment choices pertaining reuse of unused historical public heritage to ensure efficient allocation of public resources | Social value (e.g. community involvement), historical and cultural value (e.g. compatibility) and economic and financial value (e.g. return on investment) | Framework based on literature review and case-specific research: identification of potential use alternatives based on multistakeholder consultation resulting from institutional analysis[15]. Not clear who defines criteria | Framework applied at a monastery in Catanzaro (Italy), where use alternatives selected in focus group using MCDA techniques, followed by a financial feasibility analysis of the prioritized use option | Focus groups participants included experts, citizens, associations and public administration | Della Spina (2021) |
| Integrated evaluation model combining various multi-criteria decision analysis (MCDA) techniques | Rank adaptive reuse strategies to be applied in a set of unused cultural heritage cases to support decision-makers in their selection and implementation | Urban sustainability (e.g. accessibility), project sustainability (e.g. flexibility of spaces to new functions) and economic sustainability criteria (e.g. payback period) | Muti-criteria techniques (MacBeth, Evamix and AHP) grounded on literature review. Criteria based on UNESCO HUL approach and focus groups with experts. Use alternatives identified through case-specific focus groups and questionnaires with various stakeholders | Model applied at six former military heritage cases in Stretto de Messina (Italy), where the combination of functions and assessment of alternatives were elicited in focus groups and the weighting of criteria was queried in interviews, both with experts from various disciplines | Institutions, technical organizations and professionals, representatives of construction, tourism and trading and of the community engaged in definition of possible use functions through focus groups and questionnaires. Else, only experts engaged | Della Spina (2020) |
| Multi-Stakeholder Decision Analysis framework combining Multi-Criteria and Multi-Group Evaluation techniques and Feasibility (Economic Sustainability) Analysis | Evaluate and choose reuse alternatives for industrial heritage attending to internal and external dependencies between criteria and dimensions | Environmental, social, environmental and cultural criteria comprising community needs, heritage's values and economic feasibility | Framework grounded on literature reviewed and case-specific research: criteria selected in focus group with public administration and technicians. Use options defined in a focus group organized by public administration with experts and political representatives | Framework applied at an industrial heritage case in Catanzaro (Italy), where the framework was used to and select preferred alternative (through multicriteria and multi-group evaluation) on which to conduct the feasibility analysis | It combines expert and common knowledge. Experts were engaged in selection of criteria and definition of alternatives, whereas ranking of alternatives was based on multistakeholder consultation[16] | Della Spina et al. (2020) |

[15] Documented in Della Spina, L. (2019). Multidimensional assessment for "Culture-Led" and "Community-Driven" urban regeneration as driver for trigger economic vitality in urban historic centers. Sustainability 11, 7237 and Della Spina, L. (2019). Historical cultural heritage: Decision making process and reuse scenarios for the enhancement of historic buildings. In New Metropolitan Perspectives; ISHT 2018; Smart Innovation, Systems and Technologies; Calabrò, F., Della Spina, L., Bevilacqua, C., Eds.; Springer: Cham, Switzerland, 2019; Volume 101.

[16] Della Spina (2019) - see footnote 15 – documents results from the stakeholder analysis

| Short description | Framework's purpose | Aspects/criteria included | Methodology to develop the framework | Real-case application (Validation) | Stakeholder engagement | Source |
|---|---|---|---|---|---|---|
| Circular Economy (CE) framework comprising various phases of the building cycle – from design to materials sourcing, build phase, use and operation and repurpose or demolition | Encourage consideration of circular economy in heritage reuse projects through identification of strategies and stakeholders at each stage, as well as assessment of their circularity to reduce environmental impact | Circularity strategies: refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, recover | Selection of methods and techniques based on building, construction and adaptive reuse of cultural heritage literatures | Description of how to apply the framework but no validation on real-life case | No stakeholders were engaged in development of the framework, but stakeholders that may use the framework are identified | Foster (2020) |
| Circular Environmental Impact Indicator Framework measuring both direct and indirect impacts at the micro level (building project) | Guide, monitor and evaluate implementation of circular economy in adaptive reuse of cultural heritage buildings | Direct (e.g. embodied energy, materials reuse) and indirect (e.g. emissions and land use savings) environmental impacts | Indicators were selected based on literature review | No application/validation of the framework reported | None documented | Foster et al. (2020) |
| Circular City Adaptive Reuse of Cultural Heritage Index | Identify which European cities present the best investment opportunities for adaptive reuse of cultural heritage buildings | Cultural stock, environmental stewardship, socio-economic/demographic dimensions included | Selection of indicators based on literature review, data availability, credibility, contemporary focus and relevance to the conceptual framework (the notion of investment opportunity) | Index applied to 190 European cities included in the 2019 European Cultural and Creative Cities Monitor | None documented | Foster & Saleh (2021) |
| Vulnerability assessment framework based on the Integrated Value Model for Sustainability Assessment (MIVES) which combines Multi-Criteria Decision-making Theory and Value Engineering | Assess vulnerability of heritage sites to flooding events, facilitating consideration of climate change effects in reuse processes | Heritage's sensitiveness and adaptive capacity to a particular event | Selection of multi-criteria approach, including criteria indicators and weighting methodology (AHP) based on previous work | Framework is applied in San Sebastian (Spain) and validated by comparing results of the framework application to a survey of selected buildings | Experts are engaged in weighting of criteria and indicators and definition of the value function to transform indicators values into comparable units | Gandini et al. (2018) |
| Evaluation framework and dashboard for the assessment of urban | Monitor and compare cities considering the specific contribution of | Economic, cultural, social and environmental criteria | Selection of indicators based on literature review | Validation of framework feeding into ex-ante | Not specified, but reported elsewhere[18] | Gravagnuolo et al. (2021a) |

[18] Gravagnuolo et al. (2021b) documents that stakeholder engagement took place within the project to identify relevant heritage and build collective knowledge on its values and attributes as well as to envision reuse opportunities and prioritization of actions

| Short description | Framework's purpose | Aspects/criteria included | Methodology to develop the framework | Real-case application (Validation) | Stakeholder engagement | Source |
|---|---|---|---|---|---|---|
| circular performance on the grounds of cultural heritage adaptive re-use | adaptive reuse of abandoned cultural heritage and landscapes to circular economy objectives | to assess the regenerative, generative and symbiotic capacities of cultural heritage (re)use to urban circular performance | | indicators documented elsewhere[17] | | |
| Framework consisting of a Multi-criteria decision making (MCDM) method to weight criteria and rank alternatives | Support selection of the optimal new use function for heritage buildings | Heritage value, architectural value, economic performance, social value, environmental impact | Selection of criteria and MCDM methodology (AHP) is based on literature review | Framework applied at a palace in Alexandria (Egypt) | None documented | Haroun et al. (2019) |
| Application of the ITACA sustainability rating system to compare potential energy performance after selected refurbishments with current energy performance | Facilitate the assessment of environmental sustainability of heritage buildings in an early stage of energy improvement design | Environmental criteria comprising site quality (e.g. distances to services), resource consumption, environmental loads (e.g. emissions), indoor environmental quality, services quality | Methodology selected based on review of existing Environmental Sustainability protocols | Methodology applied to a historical complex (planned to be used as university) in Genoa (Italy) | None documented | Magrini & Franco (2016) |
| Methodology combining environmental life cycle assessment (LCA) and social life cycle assessment (S-LCA) | Explore potential contribution to sustainable development of cultural heritage reuse projects from a life cycle perspective | Includes environmental and social criteria (social criteria is identified for each stakeholder group) | Selection of criteria for LCA and S-LCA based on literature review (including standards and guidelines) | Framework validated to evaluate reuse and management of a medieval fortress used as museum in Zaragoza (Spain) using existing data and a meeting with the local community | The local community participates in evaluation of well-being | Mohaddes Khorassani et al. (2019) |
| RURITAGE General Monitoring Programme | Show the role of cultural and natural heritage in rural areas for sustainable growth | Cultural, environmental, built, social, human and financial capital | Criteria and related KPIs informed by role models and replicators and weighted by experts | Framework applied at selected cases | Limited to experts | Olmedo & Barrientos (2020) |
| Framework based on triple bottom line approach (people, planet and profit) integrated with a | Generate design solutions for buildings to increase energy efficiency and indoor qualities; retain architectural legibility | Energy efficiency, noise reduction and use of renewable energy; floor and collective spaces and accessibility; | Design alternatives based on literature and document review | Framework applied at renovation of post-war walk-up apartments in Netherlands using survey-based discrete choice | Consumers consulted in survey; and housing associations and architects engage in workshops, in which discussion of the | Oorschot et al. (2018) |

[17] Gravagnuolo & Girard (2021)

| Short description | Framework's purpose | Aspects/criteria included | Methodology to develop the framework | Real-case application (Validation) | Stakeholder engagement | Source |
|---|---|---|---|---|---|---|
| consumer preference assessment | and heritage value; provide affordable housing attending to users' preferences | architectural legibility and functionality | | modelling to elicit users' preferences | framework and survey results resulted in a roadmap | |
| Three phase (*intelligence, design, choice*) spatial multidimensional analytical framework combining GIS and MCA consisting of territorial (1) attractiveness and (2) vulnerability assessments feeding into a (3) priority matrix | Account for spatial components and raise awareness about the territorial potentials and constraints of cultural heritage interventions to identify those better placed to trigger economic and social development | Considers territorial strengths in terms of natural, historical-cultural and socio-economic and weakness across environmental, demographic and economic criteria. | Criteria to analyze territorial strengths and weaknesses are based on literature review, case studies and analysis of previous public consultation. Value functions of criteria and weightings are selected based on interviews with experts | Methodology is developed departing from a real-life problem (the potential use of heritage assets along cycling/walking routes), but it is not applied on a real case | Experts are engaged in defining value functions and weighting of criteria | Oppio & Dell'Ovo (2021) |
| Methodology based on geographical register data and recovery potential criteria | Identify unused buildings and assess their recovery potential building on existing data and minimizing need for costly on-site inspections | Conservation status, accessibility to main roads, proximity to the consolidated urban fabric, architectural value, landscape value, degradation | Based on literature review and case-specific data availability | Methodology applied at a medium size municipality: Chiari (Italy) | None documented | Richiedei (2020) |
| Five-step framework comprising various methodologies to 1) conduct a context analysis, 2) define and 3) select reuse alternatives, 4) assess financial sustainability and 5) analyze risk | Assess the financial sustainability of conscious cultural heritage reuse project to inform decisions on cultural heritage reuse | Contextual characteristics, including heritage's economic and social values; alternatives' economic, cultural and environmental performance, financial sustainability; and financial, regulatory and environmental risks | The selection of methodologies included in the framework – (1) system thinking approach, SWOT analysis, historic research, interviews, on-field survey; (2) scenario building; (3) multicriteria analysis; (4) discounted cash flows; and (5) sensitivity analysis – is guided by existing literature | Framework is applied at a Historical Rural Landscape in Pantelleria (Italy) | Local stakeholders are engaged through surveys and interviews in the decision context analysis and scenario building, while local experts are engaged in the recognition of heritage values | Rossitti et al. (2021) |
| Multi-criteria non-hierarchical hybrid network-based approach | Select the share of complementary use functions for a complex of historical buildings by considering internal interdependencies, while also attending to positive and negative impacts | Considers economic, societal, environmental, cultural and architectural benefit in the selection of possible use functions | Criteria selected based on review of literature and discussed with multi-disciplinary experts. Use functions forwarded by case-specific municipal decision-makers and assessed by the authors | Approach verified at a complex of historical buildings in Giżycko (Poland), where system network structure, Inter-dependencies and impacts (polarity and strength) were defined by experts | Limited to experts through survey and heuristic methods | Sladowski et al. (2021) |
| Model comprising indicators to improve | Identify most optimal energy efficiency | Considers energy performance of | Indicators, categorization of protection levels, allowed | Model applied in Serbia, though on abstract | Experts involved in the identification of | Stajonevic et al. (2021) |

| Short description | Framework's purpose | Aspects/criteria included | Methodology to develop the framework | Real-case application (Validation) | Stakeholder engagement | Source |
|---|---|---|---|---|---|---|
| buildings' energy efficiency and multi-criteria decision making (MCDM) method | retrofitting measures for cultural heritage depending on its level of protection | technical systems and building's thermal performance | physical interventions, and MCDM method based on previous research and recommendations | categories (not specific heritage cases) | priority indicators for each level of protection | |
| Three phase (*intelligence*, *design*, *choice*) evaluation model integrating technical and social multicriteria analysis and financial model | Guide choice of sustainable alternative functions for the adaptive reuse of heritage buildings from a circular economy perspective | Social, economic and urban development criteria; local community's needs, historical and cultural values, and economic and financial feasibility | Framework elaborated based on literature review and case-specific research: criteria and stakeholders identified by technicians | Framework applied on a monastery in Mugnano di Napoli (Italy), where alternatives were identified and evaluated technically in a focus group and socially by means of an online survey using selected criteria and MCDA methods | Technical experts and public administration engaged in alternatives identification and technical evaluation. Social evaluation engaged public administration, politicians, entrepreneurs, business owners and professionals, social and cultural associations, students and (un)employed and retired individuals | Torrieri et al (2019) |
| UNESCO Thematic Indicators for Culture Framework | Measure and monitor culture's contribution to national and local implementation UN's SDGs | Explicit link to UNs SDGs | Review of frameworks, methodologies and UNESCO's/partners' experiences, two expert workshops and member states' consultation | No application/validation of the framework reported | Mainly experts | UNESCO (2019) |
| Framework comprising a set of criteria and Multicriteria Assessment Model | Support selection of suitable and compatible use functions by utilizing the view of various stakeholders | Economic, environmental, social, cultural, legal and architectural criteria | Framework developed based on a literature review (to identify criteria) and case-specific research: field survey to collect data on the site and survey among locals to pre-select alternative functions | Model is grounded and applied at a underutilized hospital building in Kyrenia, Cyprus (partly used by NGOs) | Locals surveyed to identify functions. Locals and experts interviewed to weight criteria and rank alternatives | Vehbi et al. (2021) |

Source: own elaboration

As illustrated in table 3, frameworks have been developed with various purposes. However, at a general level, it is possible to distinguish between two types of frameworks: a) those proposed to be used in decision-making processes at an early phase of the reuse project; and b) those (coloured in table 3[19]) designed to conduct ex-post evaluations. Among the second type of frameworks (b), we find frameworks to evaluate the contribution of heritage reuse projects to sustainable development, relevant sustainability dimensions such as circularity or UN's sustainability goals. They typically consist of sets of indicators. We find, however, no frameworks guiding heritage reuse processes in between planning (selection of project) and evaluation.

Among the first type of frameworks (a) we typically find frameworks have been developed to evaluate, rank and choose from among alternatives using different types of criteria. Alternatives can comprise functions with which to fill-in particular heritage objects (e.g., Chen et al., 2018; Dell'Ovo et al., 2021; Della Spina, 2021; Della Spina et al. 2020; Haroun et al., 2019; Torrieri et al, 2019) or cultural heritage buildings to satisfy particular functions (e.g., Aigwi et al., 2019, 2020) or both, i.e. which functions to allocate in which buildings (Capolongo et al., 2019; Della Spina, 2020). Moreover, some of the frameworks are designed to consider the complementarity of multiple functions (Sladowski et al., 2021; Vehbi et al., 2021). In addition, we find also frameworks to forecast impacts of reuse projects that can compromise heritage sites (Besana et al., 2018) and assess their vulnerability to extreme events (Gandini et al., 2018); encourage consideration of circularity strategies (Bosone & Ciampa, 2021; Foster, 2020); inform design of interventions aligned with triple bottom line perspectives (Oorschot et al., 2018) and of energy efficiency (Stajonevic et al., 2021); assess various types of interventions at early stages of the process (e.g.; Magrini & Franco, 2016; de Gregorio et al., 2020; Oppio & Dell'Ovo, 2021; Rossitti et al., 2021); and identify the potential of reusing cultural heritage objects (Richiedei, 2020).

Some of these frameworks (a) comprise three phases: 'intelligence', 'design' and 'decision', but the tasks comprised by each of these phases can vary across studies. Capolongo et al. (2019) dedicates the 'intelligence phase' to the collection of data to identify relevant stakeholders, assess the site's artistic, historic, social, scientific, cultural and economic values and understand its territorial context. Oppio & Dell'Ovo (2021) use the 'intelligence phase' to structure the decision-making framework and collect data to assess selected criteria. And Dell'Ovo et al. (2021) define reuse alternatives under the 'intelligence phase', a task first performed under the 'design phase' by Capolongo et al. (2019). Dell'Ovo et al. (2021) and Oppio & Dell'Ovo (2021) conduct the evaluation of alternatives during the 'design phase', leaving the aggregation of values (Oppio & Dell'Ovo, 2021) and the sensitivity (Dell'Ovo et al, 2021) for the 'decision phase', whereas Capolongo et al. (2019) conduct their integrated financial and multi-criteria assessments in the 'decision phase'.

Data collection on the heritage site itself seems a pertinent task to start with. Blagojevic and Tufegdzic (2016) argue that converting functionally obsolete buildings in ways that respect their values, authenticity and integrity is challenging, and that frameworks that consider building's aesthetic integrity and its structural and functional capacity to accommodate new uses and meet standards can contribute to deliver successful heritage reuse processes. Moreover,

[19] in yellow those applicable in both ex-ante and ex-post assessments

understanding the heritage site itself improves our understanding on its vulnerability (Haroun et al., 2019).

Chapter 5.3.1 provides a more detailed overview of criteria and indicators included in the frameworks, but we can anticipate that there is a wide range of criteria comprised in frameworks including: community needs, preservation of historical and cultural values, economic and financial feasibility, circular economy, environmental impacts and performance, socio-cultural aspects, building usability, regulatory aspects and/or multidimensional benefits. We find that some frameworks are limited to aspects traditionally belonging to the environmental dimension (Foster et al., 2020; Magrini & Franco, 2016; Stajonevic et al., 2021), but several of the frameworks are quite broad in scope (e.g., Aigwi et al., 2020; Bosone & Ciampa, 2021; Mohaddes Khorassani et al., 2019; Gravagnuolo et al., 2021a; Olmedo & Barrientos, 2020; UNESCO, 2020), in terms of criteria comprised. Moreover, some frameworks combine criteria pertaining the building/site and the broader local context (Besana et al., 2018; de Gregorio et al., 2020) or on-site and off-site impacts (Dell' Ovo et al., 2021) into the decision-making process. Also, various of the 'ex-ante' assessment frameworks combine MCDA methods with financial assessments such as Discounted Cash Flow Analysis (DCFA) of the prioritized alternatives (e.g. Della Spina et al, 2020; Della Spina, 2021; Rossitti et al., 2021; Torrieri et al., 2019).

The methodologies used to develop frameworks are also diverse and comprise literature review and desk research, workshops, focus groups, surveys, observations and fieldwork, and statistical and spatial analysis. Most frameworks, however, depart from a literature review and desk research, and a substantial amount are developed solely based on previous work and literature (e.g., Besana et al., 2018; de Gregorio et al., 2020; Foster, 2020; Foster et al., 2020; Foster & Saleh, 2021; Gandini et al., 2018; Gravagnuolo et al., 2021a; Haroun et al., 2019; Magrini & Franco, 2016; Mohaddes Khorassani et al., 2019; Rossitti et al., 2021), whose results they eventually adapt them to a particular context/case(s) (e.g., Aigwi et al., 2019, 2020; de Medici et al., 2020; Oorschot et al., 2018). Some of the frameworks are, however, more fundamentally grounded on specific cases (Bosone & Ciampa, 2021; Oppio & Dell'Ovo, 2021; Richiedei, 2020; Vehbi et al., 2021) and/or draw on consultation of stakeholders. However, consultations are often limited to experts or technicians (e.g., Bosone et al., 2021; Capolongo et al., 2019; Dell'Ovo et al., 2021; Oppio & Dell'Ovo, 2021; Sladowski et al., 2021; Stajonevic et. al., 2021; Torrieri et al., 2019, UNESCO, 2019).

Only few studies draw on consultation with a wider range of stakeholders in the development of frameworks and models. Bosone & Ciampa (2021), for instance, grounded their model in the literature; but their Human-Centred Evaluation Matrix and Indicators Framework are also the result of application of the methodological model at two specific case studies, in which they engage local communities, in addition to decision-makers and experts. Della Spina (2020, 2021) draws on multistakeholder consultation to identify potential reuse alternatives, as well as on consultation with public administration and technicians to select criteria (Della Spina et al., 2020). And Vehbi et al. (2021) ground their evaluation framework on a particular case, where they engaged locals in the pre-selection of alternative functions.

23 out of the 30 frameworks comprised in table 3 are applied in real-life cases[20]. We note that in applying the frameworks, more attention is dedicated to the engagement of a diversity of stakeholders. For instance, Aigwi et al. (2019, 2020) engage owners, developers, users of heritage buildings and legal and council and community representatives in weighting of criteria and evaluation of reuse alternatives. Under application of the framework proposed by Bosone and Ciampa (2021), local communities (e.g. citizens, organizations) are surveyed to map needs, whereas decision-makers (e.g. heritage and local authorities) are interviewed to understand impacts. De Medici et al. (2020) survey institutional representatives, technical-professional organizations and adaptive reuse experts to assess the implementation of adaptive reuse projects. In applying the framework proposed by Della Spina (2021) and Della Spina et al. (2020), multiple stakeholders (experts, citizens, associations and public administration) participate in focus groups to select reuse alternatives. And Mohaddes Khorassani et al (2019) engage local communities to assess well-being; whereas Torrieri et al. (2019) engage multiple stakeholders (public administration, politicians, entrepreneurs, business owners and professionals, social and cultural associations and citizens) in the assessment of social aspects. Yet, applications of various frameworks are also limited to experts (Chen et al., 2018; Dell'Ovo et al., 2021; Della Spina, 2020; Gandini et al., 2018; Olmedo & Barrientos, 2020; Oppio & Dell'Ovo, 2021; Sladowski et al., 2021).

In addition to the frameworks documented in table 3, a literature review conducted by Li et al. (2021) describe the following (more general) research frameworks for understanding adaptive reuse in the context of sustainable development.

- Campbell's planner's triangle (Campbell, 2016)[21] which seeks to balance social justice, economic development and environmental protection and interrelated property, development and resource conflicts between these three dimensions
- Townsend's planner's circle (Townsend, 2015)[22] which focuses on the interrelations between five indicators (nature, place, economy, community and psychology) and their related sub-indicators to assess the heritage reuse process
- UNESCO's 'Historic Urban Landscape' (HUL) approach (2011)[23] which is based on the concept of dynamic integrity considering the need to manage heritage in evolving environments
- The model of social sustainability forwarded by Vallance et al (2011)[24] which highlights the human dimension

[20] Lack of reported applications of the other seven frameworks does not necessarily mean that they have not been validated in specific cases, as dissemination on development and application of frameworks can be fragmented.

[21] Campbell, S. 2016. "The Planner's Triangle Revisited: Sustainability and the Evolution of a Planning Ideal That Can't Ctand Still." Journal of the American Planning Association 82 (4): 388–397. https://doi.org/10.1080/01944363.2016.1214080

[22] Townsend, L. 2015. Effective Strategic Planning, Planet Training Notes. Planning Institute of Australia. Retrieved from Campbell, Duffy, and Michelle, Edmondson (Eds.). 2020. Located Research: Regional places, transitions and challenges. London: Palgrave Macmillan

[23] UNESCO. 2011. Recommendation on the Historic Urban Landscape. http://portal.unesco.org/en/ev.php-URL_ID=48857&URL_DO=DO_TOPIC&URL_SECTION=201.Html.

[24] Vallance, S., H. C. Perkins, and J. E. Dixon. 2011. "What is Social Sustainability? A Clarification of Concepts." Geoforum 42 (3): 342–348. https://doi.org/10.1016/j.geoforum.2011.01.002

- The diagram proposed by the Cultural Heritage Counts for Europe project (Europa Nostra, 2015) comprising four value domains: cultural, social, environmental and economic
- Srinivas' matrix (2015) for heritage management based on two axes[25]: one considering the combination of heritage development and macro development and one considering direct and indirect benefits generated by heritage conservation at the community level and the city level.

As with the frameworks presented in table 3, these frameworks seek to integrate multiple criteria into decision-making processes.

We can conclude this chapter saying that the overview of frameworks and models retrieved by the literature review provides a solid, yet probably insufficient, knowledge base to develop RUVIVAL's sustainability framework/tool, as none of the frameworks reviewed was designed to be used at different phases of the reuse project. In subsequent research, we may need to explore how to integrated best models designed to be used at different stages of the reuse processes and what kind of tools and methods can be useful to actually implement reuse processes. Moreover, we may explore which kind of functionalities are potential users interested in at any phase of the reuse process. For instance: are they more interested in tools to range or evaluate use alternatives to already identified heritage objects or to find a location/heritage object to host and satisfy a new social need?

## 5.3 Elements of sustainability frameworks – the content

### 5.3.1 Sustainability criteria and indicators

Indicators are commonly used to operationalize sustainability, and several of the studies reviewed comprised criteria and indicators against which cultural heritage and environments reuse alternatives can be evaluated. Table 4 provides an overview of these studies. Criteria and indicator sets are not fully reproduced, given their extension[26]. Nevertheless, table 4 provides a sense of the kind of criteria, indicators and (if reported) the type of measurements proposed.

[25] Srinivas, H. 2015. "Heritage and Conservation Strategies: Understanding the Justifications and Implications." Policy Analysis series E-100. https://www.gdrc.org/heritage/heritage-strategies.html

[26] Some sets included up to 176 indicators

*Table 4: Overview of studies comprising sustainability criteria and indicators.*

| Source | Description of indicator system/set |
|---|---|
| Aigwi et al. (2020) | Set of five 'priority aspects' and 24 criteria to prioritise (ex-ante) underutilised historical buildings for adaptive reuse interventions<br>→economic sustainability<br>• Increased property and land value from potential new use<br>• potential cost savings from reuse of construction materials<br>• shorter construction period due to existing main structural elements<br>• attractive location to potential users<br>• commercially viable new building function<br>• increased revenue from tourism<br>→built heritage preservation<br>• maintained sense of place<br>• sustained architectural history and narration of towns existence<br>• sustained visual heritage appeal of surrounding streetscape<br>• sustained architectural history and narration of towns existence<br>→socio-cultural<br>• improved quality of life through shared cultural identity<br>• improved feeling of belonging and attachment to place<br>• renewed public interest in refurbished historical buildings<br>• practical socio-cultural amenity to neighbourhood<br>→building usability<br>• desired intervention for building<br>• target new use for building<br>• target new users for building<br>• desired optimal functionality in use<br>→regulatory compliance<br>• Seismic code requirements<br>• Building code requirements<br>• Heritage regulatory requirements<br>• Disability, fire protection and emergency escape requirements<br>• Environmental requirements<br>• Urban master plan and zoning specifications |
| Besana et al. (2018) | Control variables to evaluate design choices (ex-ante):<br>• loss or removal of material,<br>• structural and spatial alteration of the building layout<br>• degree of reversibility<br>• loss or weakening of its identity values<br>• increase in safety<br>• reduction in ecological footprint generated by the project<br>• increase in accessibility<br>• future adaptability |

| Source | Description of indicator system/set |
|---|---|
| Bosone et al. (2021) ; Gravagnuolo & Girard (2021, p. 51-53) | 40 criteria to assess the impact (ex-post & ex-ante[27]) of adaptive reuse of cultural heritage from a circularity perspective<br>→regenerative capacity<br>• Authenticity and integrity<br>• Intrinsic value<br>• Financial self-sustainability<br>• Local circular economy<br>• Energy efficiency<br>• Freshwater efficiency<br>• Nature-Based Solutions<br>• Soil recovery<br>• Heritage community<br>• Local community<br>→symbiotic capacity<br>• Traditional skills<br>• Local identity<br>• Mutual cooperation<br>• Cultural and knowledge capital production<br>• Circular metabolism<br>• smart Specialisation Strategies<br>• Construction & Demolition Wastes<br>• Materials extraction<br>• Participation in decision-making<br>• Social cohesion<br>• Civil pride Local community<br>→generative capacity<br>• Cultural vibrancy<br>• Creativity and innovativeness<br>• Jobs creation<br>• Economic spill-overs<br>• Public finance benefit<br>• Attractiveness for creative, cultural and innovative enterprises<br>• Attractiveness for residents<br>• Attractiveness for circular cultural tourism<br>• Soil consumption reduction<br>• Air quality and microclimate<br>• GHG emissions reduction<br>• Water quality<br>• Biodiversity<br>• Landscape quality and atmosphere<br>• Safety of public spaces<br>• Cleanliness and healthiness of public spaces<br>• Quality of life for residents<br>• Health<br>• Wellbeing |

[27] Bosone et al., 2021 present this set for ex-post evaluation, but Gravagnuolo & Girard (2021, p. 45) write that the set can also be used for ex-ante evaluation

| Source | Description of indicator system/set |
|---|---|
| Capolongo et al. (2019) | Four sustainability criteria with 13 sub-criteria used in multi-criteria analysis to evaluate (ex-ante) reuse alternatives. For all criteria the unit of measurement is defined in terms of being positive or negative, unless other specified<br>→Functional sustainability<br>• flexibility<br>• usability/accessibility<br>• buffer and common space<br>• transformability index<br>→Socio-cultural sustainability<br>• functional mix<br>• social attractiveness<br>• aggregation spaces<br>→Environmental sustainability<br>• harmonization with the context<br>• energetic quality<br>• consistency with constraints<br>→Economic sustainability:<br>• construction cost (€/sqm)<br>• maintenance cost<br>• profitability of intervention (€) |
| Chen et al. (2018) | Set of five aspects and 16 criteria used in decision-making model to prioritize (ex-ante) reuse alternatives:<br>→Economic<br>• optimise local economy structure<br>• improve value of land use<br>→Social<br>• promote public interests<br>• elevate public awareness<br>→Environmental<br>• effectively use natural resources<br>• reduce pollution<br>• preserve ecological and landscape resources<br>• ensure appropriateness of development methods<br>→Architectural<br>• facilitate comprehensive preservation and management systems<br>• maintain and improve the quality of surrounding environments<br>• display regional identity<br>• enable a connected and open space network<br>→Historical<br>• Historical values<br>• Aesthetic values<br>• Integrity and authenticity<br>• Regional and cultural values |
| De Medici et al. (2020) | Set of 49 indicators to assess performance of cultural heritage adaptive reuse projects (developed for ex-post, but also suggested applicable for ex-ante assessments):<br>• No. of visitors per year or per day (attractiveness);<br>• Percentage of crowding;<br>• Contribution of heritage tourism to the city;<br>• No. of visitors for cultural reason;<br>• No. of participants in cultural events;<br>• No. (or percentage) of projects of cultural programmes and events;<br>• No. of people involved in organising events;<br>• Percentage growth rate of cultural events and creative activities;<br>• No. of cultural (and creative) enterprises (attractiveness);<br>• No. of new start-ups (attractiveness);<br>• No. artists (attractiveness);<br>• Attraction of new investments in cultural heritage and cultural/creative events-activities;<br>• Economic impact generated by cultural events;<br>• No. (or percentage) of craft stores/new handcraft shops/small scale manufacture/local production activities<br>• Percentage of crafts, small scale manufacture, production activities;<br>• No. of licenses granted in retail and services for artisan;<br>• New funds to support activities of non-profit organizations;<br>• No. of new businesses;<br>• Percentage of increase in employment in activities (or n. of new jobs) related to typical local production/distribution<br>• Average price of properties;<br>• Average rent value for residential properties; |

| Source | Description of indicator system/set |
|---|---|
| | • Average rent value for commercial-use properties/oces;<br>• Average market value for residential properties;<br>• Average market value for commercial-use properties;<br>• Percentage of increase in private land/properties value;<br>• No. (or percentage) of commercial units;<br>• No. of use change of properties;<br>• No. of new constructions/rehabilitations;<br>• No. (or percentage) of well-preserved buildings;<br>• No. (or percentage) of buildings in poor condition;<br>• No. (or percentage) of historic building with minor problems;<br>• Percentage of used/partially used historic building;<br>• Percentage of vacant historic building;<br>• No. of restoration and adaptation works undertaken on historic buildings/sites;<br>• Percentage of re-functionalized historic buildings;<br>• Area of facades of historic buildings rehabilitated;<br>• Recognizability and acceptability of the transformations;<br>• Shape preservation of the building envelope;<br>• Conservation of the aesthetic relationship with the context;<br>• Conservation of the original dimensions of the building;<br>• Conservation of the geometric features;<br>• Conservation of the indoor spaces;<br>• Preservation of the finishes;<br>• Compatibility of the transformations;<br>• Percentage of citizens satisfied with historic buildings quality;<br>• Willingness to pay for a contribution to heritage restoration;<br>• Percentage of citizens feeling safe in the city/perception of personal safety;<br>• Average number of crimes (murders, thefts in dwellings, pickpocketing, robberies);<br>• Percentage of citizens satisfied with cultural facilities supply |
| Dell' Ovo et al. (2021) | 10 criteria to evaluate (ex-ante) on-site and off-site impacts of adaptive reuse scenarios. Units of measurements are provided in parenthesis:<br>→On-site<br>• Design of public recreational spaces (sqm)<br>• Compatibility of the function with the property (scale 1-5)<br>• Initial cost (EUR/sqm)<br>• Construction periods of building's adaptation (months)<br>• Involvement of local associations (binary)<br>→Off-site<br>• Catchment area (scale 1-3)<br>• Improvement of the accessibility (binary)<br>• Mixed new job opportunities (no)<br>• Sustainable Development Goals (SDGs) (no)<br>• Involvement of the community (scale 1-3) |
| Della Spina (2020) and Salerno (2020) | 11 indicators across three criteria to range (ex-ante) adaptive reuse strategies. Units of measurements are provided in parenthesis:<br>→Urban sustainability<br>• Presence of historical-cultural places within 1 km (1-5)<br>→Project sustainability<br>• Quality of the urban landscape (1-5)<br>• Accessibility by private car (km)<br>• Presence of commercial activities nearby (1-5)<br>• Presence of accommodation and hospitality services (1-5)<br>• Total property availability (sqm)<br>→Economic sustainability<br>• Flexibility of spaces to new functions (1-5)<br>• Degradation level (1-5)<br>• Investment costs (EUR/sqm)<br>• Payback period (year)<br>• Financial appeal for private investors (1-5) |

| Source | Description of indicator system/set |
|---|---|
| Della Spina (2021) | Set of three criteria with nine sub-criteria and corresponding measurements (in parenthesis) employed in multi-criteria analysis to compare and rank (ex-ante) alternative reuse scenarios:<br>→Social value<br>• community involvement (average no of daily users who frequent the facility, measured by the structure's maximum capacity index)<br>• new job opportunities activated by the new function (no of potential new permanent workers hired to manage the structure)<br>→Historical and cultural value<br>• cultural effects, attractiveness concerning to cultural events (scale 1-7)<br>• representativeness of the use function (scale 1-7)<br>• user impact (the average number of daily users)<br>• minimal intervention (scale 1-7)<br>→ Economic and financial value<br>• existence/absence of competitors of similar activities in the municipality (yes/no)<br>• investment costs (€/m2)<br>• return on investment (ROI) for the private entity (profitability of a similar economic sector in the survey area) |
| Durukan et al. (2021) | Set of 26 sub-parameters to evaluate (ex-post) the impact of material heritage reuse aligned along three principles:<br>→Environmental sustainability:<br>• use of local resources<br>• adaptation to the natural environment<br>• ecology sensitive/bioclimatic properties<br>• resource protection<br>• construction techniques<br>• architectural/aesthetic values<br>• energy efficiency and continuity<br>• architectural layout/urban texture/planning<br>→Economic sustainability:<br>• waste management<br>• reducing operating, maintenance and repair costs<br>• energy saving/efficiency<br>• job creation<br>• management of resources regulations<br>• cultural activity<br>• tourism return<br>• revival of settlements/local workforce<br>→Social sustainability:<br>• protection of artisanal activities<br>• preservation of cultural diversity<br>• ensuring public participation in protection actions<br>• balance between past and present<br>• strengthening environmental and community ties<br>• emotional value<br>• existance, creation and protection of identity<br>• continuity of local construction and culture<br>• cultural function<br>• human needs and quality of life<br>• memory and sense of place |
| Europa Nostra (2015) | Set of 25 potential aspects across economic, social, cultural and environmental sustainability dimensions upon which cultural heritage may have an impact, being some of these aspects relevant for various sustainability dimensions:<br>• Image and symbols creation<br>• Visual attractiveness<br>• Architectural language<br>• Creativity and innovation<br>• Sense of place<br>• Cultural landscape<br>• Reducing urban sprawl<br>• Preserving embodied energy<br>• Lifecycle prolongation,<br>• Education,<br>• Skills<br>• Knowledge<br>• Creation of identity<br>• Regional attractiveness<br>• Social cohesion<br>• Community participation<br>• Continuity of social life |

| Source | Description of indicator system/set |
|---|---|
| | • Place branding<br>• Labour market<br>• Regional competitiveness<br>• Real estate market<br>• Gross Value Added<br>• Return on investment<br>• Tax income<br>Housing stock management |
| Foster et al. (2020) | Indicator framework comprising four types of indicators, 20 indicators and corresponding units of measurement (in parenthesis) to guide (ex-ante), monitor and assess (ex-post) environmental impacts of adaptive reuse of cultural heritage buildings:<br>→Direct reductions to new natural materials extraction<br>• Maintain embodied energy ($CO_2$ eq, GHG tons/year avoided/reused)<br>• Reuse materials and objects (kg/metric tons/m3)<br>• Traditional and/or biomass and/or local sustainable materials description and volume (kg/metric tons/m3)<br>• Increase water efficiency/fresh water consumption (litres/person/year)<br>• Implement water collection storage and reuse systems onsite (litres/person/year)<br>• Reduce C&D waste to landfill through recovery and reuse on or off-site (kg/metric tons/m3 avoided)<br>• Increase land use efficiency due to the adaptive reuse (m2 reductions to space requirements of new purpose)<br>→Direct reductions to energy:<br>• GHG emissions ($CO_2$ eq, GHG tons/year)<br>• Increase energy efficiency (Consumption per (KWh/user/year)<br>• Increase amount of non-renewable vs. renewable energy use (% of KWh/user/year from renewable sources on or off-site)<br>→Direct environmental improvements<br>• Reductions to air emissions ($CO_2$, Nox, Sox, particulate matter)<br>• Provide habitat for specific endangered or culturally relevant species (description of species and impact)<br>• Improved water quality (eutrophication potential based on nutrient loads)<br>• Improvements to water, air or soil pollution, e.g. brownfield remediation (concentration in ppm)<br>• Implement natural heritage conservation of site (legally protected landscape m2 or hectares and % of project)<br>• Implement natural heritage preservation designation of site (legally protected building and/or landscape m2 or hectares and % of project)<br>→Indirect reductions to energy use or pollution<br>• Limit land use change (farmland maintained or reduction to urban sprawl in hectares)<br>• Indirect emissions reductions, e.g. vehicle use ($CO_2$ eq, GHG tons/year avoided)<br>• Maintain embodied energy in off-site reused materials ($CO_2$ eq, GHG tons avoided)<br>• Reuse materials and objects off-site (kg/metric tons/m3) |

| Source | Description of indicator system/set |
|---|---|
| Gravagnuolo et al. (2021a)[28] | Set of criteria and performance indicators (in parenthesis) to assess (ex-post) the contribution of cultural heritage adaptive reuse to a circular city comprising 29 sustainable city objectives:<br>• Energy efficiency increase - Old buildings retrofitting (Energy consumption (Megawatt/sq.m.)<br>• Non-renewable energy consumption reduction - Conservation of embodied energy (CO2 tons/year avoided)<br>• Renewable energy sources increase - Increase of renewable energy generation in site (solar, wind, water, geothermic) (KW)<br>• Freshwater consumption reduction - Adoption of water capturing, filtering and re-use systems (Freshwater consumption (liters/year))<br>• Nature-based solutions adoption - Enhancement of places safety and health through the adoption of nature-based solutions (Number of nature-based interventions in the city territory)<br>• Materials extraction reduction – Re-use of existing buildings/sites (Sq.m. old buildings re-used)<br>• Construction & Demolition Waste (C&DW) reduction -Demolition wastes avoided due to the maintenance of existing buildings instead than demolition and reconstruction options (Equivalent C&DW avoided)<br>• Soil consumption reduction – Avoiding loss of fertile soil due to new buildings construction (Land use change)<br>• Tangible and intangible cultural capital – Enhancement of cultural heritage assets (Conservation of heritage attributes) and traditional skills enhancement (Workers trained/available in traditional skills)<br>• Synergies and symbioses enhancement – Stimulation of cooperation projects between stakeholders (e.g., cooperation agreements)<br>• Heritage community enhancement – Heritage community creation around the perceived values of cultural heritage as common good (e.g., people actively participating in heritage projects)<br>• Increase of places with high social significance - Attractiveness of unique, safe and healthy public spaces for residents and visitors (e.g., Perceived atmosphere and appreciation of public spaces)<br>• Increase of places with high cultural significance (local identity enhancement) - Conservation of cultural identity values and cocreation of new values through compatible contemporary interventions in heritage sites (Level of appreciation of heritage places; Number of places with high cultural significance in the city)<br>• Mutual cooperation enhancement - Mutual cooperation between stakeholders to share common resources, knowledge, existing produced assets (e.g., Volunteers contributing to heritage reuse)<br>• Shared local values and community bonds enhancement - Local community engagement in co-creation and sharing processes (e.g., Participation in public arenas)<br>• Cultural/knowledge production enhancement - Knowledge production and cultural production stimulated by cultural heritage (e.g., Heritage-based products and services developed)<br>• Social cohesion enhancement (intra- and inter-generational) - Increase of trust, openness, diversity due to collaboration of many stakeholders in heritage projects and bottom-up initiatives (e.g., sSocial businesses and third sector involvement in heritage projects) and Increased awareness towards future generations (Awareness towards future generations access to natural and cultural resources)<br>• Cultural vibrancy enhancement - Increased opportunities to appreciate culture and cultural heritage (Participation in cultural and educational activities)<br>• Creativity and innovativeness - Generation of new ideas (New ideas generated)<br>• Economic-financial self-sustainability – Generation of diverse revenue streams through the new uses of cultural heritage able to reduce dependency from external contributions (e.g., Level of independency from external contributions)<br>• High-quality jobs creation - Generation of long term job opportunities through new uses of abandoned buildings (long-term jobs created, directly and indirectly)<br>• Economic spillovers increase - Indirect and induced economic impacts generated due to direct investments in adaptive re-use (Indirect and induced economic impacts)<br>• Public finance benefits increase - Financial returns for the public sector due to economic spillovers generated by heritage projects (Financial returns)<br>• Circular supply chains realization at local and macro-local (“glocal”) level - Stimulation of complementarities between heritage-related industries/businesses at local and macro-local (“glocal”) level (e.g., local and macro-local supply of necessary resources for the adaptive reuse of cultural heritage)<br>• Landscape quality enhancement - Better quality of the urban context thanks to the renovation of buildings and sites (Buildings renovated)<br>• Safety of public spaces enhancement - Increased perceived safety of public spaces due to renovation of buildings and sites in the area (e.g., Safety perception)<br>• Cleanliness of public spaces enhancement - Increased cleanliness of public spaces due to higher civic responsibility conveyed by inclusive adaptive reuse projects (e.g., Cleanliness perception)<br>• Quality of life for residents enhancement - Avoided gentrification effects such as excessive increase of real estate values and “touristification” of places (e.g., Change in real estate market values)<br>• Air quality and microclimate enhancement - Air quality and microclimate enhancement related to green areas and biomass increase through nature-based solutions (e.g., Biomass increase) |

[28] Based on review of indicators reported by Gravagnuolo & Girard (2021)

| Source | Description of indicator system/set |
|---|---|
| Gravagnuolo & Girard (2021, p. 107-114) | Set of 62 quantitative and qualitative indicators divided into 11 indicators categories to enhance choices in cultural heritage adaptive reuse<br>*Cultural capital regeneration*<br>• Authenticity and integrity conservation<br>• Intangible values regeneration<br>• Intrinsic values<br>• Historic Urban Landscape quality regeneration<br>• Accessibility of cultural heritage site<br>*Financial Capital regeneration*<br>• Net Present Value of investment (NPV)<br>• Internal Rate of Return (IRR)<br>• Return on Investment (ROI)<br>• Payback period<br>• Debt Service Coverage Ratio (DSCR)<br>• Loan Life Coverage Ratio (LLCR)<br>• Project Life Cover Ratio (PLCR)<br>• Public Sector Comparator (PSC) and Value for Money (VfM)<br>• Share of public and private contribution<br>• Local investment<br>*Natural Capital regeneration*<br>• Energy generated on site through renewable sources<br>• Energy performance level upgrade<br>• Carbon emissions per sqm indoor area<br>• De-impermeabilization of soils<br>• Heat island effect reduction<br>• Reduction of freshwater consumption<br>• Rainwater recovered<br>• Reduction of raw materials consumption<br>• Use of regional resources<br>• Green surfaces<br>• Nature-Based Solutions<br>• Environmental remediation<br>*Human capital regeneration*<br>• Traditional skills and construction techniques<br>• Entrepreneurship enhancement<br>• Education and training activities<br>*Social Capital regeneration*<br>• Heritage Community<br>• Support to weak and marginalised social groups<br>*Accessibility of the urban area*<br>• Accessibility enhancement<br>• Public and green space accessibility<br>• Pedestrian mobility<br>• Sustainable mobility<br>*Partnerships and synergies with the context*<br>• Stakeholders involvement in decision-making<br>• Stakeholders involvement in the management phase<br>• Third sector actors involved<br>• People involvement<br>• Marginalised social groups involvement<br>• People collaboration<br>• Businesses collaboration and symbioses<br>• Synergies with higher level policies<br>• Trust levels<br>*Employment generation*<br>• Jobs creation<br>• Regional economy spillovers<br>• Local economy<br>• Jobs/Investments ratio<br>*Local entrepreneurship and innovation*<br>• Enterprises localisation<br>• Entrepreneurs and self-entrepreneurs localisation<br>*Quality life, well-being and health*<br>• Beneficiaries of adaptive reuse intervention<br>• Proximity activities<br>• Cultural activities<br>• Cultural participation<br>• Arts, craft, making and repairing activities |

| Source | Description of indicator system/set |
|---|---|
| | • Creative and innovative spaces<br>• Urban art<br>• Public space and socialization<br>• Green space<br>*Economic impacts*<br>• Real estate market values<br>• Commercial activities |
| Gravagnuolo & Girar (2021, p. 72-80) | Matrix of 57 indicators categorized along the following 32 criteria categories for ex-post evaluation of cultural heritage adaptive reuse impacts on circularity regenerative, symbiotic and generative capacities:<br>Authenticity and integrity<br>• Intrinsic value<br>• Financial self-sustainability<br>• Reinvestment of profits<br>• Energy efficiency<br>• Fresh Water efficiency<br>• Nature-Based Solutions<br>• Heritage community<br>• Local community<br>• Traditional skills<br>• Smart Specialisation Strategies<br>• Construction & Demolition Wastes<br>• Materials extraction<br>• Social Sustainability<br>• Participation in decision making<br>• Participation in cullture<br>• Cultural visitors<br>• Jobs creation<br>• Indirect and induced economic impacts<br>• Financial returns for public sector<br>• Cultural vibrancy<br>• Landscape quality<br>• Place attractiveness<br>• Cleanliness of public spaces<br>• Safety of public spaces<br>• Wellbeing<br>• Quality of life<br>• Greenhouse gas emission s (GHG)<br>• Air quality<br>• Water quality<br>• Biodiversity<br>• Soil pollution |
| Haroun et al. (2019) | Set comprising five criteria and 10 sub-criteria to select (ex-ante) optimal new use function for heritage buildings:<br>→Heritage value<br>• protection and enhancement heritage significant<br>→Architectural value<br>• compatibility (new functional appropriateness to original layout)<br>• recognizability of heritage and new function<br>• respectability of building ’s system<br>• building’s physical stability<br>→Economic performance<br>• economic benefit<br>• adaptation costs<br>→Social value<br>• effect on society<br>→Environmental impact:<br>• congruity with land uses<br>• accessibility |

| Source | Description of indicator system/set |
|---|---|
| Mohaddes Khorassani et al. (2019) | Two sets of criteria to perform environmental and social life cycle analysis (ex-post) comprising all together 18 topics and corresponding performance indicators (examples in parenthesis) to explore the contribution of cultural heritage reuse projects to sustainable development:<br>→Topics comprised in the environmental LCA comprising different phases measured in relevant output terms such as emissions to air, water, waste and recycling<br>• Production phase: raw materials extraction, manufacturing<br>• Construction phase: transport to building site, preliminary operations, construction-installation processes<br>• Use phase: operational energy use in 100 years, maintenance operations in 100 years<br>• End of life phase: demolition of construction elements, transport, waste processing/recycling<br>→Topics comprised in the social LCA and examples of corresponding indicators in parenthesis:<br>• health and safety (e.g., adequate health and safety training; safety plans and systems in place)<br>• wages (e.g., percentage of workers paid below legal wage, at legal wage, or living wage)<br>• social benefits (e.g., percentage of workers paid the social benefits or additional benefits)<br>• working hours (e.g., overtime recorded, voluntary, compensated at premium rate, does not exceed legal limits)<br>• discrimination (e.g., wage slips or wage records of workers confirm equal pay for work of equal value)<br>• freedom of association (e.g., employer does not hinder or interfere but proactively informs workers about their right to organize themselves and bargain collectively)<br>• employment relationship (e.g., percentage of workers who have a permanent employment relationship)<br>• training and education (e.g., percentage of workers who received training or have participated periodically in programs aimed at capacity and skill development9<br>• work-life balance (e.g., percentage of workers that can benefit from flexible working arrangements to balance work and private life)<br>• job satisfaction and engagement (e.g., worker turnover rate during the reporting period wellbeing)<br>• cultural development (e.g., presence of educational programs for visitors)<br>• access to tangible resources (e.g., appropriate measures to prevent or mitigate adverse impacts or to restore community access to tangible resources)<br>• local capacity building (e.g., programs to build human capacities of community members through general community education initiatives and/or formal programs)<br>• community involvement (e.g., opportunities for community support are identified and appropriate programs)<br>• employment (e.g., number of new jobs created/lost during the reporting period)<br>• involvement (e.g., involvement of the municipality in the management of the complex)<br>• cultural value (e.g., complex included in the register of cultural goods (and level)) |

| Source | Description of indicator system/set |
|---|---|
| Mohammed & Alauddin (2016) | Set of 5 criteria and 31 sub-criteria to evaluate decision-making on adaptive reuse with regards sustainable development (ex-ante)<br>→Economic:<br>• Target market/profit from market demand<br>• Sources of finance/risk<br>• Subsidize/financial incentives<br>• Initial investment and necessary investment in future maintenance<br>• Benefit of exemption/tax concessions<br>• Building value<br>→Environment<br>• Site and situation<br>• Land use planning and zoning<br>• Potential environmental quality of the surroundings<br>• Contamination<br>• Sustainability<br>• Reduce of greenfield sites<br>• Reduction of resource consumption<br>→Social<br>• Compatibility of newly introduced uses with existing<br>• Public interest<br>• Social and cultural value<br>• Location (proximity to transport and amenities, cost of land)<br>• Enhancing the rolw of communities<br>• Retaining a sense of place<br>→Legislative<br>• Regional development policies<br>• Official plan and zoning regulation<br>• Building code<br>• Heritage designated buildings<br>• Development of government incentives<br>• Conditions of integrity and authenticity<br>→Architecture<br>• Building system/technological value<br>• Structural condition<br>• Architectural condition and space layout<br>• Site layout<br>• Building suitability<br>• Client requirement |

| Source | Description of indicator system/set |
|---|---|
| Nocca (2017) | Set of 176 indicators (examples given in parenthesis) followed by corresponding units of measure that are categorized in nine impact categories and 31 sub-categories to capture (ex-post) the impacts and benefits of cultural landscape conservation/valorization for sustainable development:<br>→Tourism and recreation<br>• Touristic demand (e.g., no. of visitors per year (or per day)<br>• Touristic supply (e.g., increase in accommodation capacity<br>• Economic impact on local wealth (e.g., earnings supported by heritage tourism)<br>• Economic Vitality (e.g., no. of licenses in tourism activities)<br>→Creative, Cultural And Innovative Activities<br>• Cultural demand (e.g., no. of participants in cultural events)<br>• Cultural supply (e.g., no. (or percentage) of cultural events per year)<br>• Economic impact on wealth and health (e.g., economic impact generated by cultural events)<br>• Employment in cultural activities (no. (or percentage) of artists taking part in cultural activities)<br>→Typical Local Production Indicators<br>• Employment in local production (e.g., no. of artisan units)<br>• Creative firms (e.g., percentage of crafts, small scale manufacture, production activities)<br>• Local production (e.g., no. of projects in traditional arts)<br>→Environment And Natural Capital<br>• Environmental preservation (e.g., attraction of new investments for enhancing of green areas)<br>• Green areas and facilities supply (percentage of citizens satisfied of green spaces)<br>→Social Capital/Cohesion and Inclusion<br>• Social cohesion (e.g., no. of volunteers)<br>• Sharing/collaborative economy activities (no. of new cooperative enterprises)<br>• Employment (e.g., employment rate/youth employment rate)<br>• Social inclusion (e.g., percentage (or n.) of residents in low-income households)<br>→Real state<br>• Real estate value (e.g., average price of properties)<br>• Real estate supply (e.g., no. (or percentage) of residences/new residences)<br>• Real estate development (e.g., no. of new permits related to new constructions)<br>→Financial return<br>• Public financial return (e.g., increase in taxes related to tourist flows/receipts)<br>→Cultural Value of Properties/Landscape<br>• State of conservation (e.g., no. (or percentage) of well-preserved buildings)<br>→Well-being<br>• Security (e.g., percentage of citizens feeling safe in the city/perception of personal safety)<br>• Quality of services (e.g., percentage of citizens satisfied with health services (and other services)<br>• Housing quality (percentage of people living in homes without toilet out of total residents)<br>• Health (percentage of people who lives a cultural place and reporting good health compared to those who did not live there) |
| Torrieri et al. (2019) | Set of 10 criteria categorized in three dimensions to guide the choice of sustainable alternative functions for the adaptive reuse of heritage buildings from a circular economy perspective. Units of measurement in parenthesis:<br>→Social<br>• Ability to involve the third sector (rank)<br>• Awareness and social collaboration (rank)<br>• Enhancement of welfare (---/+++)<br>→Economic<br>• Possibility of obtaining public funds (---/+++)<br>• Construction cost (€/$m^2$)<br>• Capacity of encouraging new activities (rank)<br>• Possibility of construction time partition (yes/no)<br>• Existence of competitors (yes/no)<br>→Urban<br>• Involvement in urban congestion (rank)<br>• Encourage the old town redevelopment (---/+++) |

| Source | Description of indicator system/set |
|---|---|
| UNESCO (2019) | Set of 22 indicators and corresponding data sources categorized in four dimensions to evaluate culture's contribution to national and local implementation of UNs sustainable development goals and targets.<br>→Environment and resilience<br>• Expenditure on heritage<br>• Sustainable management of heritage<br>• Climate adaptation and resilience<br>• Distribution of cultural infrastructure<br>• Open space for culture<br>→Prosperity and livelihoods<br>• Culture in GDP<br>• Cultural employment<br>• Cultural businesses<br>• Household expenditure<br>• Trade in cultural goods and services<br>• Public finance for culture<br>• Governance of culture<br>→Knowledge and skills<br>• Education for sustainable development<br>• Cultural knowledge<br>• Multilingual education<br>• Cultural & artistic education<br>• Cultural training<br>→Inclusion and participation<br>• Culture for social cohesion<br>• Artistic freedom<br>• Access to culture<br>• Cultural participation<br>• Participatory processes |
| Vardopoulos (2019) | Set of 11 factors and 33 sub-factors (examples in parenthesis) across four dimensions influencing local sustainable development through adaptive reuse projects<br>→Economy<br>• economic growth (e.g., job creation)<br>• tourism (cultural) economy growth (e.g. visitors' sentiment and architecture)<br>• local value enhancement (e.g. character and sense of familiarity and safety)<br>→Society<br>• quality of life improvement (e.g. income growth, environmental quality, safety)<br>• community action and involvement empowerment<br>→Environment<br>• environmental management (e.g. climate change mitigation, energy efficiency)<br>• land conservation (e.g. reduce land use)<br>→Culture<br>• public cultural and environmental awareness (e.g. educational potential)<br>• technological innovation (e.g. recovery of local tradition construction techniques)<br>• local memory and cultural identity preservation (e.g. maintain Local Memory)<br>• cultural heritage protection (e.g. heritage preservation) |

| Source | Description of indicator system/set |
|---|---|
| Vehbi et al. (2021) | Set of 6 criteria and 23 sub-criteria to select appropriate new uses for heritage buildings:<br>→Cultural<br>• Historical value,<br>• Artistic value<br>• Condition relating to integrity and authenticity<br>→Economic<br>• Financial sources,<br>• Initial investment and necessary investment in future maintenance<br>• Profitability<br>• Market Potential<br>→Architectural<br>• Physical condition of the building<br>• Architectural character and form<br>• Space usage and gains<br>• Structural analysis<br>• Conditions of materials and decoration<br>→Environmental<br>• Contextual value and environmental effect<br>• Regional development policies<br>• Potential of the surrounding<br>→Social<br>• Compatibility of newly proposed functions with existing,<br>• Public interest<br>• Social value<br>• Increasing public awareness<br>• Enhancing the role of communities (involvement)<br>→Legal<br>• Adequate conservation and management system,<br>• Future change feasibility<br>• Ecological and cultural sustainability |
| Yoon & Lee (2019) | Set of six factors and 24 items linked to the four sustainability dimensions to evaluate (ex-ante) adaptive reuse of historical buildings<br>→Intervention<br>• level of physical change<br>• accessibility<br>• safety<br>• structural stability<br>→Group interest<br>• financial support<br>• business activities<br>• job opportunities<br>• public facilities<br>→Social interest<br>• local interest and identity<br>• neighbourhood compatibility<br>• support for the general public and local residents<br>• social network<br>• memory of society<br>• community involvement<br>• public agreement<br>→Use<br>• changing needs<br>• market trend<br>• local needs<br>→Architectural merit<br>• feature appeal<br>• local distinctiveness<br>• harmony with surrounding<br>→Originality<br>• historical interest<br>• authenticity<br>• rarity |

Source: own elaboration

In addition to the sets reproduced in table 4, we found two further studies comprising criteria and indicators that were excluded from the overview because they focus on detailed technical issues to assess vulnerability of heritage sites to flooding events (Gandini et al., 2018) and environmental sustainability of traditional housing (Kosanovic et al., 2019). Gandini et al. (2018) uses indicators such as ground floor typology, roof type, facade material or drainage system condition, whereas Kosanovic et al. (2019) use criteria to evaluate the physical framework (e.g. materials), indoor environment (e.g. indoor air quality), as well as passive (e.g. passive heating and cooling) and active mechanisms (e.g., electric generation). Additionally, we excluded the set of indicators provided by Bosone & Ciampa (2021) because they extend well beyond the cultural heritage reuse project and comprise indicators to assess the progress of circular strategies at urban level. Also, the criteria to guide and evaluate adaptive reuse processes proposed by Zeren (2015) is excluded because it does not operationalize sustainability[29].

As illustrated in table 4, criteria and indicators are defined with different purposes to evaluate alternatives or projects at different stages of the reuse project. Approximately half of the sets are designed to assess heritage reuses ex-ante (e.g., Capolongo et al., 2019; Chen et al., 2018; Dell' Ovo et al., 2021; Della Spina, 2020) and rank/select most appropriate functions or sites to be reused; whereas the other half are designed for ex-post evaluations (e.g., Foster et al., 2020; Gravagnuolo et al., 2021a; Mohaddes Khorassani et al., 2019). That being said, it should also be noted that some of the sets comprised in table 4 are not strictly proposed to evaluate reuse of cultural heritage. For instance, the purpose of the framework developed by UNESCO (2019) is measuring and monitoring culture's contribution to UN's SDGs, and it comprises both the cultural heritage and the cultural sector.

Table 4 also illustrates that criteria and indicators cover a wide range of aspects relevant for sustainable development. Some of the sets of criteria and indicators are explicitly linked to sustainability dimensions (e.g., Durukan et al., 2021; Europa Nostra, 2015; Vardopoulos, 2019) or sustainable development goals (e.g. UNESCO, 2015). However, criteria and indicators' categorization and definition across the studies is quite diverse. Several of them do not arrange criteria and indicators along traditional sustainability dimensions (e.g. Dell'Ovo et al., 2021; Yoon & Lee, 2019) and/or comprise regulatory or legislative requirements (Aigwi et al., 2020; Mohammed & Alauddin, 2016; Vehbi et al., 2021) that may arguably be excluded in a sustainability framework/tool considering that they are mandatory. The former may be partly due to the challenging task of arranging indicators into partly overlapping dimensions (Bosone et al., 2021).

Interestingly, indicator sets differ regarding the level of detail. Various studies define criteria in broader terms (e.g., Europa Nostra, 2015; Haroun et al., 2019) or in terms of targets (e.g. Chen et al., 2018), and in the majority of studies indicators do not follow with specific suggestions on units of measurement. In general, units of measurements are more specific in criteria and indicator sets proposed to conduct ex-post evaluations (e.g. Foster et al., 2020), although we also find suggestions on measurement units in criteria sets proposed for ex-ante (e.g. Della Spina, 2021). As Bosone et al. (2021) argue, it is challenging to adopt ex-post evaluation criteria in ex-ante evaluations because of the difficulty of estimating impacts.

[29] Among the criteria suggested by Zeren (2015), we find "mak(ing) the structure livable in the meaning of sustainability", but it is not clear what is meant by this.

A further difference among criteria and indicators proposed by the literature reviewed is that they comprise aspects that demand assessment at different levels. Some criteria/indicators refer to the aspects pertaining the heritage site itself (e.g. buildings' construction or maintenance costs), whereas other criteria/indicators refer to the local (e.g. community participation, sense of place), regional (e.g. regional development policies) and national levels (e.g. regulatory requirements).

The literature reviewed, thus, suggests that criteria and indicators are essential to guide choices and prioritize use functions and/or heritage reuse projects, and the studies reviewed provide an extensive range of criteria and indicators that may be relevant to consider. At the same time, our review also raises questions that need further analysis when working with the development of RUVIVAL sustainability framework/tool: How to organize criteria and indicators? What is the most appropriate level of analysis? And how many and specific should criteria and indicators be?

With RUVIVAL being interested in developing a practically relevant and supporting tool, answering these questions will demand further user-centered research. However we try to sketch some features in chapter 7, after getting an overview on cultural heritage management in Norway and what are the experiences with incorporating sustainability in heritage reuse practices.

### 5.3.2 Methods to integrate views and facilitate decision-making

From the above follows that cultural heritage reuse processes demand attention to multiple criteria and imply challenging and complex decision-making processes. Moreover, cultural heritage reuse processes often require engagement of multiple stakeholders (e. g. heritage owners, heritage managers, municipal planers, businesses, civil organizations and populations) with various, ambiguous and conflicting interests and objectives. While some objectives can strengthen each other, pursuing some objectives/interests can also act as a barrier for fulfilling other objective/interests.

Against this background, multicriteria decision analysis (MCDA) is often regarded as a useful tool to facilitate recognition of the diversity of stakeholders (and their interests) and the integration of perspectives and knowledge; consideration of multiple objectives, interests and criteria; inclusion of non-monetary impacts and benefits; systematic evaluation and comparison of alternatives; and transparency in the ranking and prioritization/selection processes (Aigwi et al., 2019; Della Spina, 2020; Della Spina, 2021; Oppio & Dell'Ovo, 2021; Gravagnuolo et al., 2021c; Morkunaite et al., 2019; Torrieri, 2019; Vehbi et al., 2021). This is reflected in table 3, where we can see that MCDA is integrated in various of the frameworks proposed to facilitate consideration of multiple criteria in ex-ante assessments of cultural heritage reuse alternatives to select/prioritize particular functions and uses (e.g. Capolongo et al., 2019; Chen et al., 2018; Dell'Ovo et al., 2021; Della Spina, 2020; 2021; Haroun et al., 2019; Rossitti et al., 2021; Torrieri, 2019; Vehbi et al., 2021) and/or heritage objects (e.g. Aigwi et al., 2019; 2020; Sladowski et al., 2021).

MCDA methods have also been used for identifying optimal energy efficiency retrofitting measures adequate to cultural heritage's level of protection (Stajonevic et al., 2021); determining the level of hazards (Morkunaite et al. 2019), assessing vulnerability of cultural heritage to flooding events (Gandini et al., 2018), evaluating the ability of CH reuse process to meet population needs (Vehbi et al., 2021).

MCDA is popular in various research fields including environmental management, tourism management, energy, engineering and sustainability. In the field of cultural heritage, there are still relatively few references to application of MCDA (Morkunaite et al. 2019; Vehbi et al., 2021), although their number has been increasing (Salerno, 2020).

MCDA can be implemented using various specific methods and techniques, with Haroun et al. (2019) reporting 100 different tools. Yet, based on the literature reviewed, we can identify and describe the main phases characterizing MCDA processes. These are illustrated in figure 4.

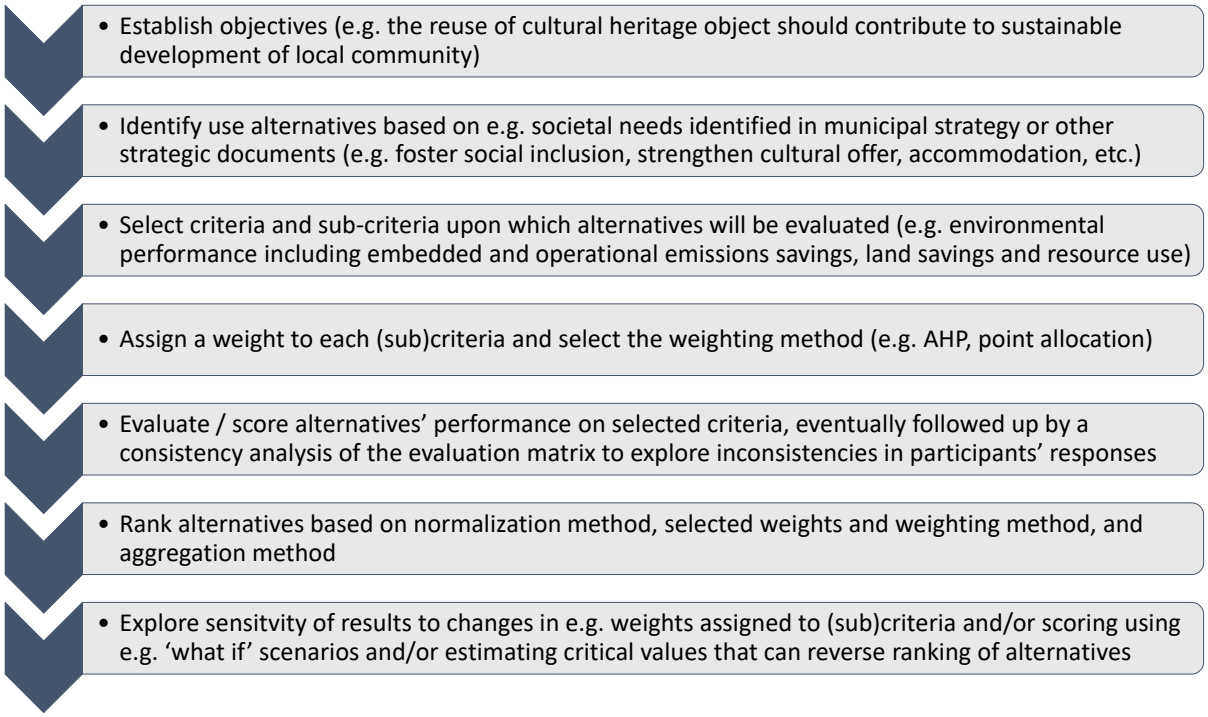


*Figure 4: Main steps in multi-criteria decision analysis processes. Source: own elaboration based on Aigwi et al. (2019), Capolongo et al. (2019), Della Spina (2020), Haroun et al. (2019), Salerno (2020) and Vehbi et al. (2021).*

Also, as illustrated in figure 4, the selection of more specific methods is needed in key steps of the MCDA process to weight criteria, normalize and aggregate data/scores. Following previous work, Gravagnuolo et al. (2021c) distinguish between MCDA single synthesis criterion methods, MCDA outranking methods and MCDA goal, aspiration or reference-level approach methods. They also make reference to a further categorization that classifies MCDA methods depending on whether the set of alternatives is finite (discrete) or infinite (continuous). Moreover, there are also various ways to perform consistency and sensitivity analysis. One may opt for conducting 'what if' scenarios to illustrate how ranking of alternatives may change when changing weightings (e.g. Capolongo et al., 2019; Chen et al., 2018; Dell'Ovo et al., 2021) or for estimating critical and sensitivity values beyond which ranking of alternatives will be reversed (e.g. Aigwi et al., 2019).

The selection of MCDA methods depends on the specific case and problem (Della Spina, 2020; Haroun et al., 2019; Salerno, 2020). Key features that may be considered in this selection include the number of criteria and alternatives to be considered, the type of indicators/data required (quantitative, qualitative), whether the method allows for intercriteria compensation and/or considers internal relationships between system elements and/or interdependencies

between individuals, the level of stakeholder engagement it opens for, the transparency and simplicity of the method, the type of decision-making problem (e.g. describing or ranking) and the solution approach (full aggregation, outranking or goal/aspiration/reference level) (Aigwi et al., 2019; Della Spina, 2020, 2021; Dell'Ovo et al., 2021; Gravagnuolo et al., 2021c; Haroun et al., 2019; Torrieri, 2019).

Building on the literature reviewed, main features of a small selection of popular methods to conduct MCDA are described below.

Among MCDA methods, the **Analytical Hierarchy Process (AHP)** is one of the most commonly used techniques (Della Spina, 2021; Haroun et al., 2019; Li et al., 2021; Morkunaite et al. 2019; Stajonevic et al., 2021). AHP is an outranking and hierarchical method, that allows to break down a multidimensional problem in smaller problems and in which priorities are determined by pairwise comparisons (Gravagnuolo et al., 2021c; Li et al., 2021; Vehbi et al., 2021).

Main phases in AHP are: 1) the construction of the hierarchy (e.g. in a three level hierarchy this would be the definition of the objective, criteria and alternatives); 2) establishing the priorities between elements of the hierarchy by pairwise comparisons (e.g. in the three level hierarchy used as example, this would be pairwise comparisons of criteria with reference to objective and of alternatives with reference to each criterion) using Saaty semantic scale[30]; 3) the verification of the logical coherence of pairwise comparisons through consistency analysis (with a consistency ratio of 0.10 or less being considered acceptable); and 4) sensitivity analysis (Della Spina, 2020; 2021; Gravagnuolo et al., 2021c; Vehbi et al., 2021).

In principle, AHP is not regarded suitable for problems comprising more than nine criteria, but this can be overcome by adding one further level in the hierarchy that is used to splitt criteria into sub-criteria (Della, Spina, 2020). However, this adds further complexity to the decision matrix, and the number of alternatives that to be included should, nevertheless, be limited (Haroun et al., 2019).

Some of the advantages of using AHP is that it allows for consideration of quantitative and qualitative criteria (Aigwi et al., 2019; Gravagnuolo et al., 2021c; Haroun et al., 2019). AHP is also regarded as a transparent method, in so far as it facilitates revision of the decision-making process (Della Spina, 2021; Gravagnuolo et al., 2021c), as well as simple in construction and easy to understand and communicate. This, in turn, facilitates stakeholder engagement and, thus, reflection of different views (Gravagnuolo et al., 2021c). Moreover, by building on judgments through pairwise comparisons, AHP method is considered a robust method (Della Spina, 2021; Gravagnuolo et al., 2021c).

On the other hand, it is argued that AHP is not appropriate to deal with fuzziness and uncertainty, for which alternative methods such as fussy delphi (Aigwi et al., 2019) or fuzzy AHP (Stajonevic et al., 2021) have been suggested. As a hierarchical method, AHP does not consider internal relationships between the decision matrix systems and, consequently, as most MCDA methods, AHP focus on single heritage buildings and not on groups of heritage buildings

[30] Main values of Saaty's 9-point scale: 1: if two elements have 'equal' importance; 3: if one recognises a 'moderate' importance of one element compared to another; 5: if one recognises a 'strong' importance of one element over the other; 7: if one recognises a 'very strong' importance of one element over another; 9: if 'extreme' importance of one element over another is recognized; intermediate values: 2, 4, 6, 8 (Gravagnuolo et al., 2021c)

(Sladowski et al., 2021). Moreover, AHP allows for compensation between criteria (Gravagnuolo et al., 2021c) and only considers impact strength without attending to whether the impact is positive and negative (Sladowski et al., 2021). This can be unfortunate, in projects in which certain threshold values should not be trespassed, as it often is the case when managing cultural heritage (Dell'Ovo et al., 2021). AHP does neither show (in)consistency of opinions among consulted individuals. However, it is possible to evaluate differences and commonalities by running the method in various stakeholder groups (as Vehbi et al., 2021 do).

To address the lack of attention to internal relationships between elements (e.g. criteria, alternatives), network-based methods such as the **Analytical Network Process (ANP)** can be used (Chen et al., 2018). ANP can be considered as an extension of the AHP and is also a popular method (Morkunaite et al., 2019). It allows for consideration of complementary uses (Sladowski et al., 2021), in addition to being also suitable to rank options (Haroun et al., 2019). Further network-based approaches comprise DEMATEL (Decision Making Trial and Evaluation Laboratory) and WINGS (Weighted Influence Non-linear Gauge System (Sladowski et al., 2021)

Many of MCDA methods are grounded on the **Multiple Attribute Utility Theory (MAUT)**, according to which "*each decision-maker consciously or implicitly seeks to optimize a function that aggregates all their views*" (Gravagnuolo et al., 2021c, p. 36, citing Ishizaka & Nemery, 2013). Like AHP, MAUT is a full aggregation method but, in contrast to AHP, it is suitable for ranking a large number of alternatives, but only a limited number of criteria and sub-criteria (Haroun et al., 2019). MAUT allows for consideration of qualitative and quantitative data, intangible factors and risk (Gravagnuolo et al., 2021c), but only quantitative indicators (Haroun et al., 2019), as it facilitates comparison of alternatives based on scores expressed in numbers (Gravagnuolo et al., 2021c). MAUT is regarded as a clear and transparent method that allows stakeholder participation (Gravagnuolo et al., 2021c). However, it is regarded inappropriate for consideration of the preferences of large populations, since it is based on individual preferences expressed by utility functions (Arrow's impossibility theorem) (Gravagnuolo et al., 2021c). As in the case of AHP, MAUT allows for considering neither interdependencies between attributes nor individuals (Gravagnuolo et al., 2021c). MAUT is flexible regarding whether to allow for compensation or not, depending on the construction of the utility function.

The **Evaluation of Mixed data (EVAMIX)** is also a full aggregation MCDA method, like AHP and MAUT. EVAMIX is regarded an effective and simple method consisting of the construction of an evaluation matrix, in which alternatives' performance is assessed with respect to each criterion (Della Spina, 2020). EVAMIX allows for expressing the importance of each criterion using ordinal weights and then translating them into cardinal weights, but weights can be also determined by using other methods such as AHP.

EVAMIX comprises the following steps (Della Spina, 2020; Gravagnuolo et al., 2021c): 1) distinction between ordinal and cardinal criteria; 2) calculation of dominance scores for all ordinal and cardinal criteria; 3) calculation of standardized dominance scores for all ordinal and cardinal criteria; 4) calculation of overall dominance scores; and 5) calculation of evaluation scores.

EVAMIX poses no limit to the number of criteria; allows for using quantitative and qualitative data and supports stakeholder participation and thus integration of different perspectives, as well as communication between them (Gravagnuolo et al., 2021c). However, as with MAUT and AHP, EVAMIX does not allow for considering interdependencies between criteria (Gravagnuolo et al., 2021c).

Further full aggregation methods are the **Measuring Attractiveness by a Categorical Based Evaluation Technique (MACBETH)** or **Simple Multi-Attribute Rating Technique Extended (SMARTER)**. MACBETH uses semantic pairwise comparisons to rank criteria and these ae translated into weights using a linear programming model. Alternatives are, then, scored on each criterion and summed into a total score using these weights. In SMARTER decision makers rank criteria from the most to the least important and – based on this ranking, weights are assigned according to the Rank Order Distribution method (ROD) (Dell' Ovo et al., 2021).

An alternative to full aggregation methods, in which alternatives are ranked based on synthesis values, are outranking methods such as the Eliminination et choice translating reality (ELECTRE), the Novel Approach to Imprecise Assessment and Decision Environments (NAIADE), Preference Ranking Organization Method for Enrichment of Evaluations (PROMETHEE) or REGIME.

The **Eliminination et choice translating reality (ELECTRE)** can measure quantitative and qualitative criteria (Haroun et al., 2019), but requires cardinal rankings (Gravagnuolo et al. (2021c). It is both suitable for ranking options as well as for sorting and describing them (Haroun et al., 2019). ELECTRE does not allow for inter-criteria compensation (Gravagnuolo et al., 2021c) and is only suitable for decision-making problems with a limited number of criteria and sub-criteria and a small number of alternatives (Haroun et al., 2019). ELECTRE is considered to be difficult to understand (Gravagnuolo et al., 2021c; Morkunaite et al., 2019). Among other, it requires building concordance and discordance matrices, and this can challenged stakeholder engagement.

The most important feature of the **Novel Approach to Imprecise Assessment and Decision Environments (NAIADE)** allows for comparison of the preferences expressed by groups of stakeholders (e.g., public administration, entrepreneurs, cultural associations, etc) and captures similarity between each group's preferences, highlighting interests' convergence and the possible formation of coalitions (Dell'Ovo et al., 2021; Gravagnuolo et al., 2021c; Torrieri et al., 2019). It is grounded on pairwise linguistic evaluation "based on semantic distance between linguistic qualities" and provides "information (on the) distance (…) between the interests of the different social actor groups (… and on the) rankings of alternatives for every coalition" (Torrieri, 2019, p.4). Stakeholder consultation is, thus, supported explicitly (Gravagnuolo et al., 2021c). Beyond this distinctive feature, like other MCDA methods, NAIADE facilitates evaluation of the alternatives with respect to a defined set of criteria. However, the method does not comprise an explicit weighting of criteria (Gravagnuolo et al., 2021c). NAIADE supports consideration of both quantitative and qualitative data but – like most MCDA methods, does not consider interdependence between evaluation criteria (Gravagnuolo et al., 2021c).

The **REGIME** method is a "discrete multicriteria method with a partial compensatory structure based on pairwise operations" (Torrieri, 2019, p. 4). Like in case of Evamix, in REGIME the decision matrix consists of a table in which a number of alternative scenarios are evaluated with reference to a number of criteria using ordinal scales, and where criteria weights are also established by a qualitative ordinal evaluation (Gravagnuolo et al., 2021c; Torrieri, 2019). That being said, REGIME can handle both quantitative and qualitative data (Gravagnuolo et al., 2021c; Torrieri, 2019). The method does not admit incomparability among alternatives and is considered simpler than other outranking methods (ELECTRA) and easy to communicate and discuss, but little transparent (Gravagnuolo et al., 2021c).

The **Preference Ranking Organization Method for Enrichment of Evaluations (PROMETHEE)** allows for consideration of a large number of criteria and sub-criteria and a large number of alternatives and can measure quantitative and qualitative criteria (Haroun et al., 2019). PROMETHEE requires distinguishing between beneficial and non-beneficial criteria, because this affects how values are normalized. For calculating weights, PROMETHEE can be combined with other methods (e.g. AHP).

An alternative to full aggregation and outranking methods are goal or reference methods such as the **Technique of Order Preference Similarity to Ideal Solution (TOPSIS)**. As suggested by its name, this method relies on the distance to best (ideal) and worst (anti-ideal) solution (Gravagnuolo et al., 2021c). TOPSIS allows for consideration of a large number of criteria and sub-criteria and a large number of alternatives and can measure quantitative and qualitative criteria (Haroun et al., 2019). According to Morkunaite et al. 2019, one of the disadvantages is that it does not differentiate between negative and positive values and attribute values should be monotonically increasing or decreasing. Like other MCDA methods, TOPSIS can also be combined with other methods (e.g. AHP) for calculating weights.

In addition to these methods, Gravagnuolo et al. (2021c) review two qualitative multi-criteria methods to estimate benefits: The expected value method proposed by Schlager (1986) and the Schimpeler and Grecco method (1968).

The **Expected Value Method by Schlager (1986)** is a qualitative multi-criteria method in which objectives are ranked in order of importance; projects are ranked in relation to their ability to satisfy each objective; and each project is assigned a probability of implementation. The preferred alternative is then identified by summing the product of the probability of implementing each project by its ability to satisfy each of the objectives and the importance of each objective. The greater the value, the more preferred is the alternative. Results are indicative and useful as "first orientation" (Gravagnuolo et al. 2021c, p. 49)

The **Effectiveness matrix by Schimpeler and Grecco (1968)** is a qualitative multi-criteria method in which alternatives are evaluated based on their ability to pursue selected objectives, if adopted. The effectiveness is measured with values, in which the maximum is 1 (meaning that with project x the pursuit of a goal is fully guaranteed) and the minimum is mn-30 (meaning that with project x the pursuit of a goal is practically impossible). The preferred alternative is, then, identified by the sum of effectiveness of a particular project, being the higher the value, the better, (Gravagnuolo et al., 2021c). Moreover, the evaluation matrix provides additional information, as each row facilitates information on how a particular project performs against all objectives, whereas each column provides information on the ability of the various projects to pursue the same objective (Gravagnuolo et al., 2021c, p. 51).

In contrast to the method proposed by Schlager, this method introduces an interval scale (which replaces the ordinal measurement). However, neither of the methods specify how to carry out the analysis to e.g. estimate ability or effectiveness to fulfill a particular objective, assuming that the user is able to make such assessments.

Despite (or maybe because of) methodological differences between the methods presented, scholars (e.g. Della Spina, 2020; Morkunaite et al., 2019; Salerno, 2020) suggest that the combination of MCDA methods is often useful to deal with complex decision problems pertaining cultural heritage. And this is also the case in some of the studies included in our literature review, as illustrated in table 5.

*Table 5. Methods and techniques used to integrate views and support decision-making*

| Methods / technniques | Who is involved? and how? | Source |
|---|---|---|
| Analytical Hierarchy Process (AHP) using linear additive principle for weighting and scoring; Fuzzy-Delphi (FD), and sensitivity analysis | Owners, developers and users of historical buildings and heritage, legal and council and community representatives; focus group | Aigwi et al. (2019) |
| Point allocation for weighting, Multi Attribute Value Theory to aggregate standardized weighted scores, and sensitivity analysis | Experts; focus group | Capolongo et al. (2019) |
| Fuzzy-Delphi (FD) to weight and select criteria and Analytic Network Process (ANP) to verify weightings and rank alternatives based on criteria, followed by sensitivity analysis | Experts from various fields (construction, planning, cultural heritage, governmental, research); questionnaire | Chen et al. (2018) |
| Weighted Sum Model (WSM), and sensitivity analysis using Novel Approach to Imprecise Assessment and Decision Environments (NAIADE) and Simple Multi-Attribute Rating Technique Extended (SMARTER) | Experts; focus group and questionnaire interview | Dell' Ovo et al. (2021) |
| MacBeth to assess best combination of functions, Analytical Hierarchy Process (AHP) to weight criteria and EVAMIX to rank order of alternatives, followed by sensitivity analysis | The preliminary data collection engaged a wide range of stakeholders to identify possible uses; but only experts were engaged in MCDA through focus groups (Macbeth and EVAMIX) and interviews (AHP) | Della Spina (2020) |
| Analytical Hierarchy Process (AHP) to weight criteria and rank use alternatives | Public administration, experts (architecture, economics, and sociology), citizens, associations; focus group | Della Spina (2021) |
| Novel Approach to Imprecise Assessment and Decision Environments (NAIADE) and Analytical Network Process (ANP) | Not specified[31] | Della Spina et al. (2020) |
| Analytical Hierarchy Process (AHP) to weight criteria and indicators | Experts; working group | Gandini et al. (2018) |
| Analytical Hierarchy Process (AHP) to weight criteria and assess performance of alternatives on criteria | Not specified | Haroun et al. (2019) |
| Spatial Multicriteria Analysis combining GIS and MCA (although the specific technique for weighting criteria is not described) | Experts engaged in defining value functions and weighting; interviews | Oppio & Dell'Ovo (2021) |
| Electre method to evaluate use scenarios based on criteria weighted using pairwise comparisons, followed by sensitivity analysis and NAIADE method to identify conflicts/alliances across stakeholders' groups | Not specified | Rossitti et al. (2021) |
| An hybrid network-based approach combining 'Decision making trial and evaluation laboratory' (DEMATEL) to define the structure of the network and 'Analytical Network Process' (ANP) to determine priority of system network elements, and comprising a reliability (concordance) and sensitivity analysis | Experts; surveys and heuristic methods | Sladowski et al. (2021) |
| 'Fuzzy Analytic Hierarchy Process' (FAHP) to weight and select most appropriate energy retrofitting interventions for cultural heritage with different protection levels | Experts; not specified how | Stajonevic et al. (2021) |
| Regime analysis and weighted summation methods for technical evaluation and ranking order of alternatives and Novel Approach to Imprecise Assessment and Decision Environments (NAIADE) for social evaluation and coalition assessment | Decision maker and experts in focus groups for technical evaluation, and public administration, politicians, entrepreneurs, professionals, business owners, social and cultural associations and citizens in an online survey for social evaluation | Torrieri et al (2019) |

[31] Della Spina (2019) – see footnote 15 – documents results from the stakeholder analysis

| Methods / technniques | Who is involved? and how? | Source |
|---|---|---|
| Analytical Hierarchy Process (AHP) for weighting criteria and ranking use alternatives followed by a Consistency Analysis | Experts and locals; interviews | Vehbi et al. (2021) |

Source: own elaboration

As shown in table 5, in some of the studies, multiple stakeholders (e.g., property owners and developers; users of historical buildings; legal and heritage experts; government and community representatives) have been engaged in MCDA processes. Yet, as argued by Li et al. (2021) and also illustrated in table 5, application of MCDA methods often relies solely on expert and technical consultation. In principle, however, MCDA methods open for stakeholder engagement, although – based on their description above – some of them seem, a priori, more appropriate to fulfill this purpose because they are easier to understand and use.

A further alternative, forwarded by Li et al. (2021) is combining these MCDA (top-down) methods with bottom-up approaches to elicit people's preferences. More specifically, Li et al. (2021) suggest consideration of three types of people-centered approaches: semantic differential (SD), stated preference (SP), and means-end chain (MEC) methods, each with its own advantages. SD methods are relatively easier to use because they consist of quantitative but subjective evaluations based on the use of opposite adjectives in pairwise comparisons. However, being based on factual behaviours, they do not allow for evaluation of preferences in hypothetical scenarios, as SP methods do. Both – SD and SP – are based on questionnaires, whereas MEC focus on a qualitative assessment of personal values and behaviours through interviews and semantic analysis (Li et al., 2021). Oppio et al. (2017) also propose using choice experiments – a SP method that so far has been mainly used in assessment of environmental goods – to assist selection of potential uses in cultural heritage reuse processes. They use this methodology in a survey distributed among tourists and residents to identify new uses for three particular heritage sites in Italy, previous identification of key attributes through expert consultation to define scenarios. Moreover, Oppio et al. (2017) suggest exploring the combination of choice experiments with MCDA methods.

Li et al. (2021) argue that the use of bottom-up/people-centered approaches in cultural heritage reuse processes can increase engagement of populations, heritage owners and managers and support, thus, inclusion of people– an essential element of sustainable development. To this, we can add that inclusion of a wide range of perspectives is also a requirement in municipal planning processes. Moreover, although inclusion of a broader range of perspectives can make explicit conflicts and hamper progress towards decisions, recognition of and engagement with such conflicts can also contribute to increase legitimacy (Scharpf, 1999; Hillier, 2002), challenge dominant narratives (Lövbrand et al., 2015; Swyngedouw, 2010) and improve capacity to work with a diversity of alternatives (Lundberg et al., 2019).

The literature review, thus, suggest the utilization of MCDA methods to consider multiple criteria and perspectives in cultural heritage reuse processes and facilitate decision-making processes. Given their features, some methods stand out as potential candidates. For instance, if the goal is to engage non-experts, an essential feature to consider will be how easy these methods are to understand and use. Yet, as with the case of criteria and indicators, further user-centered research will be needed to elicit which kind of methods are most relevant to be incorporated in RUVIVAL sustainability framework/tool.

### 5.3.3 Guidelines to support sustainable heritage reuse

Frameworks proposed demand realization of complex tasks at different stages of the project. For instance, selection of the use function and/or heritage case to be reused is only the last of a sequence of tasks that can comprise the collection of data on the specific case, the identification of stakeholders and criteria against which alternatives may be evaluated, stakeholder consultation and multi-criteria analysis and financial assessments (e.g. Capolongo et al., 2019; Dell'Ovo et al., 2021; Torrieri, 2019). Also, working with multiple sustainability criteria and indicators and/or implementing MCDA methodologies can be challenging (as discussed in chapter 5.4). Moreover, selection of the use function and/or heritage case to be reused is only the start of the cultural heritage reuse process. Then, what: how to implement the project? Cultural heritage owners and parties interested in reusing underutilized cultural heritage objects may benefit from material guiding them throughout the process.

Fortunately, the literature review has also reveal that guidelines have already been developed to support cultural heritage reuse processes.

For instance, the EU H2020 funded ROCK (Regeneration and Optimization of Cultural heritage in creative and Knowledge cities) project[32] has built on heritage-led urban regeneration experiences from seven European role model cities to develop tools and policies that support urban transformations in three further European cities. One of the outputs of the project are guidelines to implement sustainable adaptive reuse of heritage in historic districts to support urban regeneration which Dane et al. (2019) summarize in 6 steps: 1) analysing the status; 2) establishing vision and goals; 3) identifying and involving stakeholders; 4) identifying the changes; 5) implementing and communicating the changes; and 6) defining long-term management strategies.

Following a similar approach – but focused on rural areas, the EU H2020 RURITAGE project[33] looked into how to transfer knowledge from role models to replicators through participatory planning and how to develop sustainable heritage-led strategies to support rural regeneration. In addition to the monitoring programme presented in chapter 5.2 (Olmedo & Barrientos, 2020), the project has also produced various resources including guidelines for identification of stakeholders (Perello et al., 2018), a methodology for community-based heritage management and planning (Perello et al., 2020), and a toolkit comprising various methods to allow landscape valuation (Martin et al., 2021).

Another relevant EU H2020 funded project is the CLIC (Circular models leveraging investments in Cultural heritage adaptive reuse) project[34] within which some of the frameworks (Gravagnuolo et al., 2021a) and sets of indicators (Bosone et al. 2021) presented in chapters 5.2 and 5.3.1 were developed. In addition to these contributions, the project has also proposed a support system to assist municipalities in decisions pertaining cultural heritage reuse which builds on three steps: 1) identification of elements of the decision problem including stakeholders involved, alternative uses, criteria and constraints; 2) prioritization of uses; and 3)

[32] https://rockproject.eu/

[33] https://www.ruritage.eu/

[34] https://www.clicproject.eu/

selection of the uses to be implemented; and 4) validation and robustness analysis (Greco et al., 2019).

The Interreg EU project Forget Heritage[35] has also developed a management manual and templates to guide cultural heritage-based revalorization projects (Herrmann & Trunk, undated). It encompasses 1) goals setting; 2) stakeholders' identification and relationships; 3) mapping/identifying potential uses; 4) identification of necessary requirements (infrastructure, planning, processes, tools) to implement uses; 5) developing a business model and a financial plan; 6) planning implementation of the project.

Considering the key role of indicators in early and late phases of the cultural heritage reuse processes, the methodological toolbox proposed by Europa Nostra (2015, p. 80) to assess the impacts of cultural heritage is also relevant here, particularly for assessing criteria for which no data exists. Among the most frequent quantitative methods are cost benefit analysis, hedonic pricing, travel cost, contingent valuation method and choice modelling (Europa Nostra, 2015, p. 104). Qualitative non-participatory methods typically employed are expert analysis, literature reviews, case studies and policy analysis; whereas qualitative participatory methods commonly used are REAP, participatory mapping, cultural mapping, grounded theory and ethnography (Europa Nostra, 2015, p. 105). Interestingly, the study categorizes multi-criteria analysis as a non-participatory method, but – as argued in chapter 5.3.2, multi-criteria analysis can, in principle facilitate engagement of multiple stakeholders.

In addition to these contributions, the District Centre[36] and the Directorate for cultural heritage[37] compile guidelines on a range of instruments and methods that can be relevant to support some tasks or specific phases of cultural heritage reuse processes. Table 6 provides a non-exhaustive selection of guidelines forwarded by these institutions. Most guidelines are mainly relevant for early stages of the process to e.g. map values (e.g. RA, 2018, undated), identify stakeholders (see footnote 37) and/or link reuse processes to general sectorial plans and regulatory frameworks (RA, 2013; RA, 2020a).

*Table 6: Selected relevant linkes and documents useful to guide heritage reuse processes.*

| Guideline | Publisher (source) | Short description |
|---|---|---|
| Kulturminner, kulturmiljøer og landskap. Planlegging etter plan- og bygningsloven | The Directorate for Cultural Heritage (RA, 2020a) | Guide addressing the opportunities that lie within the Planning and Building Act to secure cultural monuments, cultural environments and landscapes, including a description of roles and responsibilities for safeguarding them and how to use land use plans, regional plans, municipal planning strategy, municipal plan and sub-plans, zoning plans, concept choice studies and impact assessments. |
| Kulturhistorisk stedsanalyse. DIVE. | The Directorate for Cultural Heritage (RA, 2018) | Guide on how to collect and analyse data to understand a place's origin, development, character, historical significance and condition and, based on its cultural historic values, vulnerability, resilience as well as its potential for development and capacity for change, suggest strategies, instruments and measures for its management and development in ways that facilitate its preservation and support development of sustainable local communities |
| Kulturminner i kommunen. Kulturminneplan. | The Directorate for Cultural Heritage | Guidelines aimed at municipalities on how to initiate and elaborate cultural heritage plans to improve management of cultural heritage and integrate it to a greater extent into municipality's activities |

[35] https://programme2014-20.interreg-central.eu/Content.Node/Forget-heritage.html

[36] https://distriktssenteret.no/verktoy/

[37] https://www.riksantikvaren.no/

| Guideline | Publisher (source) | Short description |
|---|---|---|
| | (RA, 2013) | |
| Verdisetting og verdivekting av kulturminner | The Directorate for Cultural Heritage (RA, undated_b) | Checklist comprising types of values related to cultural monuments and environments; key characteristics of cultural monuments and environments and criteria for weighting identified values |
| Stakeholder analysis | District centre[38] (see footnote) | Guidelines and templates to map the persons/organizations that may be involved in the project, why, their interests and needs, their role and how involvement may occur. Relevant stakeholders may be persons/organizations who are affected by, have an impact on, be interested in, be against/be supportive of, earn on and/or have knowledge and competence relevant to the project |
| IPG-method | District centre[39] (see footnote) | Guidelines and templates to facilitate engagement and a balanced dialogue in which everyone can participate actively through reflection at three levels: individual (I), group (G) and plenum (P) |
| SWOT analysis | District centre[40] (see footnote) | Guidelines and template to identify strengths, weaknesses, opportunities and threats of the project, preferably at an early stage but once the project or plan is clearly defined |

Source: own elaboration based on mentioned sources

In addition to material to guide the heritage reuse process itself, guidelines to support renovation choices (while using heritage) may also be necessary, as illustrated by research on the neighbourhood of Svartlamon (Trondheim) underpinning the need for and relevance of non-professional guidelines to facilitate self-renovation (Senior et al., 2021).

Based on resources found, we argue that – in general – guidelines are either too broad and general – describing phases, but not providing specific guidance on tasks – or specific – providing guidance on how to conduct particular tasks, but unlinked from other phases. An exception is the EU project Forget Heritage, which provides templates to implement identified phases. However, this project does no go beyond the planning phase. Also, frameworks reviewed propose methods and criteria to be used at either ex-ante or ex-post assessments. We find, thus, little guidance on how to implement projects. We can envision that, in the implementation phase, interested parties may require guidance on practical issues such as accessing to funding and/or handling unexpected events. We can also envision that, in the evaluation phase, further guidelines may be required to assess and learn from the process and/or disseminate results. However, this is something that also demands stakeholder consultation and we will explore in subsequent research.

## 5.4 Implementing sustainability in heritage reuse processes – the practice

Experiences from case-specific application of frameworks presented in chapter 5.2 show that they can be useful to understand what interventions may imply for various aspects and under consideration of heritage cases' characteristics and evaluate and rank reuse alternatives to

[38] https://distriktssenteret.no/verktoy/aktoranalyse/

[39] https://distriktssenteret.no/verktoy/igp-metoden/

[40] https://distriktssenteret.no/verktoy/swot-analyse/

prioritize choices. Moreover, 'ex-ante' assessment frameworks integrating financial sustainability assessments (e.g. Discounted Cash Flow Analysis) of prioritized functions have the additional capacity to secure allocation of financial resources or increase awareness about the need of such resources, contributing to the financial sustainability of the project (e.g. Della Spina et al., 2020; Della Spina, 2021; Torrieri et al., 2019).

Although frameworks' utility to assist decision-making processes was demonstrated also in studies that only engaged experts (e.g. Chen et al., 2018), their potential seems to unfold when a wider range of stakeholders is engaged in either definition of use alternatives and/or criteria, weighting of criteria and/or evaluation of alternatives. Such frameworks proved to be effective in supporting the prioritization of reuse alternatives under consideration of multiple criteria while balancing various stakeholders' interests (e.g. Aigwi et al., 2019; 2020; Vehbi et al., 2021). This combination provides a more complete understanding of what the alternatives imply (Dell'Ovo et al., 2021) and, thus, a more sounded information basis to inform the decision. Moreover, application of frameworks that consider multiple criteria and integrate the views and knowledge of local communities with that of experts facilitate the generation of credible and transparent choices with higher acceptability levels (e.g. Della Spina, 2020; Vehbi et al., 2021).

Experiences from applying frameworks presented in chapter 5.2 also showed that 'ex-post' assessment frameworks can support monitoring of projects. Beyond benchmarking exercises (Foster & Saleh, 2021), they can contribute to increased awareness about the implications of reusing cultural heritage resources for sustainable development, eventually attracting investments (Gravagnuolo et al., 2021a). For presentation of results, the utilization of dashboards (Olmedo & Barrientos, 2020) can provide a very intuitive way to disseminate information. Moreover, the application of monitoring frameworks provide learning opportunities. For instance, application of the assessment framework proposed by De Medici et al. (2020) illustrates that two similar heritage reuse projects may have different impacts, depending on how selected functions and their management interact with their local context.

That being said, experiences from the application of frameworks also revealed some challenges. They can be time demanding, particularly when evaluating various alternatives (Aigwi et al., 2019). Moreover, as acknowledged in various of the studies (e.g., Chen et al., 2018; Dell'Ovo et al., 2021), MCDA-based frameworks are subjective in so far as rankings are affected by the preferences and opinions of the stakeholders engaged in the process of selecting and weighting the criteria and evaluating alternatives. Results can, thus, vary depending on who is involved in this process. Also, depending on selection of MCDA techniques (described in chapter 5.3.2), further limitations exist such as lack of clarity and transparency and inter-criteria compensation.

A further challenge emerge from the utilization of indicators. As documented in chapter 5.3.1, various of the frameworks comprise indicators. Indicators can help to define goals, monitor them and foster causal thinking in policy (Groven & Aall, 2020). However, working with indicators implies also substantial challenges that are well documented in the literature reviewed by Lundberg et al. (2020):

- the risk of ending with an unaffordable number of indicators
- the risk of using too broad and general indicators
- difficulties in adapting the indicators to the local level

- providing a fragmented picture of reality
- their inability to capture the dynamism of sustainable development
- poor access to standardized, open and comparable data
- insufficiently transparent measurements
- lack of time, resources and/or expertise to collect and process data

In addition, Lundberg et al. (2020) assessed municipalities' experiences to integrate sustainability goals into municipal planning, providing insights about the use of indicators. Indicators were regarded relevant for the implementation of UN's sustainability goals, for creating commitment and action and for anchoring work at management level (Lundberg et al., 2020, pp. 55-57). However, at the same time, the study also suggests that existing data is insufficient[41] and existing guidance material lacks contextual relevance, and that there is a need for methods that allow the evaluation of aspects that cannot be quantitatively measured (Lundberg et al., 2020, p. 55).

Moreover, indicators can be opened to various subjective interpretations, if they are not clearly defined (Bosone et al., 2021). They can also demand much competence and resources, place the focus on criteria that is easier to measure in detriment of other topics, and contribute to the bureaucratisation and symbolic production of data with little/no effect in practice (Groven & Aall, 2020).

In addition to these experiences, the CLIC project has documented the existence of various political, economic, social, cultural, technical, environmental, legal and administrative challenges that can hinder reuse of cultural heritage reuse (Kaya et al. 2021). Barriers are diverse and comprise – but are not limited to – limited participation and stakeholder engagement, lack of knowledge, resources, data and/or capacities, compliance with regulations, conflicts, and mismatch between expectations and outcomes (Pintossi et al., 2021a, 2021b).

Overall, there is, however, limited documentation on cases in which cultural heritage reuse cases are explicitly guided and/or evaluated by sustainability frameworks in Norway. Lack of documentation does not necessarily mean that contemporary reuse processes do not consider sustainability principles and aspects. However, at this point, we can say little about the particular challenges of designing, guiding and evaluating cultural heritage reuse processes for sustainable development. To cope with the scarcity of documentation, for now, we may build on experiences, in which cultural heritage has been at the centre of 'broad value creation' strategies, as well as on experiences to integrate sustainability principles in municipal and regional planning.

Working with the concept of broad value creation has been proposed as a way to operationalize sustainable development at the local level, because this approach entails that a form of value creation (e.g., economic) should not take place at the expense of another form of

[41] A very small share (7 per cent) of participants believe that existing statistics are suitable to a "large or very large extent" for measuring progress in UN's sustainability goals. 40 per cent believed that existing statistics are suitable to a "small or very small degree", while 27 per cent answered that they did not know (Lundberg et al., 2020, p. 55). Participants suggested that relevant data could be collected by e.g. Statistics Norway under a UN sustainability banner and that municipalities could be given a common and minimum set of indicators that they should report on, followed by a reference year (Lundberg et al., 2020, p. 56-57).

value creation (e.g., cultural, social or environmental) or weaken the total value created (DS, 2017). The district centre has published reports to share the experiences of cases working with broad value creation on the ground of cultural heritage in Rorøs, Vega (DS, 2017), Kåfjord and Valdres (DS, undated). Key ingredients to succeed with those strategies are continuous work and clear prioritization, long-term planning, investment in public goods, local anchoring and broad involvement, collaboration across many actors, and building trust, identity and place attachment (DS, 2017) as well as facilitating meeting points welcoming various voices, mapping values collectively (using e.g. maps and/or pictures), highlighting differences to find common ground, ensuring ownership of the process and the ideas, and getting inspiration from others (DS, undated).

Similar ingredients are also reported in the working documents commissioned by the District Centre to describe how small municipalities can actively work with holistic sustainable development on the grounds of natural and cultural resources. For Clemetsen and Stokke (2020) crucial elements are using actively the Plan and the Building Act in visitor management, as well as engaging integrators who create trust, are perceived as legitimate and have the ability to initiate and coordinate measures. Groven and All (2020) highlight the following features: good administrative and municipal leadership and support; enthusiastic individuals who foster engagement (particularly in small municipalities); local anchoring (i.e. ideas must spring from the local community through their mobilization); competence and administrative capacity; mitigation of conflicts between use and protection through active involvement of various interests at different levels and cooperation between state and local authorities; and cross-sectoral interaction and integration of sustainability goals across sectors. For Singsaas (2020) there are different experiences and needs across municipalities will demand differentiated instruments, but she considers that small municipalities can benefit from the creation of municipal networks in which to share experience and knowledge and get support by professionals and regional and national actors as well as from the development of relevant and easy to understand and communicate indicators.

In addition to these experiences, RUVIVAL may also find inspiration in the processes initiated by municipalities and county municipalities in Norway to integrate UN's sustainability goals in their planning work. Lundberg et al. (2020) have investigated these experiences using surveys, interviews and document review. Although their study addresses integration of sustainability in a perspective (municipal planing) that extends beyond RUVIVAL's focus (cultural heritage management), their findings and recommendations can be relevant for the design of RUVIVAL's framework/tool. These are sumarized below:

- Working with integrating sustainability goals into municipal planning supports the adoption of interdisciplinary and cross-sectorial approaches and holistic planning, the prioritization of neglected issues and increases awareness about conflicts/dilemmas
- Implementation of the sustainability goals in planning work is largely at a strategic level, although the level of progress varies among municipalities and county municipalities. Large municipalities are generally more positive towards using the sustainability goals as an management tool and have to a greater extent initiated political processes to do so.

- The majority of the municipalities have chosen to prioritize some sustainability goals based on their own challenges and posibilities[42], while the majority of the county municipalities have chosen to focus on covering all three sustainability dimensions. Yet, some demand clarification on what means to use the sustainability goals as a basis for local and regional planning.
- Several methods, guidelines and tools exist for implementating sustainability goals (some targeting thematic areas, others concerned with processes), but participants call for more specific methodologies for implementing them in planning processes
- Municipalities and county municipalities used several methods and instruments to integrate sustainability goals into planing – key performance indicators, materiality analysis, future labs, statistics, thematic focus areas – in addition to a variety of methods to ensure participation, retrieving local knowledge and facilitating local anchoring. However, there is a lack of tools that make conflicts between goals visible
- Lack of time, resources, methods and knowledge as well as lack of political anchoring and of coordination are important challenges against the integration of the sustainability goals in municipal planning
- There is a need for increasing knowledge about the diversity of planning tools and relevant and easily accessible guidance material, as well as about indicators and evaluation methods to assess what cannot be measured
- Municipalities have collaborated with other municipalities, as county municipalities lack also experience and are not able to fulfill a advisory role.
- Political leadership and anchoring, working across sectors and departments and citizen participation are key to succeed in implementing the sustainability goals in planning, and particularly enthusiastic individuals and networks were key among the first municipalities that started to work with sustainability goals

From these findings, it follows that heritage managers and owners are likely to have differentiated resources and capacities to work with cultural heritage reuse. Moreover, sustainable development is a complex concept to work with and clarification of what it means and prioritization of particular goals and/or criteria may be required. Increasing awareness about existing guidelines and tools (and making them accessible seems key), but also adjusting them to the particular context of managing cultural heritage reuse projects. Moreover, there is a need for tools that make conflicts visible. Cultural heritage reuse processes that seek to contribute to sustainable development may also benefit from collaborative and networking practices and the engagement of enthusiastic individuals. Interestingly, some of the participants interviewed by Lundberg et al. (2020) consider that cultural heritage is not well covered in the sustainability goal structure, and we hope RUVIVAL may contribute to shift this perspective by increasing awareness on how cultural heritage can contribute to sustainable development goals.

[42] According to Lundberg et al. (2020), Asker's approach to the implementation of the sustainability goals has been a great inspiration for other municipalities. Asker municipality has assessed the importance of the different UNs SDGs goals and subgoals for the municipality, selected and translated the most relevant ones and map possibilities and challenges into their vision and municipal planning (Pure Consulting, 2018).

# 6 Locating RUVIVAL's framework in cultural heritage management practices

To ensure relevance and applicability, RUVIVALs framework/tool must fit into existing cultural heritage management practices. Over the last three decades increased responsibilities on cultural heritage management have been transferred from the Norwegian State to the counties and the Sami parliament. However, although responsibility for cultural heritage protection and management is still distributed across administrative levels, municipalities hold a central role. Moreover, national policy goals encourage participation of individuals and society at large in protection and use of cultural heritage, both as a right and as a responsibility. This chapter, thus, briefly describes formal management of cultural heritage across administrative levels and public bodies (6.1) and introduces the role of the voluntary sector in cultural heritage management (6.2), before presenting the management of RUVIVAL's selected cases (6.3) and discussing potential application scenarios of RUVIVAL's sustainability framework/tool (6.4).

## 6.1 Cultural heritage formal management

In Norway, various administrative levels and public bodies hold important responsibilities and authority in the management of cultural heritage. Nevertheless, municipalities bear main responsibilities for identifying, valuing and managing cultural monuments worthy of protection in line with national goals. For this, municipalities have several instruments at their disposal, including the Planning and Building Act, which is the most important legal instrument, cultural heritage plans (kulturminneplan) and incorporation of cultural heritage in the municipality's planning system (kommuneplanens samfunnsdel, arealdelen, kommunedelplan), financial instruments such as subsidy schemes and tax exemptions), and further mechanisms to manage cultural heritage as e.g. agricultural authorities. Municipalities are also responsible for ensuring application of rules and regulations relevant for the management and use of cultural heritage. While this enhances local decision-making, it may also give rise to different applications[43]. Moreover, municipalities often own cultural heritage objects, as it is the case in two of RUVIVAL's four cases: Obrestad and Tungenes lighthouses.

In addition to municipalities, various further authorities and public bodies hold important responsibilities in the management of cultural heritage.

Since 1990, a number of administrative tasks have been transferred from the State (the Directorate of Norwegian cultural heritage) to county municipalities (KMD, 2020). Today, counties are responsible for ensuring that cultural monuments are taken into account in planning processes at county and municipal level; implementing and following up national cultural heritage policy goals; providing advice to the municipalities and other stakeholders who seek guidance in the field of cultural heritage; managing most of the automatically protected cultural monuments, protected shipwrecks and vessels, regulated properties, several

[43] Holders of the Norwegian Cultural Heritage's "Olavsrosa" argue that application of rules and regulations can vary across municipalities and increase unpredictability, costs and procedures, hindering the implementation of measures required to enable economically viable use of cultural heritage (Oslo Economics, 2017).

technical and industrial facilities and the non-ecclesiastical medieval buildings; and handling applications for grant schemes (KMD, 2020).

Similarly, since 1994, a number of administrative tasks have been transferred from the State to the Sami Parliament and, today, the Sami Parliament has a similar role and authority in the management of the Sami cultural environments as the county municipalities have for the non-Sami cultural environments (KMD, 2020).

The Directorate for cultural heritage has transferred several tasks to regional authorities but holds still much authority in conservation and objection appeals, in addition to being responsible for the national distribution of grants to county municipalities and for the management of selected cultural environments of national value and of listed church buildings. Moreover, the Directorate has important advisory functions to the Ministry of Climate and the Environment and the royal palace (on issues that apply royal property), in addition to being responsible for developing guidance material, digital services and managing of data to ensure a holistic management of cultural heritage.

The Cultural Heritage Fund is directly subordinate to the Ministry of Climate and the Environment and grants financial support for the preservation of privately owned cultural monuments worthy of protection, such as buildings, homes, boats, gardens and cultural landscapes. Important criteria in the Cultural Heritage Fund's assessments are the adopted national policy goals described in the introduction (KMD, 2020), as well as whether the cultural monuments for which grants are applied for are prioritized in municipal cultural heritage plans. Funds are allocated through a dedicated item in the national budget by the Ministry of Climate and the Environment.

The Governor of Svalbard is responsible for the management and supervision of cultural environments in Svalbard. And the Norwegian Institute for Cultural Heritage Research (NIKU) is responsible for conducting excavations of archeological cultural environment from the Middle Ages under assignment from The Directorate of Norwegian cultural heritage and county municipalities through basic funding from the Ministry of Climate and the Environment (KMD, 2020).

The Ministry of Climate and the Environment is responsible for the national cultural heritage policy, whereas the Ministry of Local Government and Modernization has the final word on planning cases against which interested parties may have presented objections. It can also, by own initiative, convene, revoke or make changes in municipal land-use plans and zoning plans, where cultural heritage interests have been disregarded (RA, 2020a).

Additionally, various international agreements and frameworks influence management of cultural heritage in Norway (KMD, 2020). And actors without a formal role (e.g., county and local museums, interest groups and local history groups) can contribute with information, insights, local expertise and dissemination of cultural monuments, environments and landscapes (RA, 2020a).

## 6.2 Non-profit and voluntary initiatives

The important role of the non-profit sector to facilitate people’s right to preserve and take part in their own culture and cultural heritage and environments and to promote inclusion and prevent exclusion is recognized in national cultural heritage policies (KMD, 2020, p. 37).

National goals for the sector are to facilitate broad and inclusive participation, the development of a strong and independent voluntary sector, operational simplification and coordination and interaction between the public and the voluntary sectors (KD, 2018). Since much of the voluntary work takes place locally, municipalities have a central role in strengthening this interaction, and having in place local volunteering policies is considered key (KD, 2018; Kantar & Frivillighet Norge, 2021). While municipalities are given room to shape such policies (KD, 2018), national authorities are also expected to facilitate guidance and sharing of experiences between municipalities (Frivillighet Norge, 2019).

'Frivillighet Norge' publishes – in collaboration with Kantar – the 'Volunteer Barometer' with survey-based figures on participation and attitudes to volunteering. Figures from before the pandemic show that the share of the population (over the age of 15) participating in voluntary work has been stable at 63 per cent, with approximately nine percent of them participating in volunteer work for more than ten hours a month in 2019 (Kantar & Frivillighet Norge, 2019). From 2021, however, this share has dropped to 55 percent, with the decline being particularly high among young people. Active participation has decreased the most (13 percent decrease vs. e. g. 5 percent decrease in membership) (Kantar & Volunteering Norway, 2021), and 4 out of 10 participants state that the situation created by the COVID-19 pandemic has prevented them from doing voluntary work, being the cancellations of activities the most important reason (Kantar & Frivillighet Norge, 2021). According to the barometer, recruitment has also declined (Kantar & Frivillighet Norge, 2021), and communicating volunteering's societal benefits has been regarded central to facilitate recruitment of new volunteers (Kantar & Frivillighet Norge, 2019).

Based on Statistics Norway's satellite accounts for non-profit institutions (SSB, 2022), figures 5-7 show the development of full-time equivalent for non-profit and voluntary organizations in, respectively, art and culture and sports sub-sectors and in total.


*Figure 5. Full-time equivalents for non-profit and voluntary sector organizations within 'art and culture'. (Source: Own elaboration based on Statistics Norway table 08520)*


*Figure 6. Full-time equivalents for non-profit and voluntary sector organizations within 'sport'. (Source: Own elaboration based on Statistics Norway table 08520)*

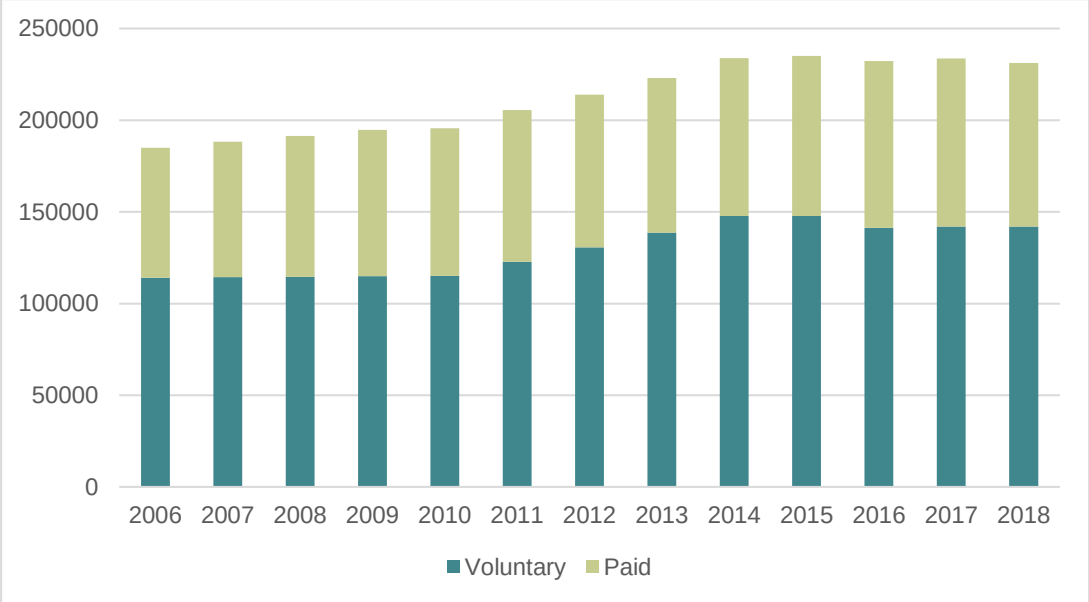


*Figure 7. Full-time equivalents for non-profit and voluntary sector organizations. (Source: Own elaboration based on Statistics Norway table 08520)*

Figures illustrate that participation in non-profit and voluntary sector organizations within 'art and culture' (figure 5) is lower than that in the sport sector (figure 6). Moreover, while the share of paid voluntary work has increased for the sports sector, the opposite has been the trend for the art and culture sector.

That being said, figures within art and culture include a much broader range of activities than those pertaining the field of cultural heritage protection. The Center for Research on Civil Society and the Voluntary Sector has estimated that 17 per cent of voluntary working hours from within this sector can be attributed to organizations working with history and cultural

protection (Wollebæk & Sivesind, 2011). Members of these voluntary associations have typically diverse professional and educational background and an increasing average age, and women and ethnic minorities are underrepresented in their boards (Wollebæk & Sivesind, 2011). It is also estimated that volunteers from member organizations of the Norwegian Cultural Conservation Association[44] contribute to proximately six million work hours per year documenting, maintaining and disseminating competences about the cultural heritage, which are worth two billion kroner (KMD, 2020, p. 37).

## 6.3 Management of selected cases and sustainability considerations

### 6.3.1 Abborhøgda in Finnskogen Natur- and Kulturpark

Abborhøgda – or Yöperinmäki – as it is called in the now extinct language that the Forest Finns used to speak, is a typical homestead for Forest Finns in Norway. It is situated in the municipality of Kongsvinger, in the Southeast of Norway, where Forest Finns coming from Sweden settled in the 18th century. Their way of cultivating the land varied from the agricultural traditions that had been carried out in Norway, and so did their way of building houses. A Forest Finnish homestead is often described as a mosaic with regards both the buildings that accommodate various uses and the landscape surrounding it.

Abborhøgda is unique because both landscape and buildings are mostly intact – though buildings require refurbishment. Moreover, Abborhøgda (as other Forest Finnish homesteads) holds a quite unique biodiversity due to the way of cultivating the land. Both buildings and landscape at Abborhøgda are protected under the Cultural Heritage Act, and Abborhøgda is one of the selected national cultural landscapes in agriculture, which aims to safeguard important cultural landscapes with great biological and cultural-historical values (RA, 2022a). Abborhøgda is located in an area with a 240 km cross-border network of historic trails ('Finnskogsleden'), which was used by the Forest Finns (RA, 2022a; Finnskogsleden, 2022), and it is part of the "Finnskogrunden" – a 53 km historic trekking route financed by the Directorate of Norwegian cultural heritage in cooperation with the Norwegian Trekking Association (DNT Finnskogen og Omegn, 2022).

Abborhøgda, formerly owned by the State of Norway (Statskog), was donated to the National Trust of Norway in 2019 – a non-profit organization concerned with facilitating a sustainable management of cultural heritage by respecting heritage's values and carrying capacities while facilitating uses with the least possible ecological footprint that stimulate local economies and create social arenas (Fortidsminneforening, undated). In its strategy, the National Trust of Norway states that their work is particularly aimed to contribute to the following UN's sustainability goals: 3 (good health and well-being), 8 (decent work and economic growth), 11 (sustainable cities and communities), 12 (responsible consumption and production), 13 (climate action) and 15 (life on land). Prior to Abborhøgda's donation, the National Trust of Norway ordered a knowledge base from Insam to shed light on matters relevant for the take-over

[44] This is an umbrella organization that brings together 26 nationwide organizations, with around 2,000 local teams and 250,000 members (Norsk Kulturvernforbund, 2022)

(Insam, 2018). According to this document, Abborhøgda was regarded as an object with important values for the dissemination of the Forest Finns' cultural history and building traditions. The document also concluded on the importance of finding a sustainable operating model and of allocating enough resources for the restoration, care and maintenance of Abborhøgda's buildings and landscape, as well as of finding good financing solutions for restoration and adaptation activities. Two business cases were developed, and in light of the National Trust's museum strategy, the concept regarded most suitable to both disseminate Abborhøgda's values and make it available to the public was the case comprising reconstruction work (following traditional techniques) on parts of the barn that had previously been demolished and changes/upgrades to facilitate its use for accommodation purposes and course activities. Changes/upgrades comprised e.g. building modern bathroom facilities, both to attract more people and to cope with visitors' numbers, and installation/upgrade of electric facilities (Insam, 2018). The museum for Forest Finn culture in Norway has expressed skepticism towards planned changes (Norsk Skogfinsk Museum, 2021). The municipal plan allows to proceed with a change of use in the barn (ACONSULT Ove Bø, 2020), and the Directorate for Cultural Heritage has approved the development plans. Yet, the National Trust of Norway wants to talk to interested parties before they apply for a start-up permit, and a working group has been established to discuss plans for Abborhøgda. The working group comprises representatives from local organizations (Norwegian Forest Finnish Museum, DNT Finnskogen og Omegn, Austmarka history team), Innlandet county municipality and the National Trust of Norway (with representatives from state, county and local levels).

The municipality, in which Abborhøgda is located, Kongsvinger aims to actively use cultural heritage in the development of urban areas and villages (Kongsvinger kommune, 2018, p. 30). In collaboration with Sør-Odal municipality – it has recently adopted a cultural heritage plan (Kongsvinger kommune & Sør-Odal kommune, 2021). The plan does not explicitly mention Abborhøgda, but acknowledges the key role of cultural heritage and landscapes in e.g. strengthening public health, creating a sense of belonging and identity and developing the tourism industry (p. 13). The plan recognizes that cultural monuments represent important use values for e.g. business development and recreation as well as in a climate perspective (energy and resource savings), while it also acknowledges the importance of considering heritage intrinsic values, especially those associated with ethnic minorities such as the Forest Finns (p. 14), and of finding a balance between preserving cultural heritage and local development (p. 11). In its planning strategy, Kongsvinger municipality has also identified which UN sustainability goals are selected as focus areas and are, thus, to be incorporated into the municipality's planning during the period (Kongsvinger commune, 2020).

### 6.3.2 Hemnesberget in Okstindan Natur- and Kulturpark

Hemnesberget is a fisher village located on a peninsula in the municipality of Hemnes close to Okstindan – the highest mountain in Nordland – and part of the landscape shaped by the Okstind glacier. Hemnesberget has long been an important harbor between northern and southern Norway with significant fishery and boatbuilding industries. It was a cornerstone in the Norwegian economy from the Middle Age until the industrialization in the 19$^{th}$ century. Its closeness to the Swedish border contributed to its strategic importance for both trade and military purposes, and the site played a key role in the supply of goods for the construction of the railway in the inland region of Nordland.

Although many of the buildings in Hemnesberget were left in ruins following Nazi occupation or were struck by fires prior to the war, the site still counts with historic buildings and cultural environments of particular significance. Lapphella is the oldest part of the village and the only cultural environment regulated for conservation based on the Planning and Building Act (PBL) (Hemnes kommune, 2019). Lapphella's wooden houses are well preserved, particularly thanks to the efforts of 'Lapphellas Venner' association who took care of the building stock in 1983. Also, two of the houses in the village – Per Smedstua and Kirkebua – and the old commercial pier - Ranheimbrygga – are part of the Helgeland museum. Both Kirkebua and Ola-Smedbua are reminders of the many church arches that were built in the area to accommodate people attending church services, and Ranheimbrygga hosts a permanent exhibition of maritime objects, including boat engines, related to sea-oriented trade (Hemnes kommune, 2019). Præstengbrygga is also an important site in Norwegian boatbuilding history, where there are ongoing plans to establish a boat museum (Hammer, 2021).

Hemnesberget is part of Okstindan nature and culture park (ONK), whose establishment was adopted by Hemnes municipality in 2018 (ONK, undated). As a regional park, ONK aims to contribute to the best possible use and development of natural and cultural resources, for the joy and benefit of business, locals and visitors (ONK, 2022). The park's goals include creating identity, well-being, interaction, creativity and business development, increasing municipality's attractiveness as a place to both live and visit, strengthening cooperation between the voluntary sector, the public sector and business and ensuring the conservation and development of resources and distinctive natural and cultural values, in addition to developing a strong brand and an innovative marketing (ONK, undated, 2022). The decision of being part of a regional park can be regarded as quite unique in Norway, where regional parks – contrarily to national parks and locally regulated parks – have no legal status. The ten-year park strategy (ONK, undated) encompasses several subsets of goals that correspond to the UNs sustainability goals.

Hemnes municipality has developed but not adopted (yet) a cultural heritage plan, in which Hemnesberget is recognized as a special cultural heritage site for its boat building tradition as well as for its boat and war history (Hemnes kommune, 2019). In its planning strategy (also still pending adoption), Hemnes municipality writes that "*the UN's sustainability goals shall form the basis for all planning in Hemnes municipality*", without specifying anything more about this (Hemnes kommune, 2020). Its municipal social plan[45] for 2013-2025 specifies various goals related to attainment of a sustainable economy, a sustainable land-use planning, and a sustainable management of the natural environment and land (Hemnes kommune, 2013). The same plan (Hemnes kommune, 2013) aims to develop a municipality that considers the needs of both present and future generations, and preserving and securing cultural landscapes and historical values and traditions is also among the municipality's goals.

Hemnes municipality work for developing Hemnesberget started in 2005, focusing on development of the waterfront, improvement of streets, guest harbors, green areas and lighting (Distriktssenteret, 2020). Since 2018, much focus has been on its waterfront, and its development has integrated perspectives of residents, builders, planners and politicians through participatory processes (see e.g. Asplan Viak, 2018). In 2021, Lapphella Kulturarena was established (Hammer, 2021). The municipality has been concerned with both attracting

[45] samfunndsdel

new residents, investors and visitors and with facilitating that residents thrive and are proud of their local community (Distriktssenteret, 2020).

### 6.3.3 Tungenes fyr

Tungenes lighthouse is situated in South-Eastern Norway, close to Stavanger, in Randaberg municipality. It marks the entrance of Byfjorden (the city's fjord) and the end of Kvitsøyfjorden. The lighthouse, which was established in 1828 after initiatives taken by citizens of Stavanger and by 'herring' fishermen, has been modernized and expanded several times (Lauritzen, 2019a). The last expansion took place in 1959, when the lighthouse tower and associated living houses were enhanced with an additional living house and an outhouse/stable (Lauritzen, 2019a). During the second world war, Nazi forces built a fortress next to the lighthouse, and this fortress is also a visible component in today's Tungenes landscape (Lauritzen, 2019a), which has been proposed as a candidate for the KULA (Cultural-historical landscapes of national interest) register by the Directorate for Cultural Heritage (RA, 2020b).

The lighthouse, which has been unmanned since 1984, was protected in 1998 according to the Cultural Heritage Act and has been owned by the Randaberg municipality since 1989 (Lauritzen, 2019a). Tungenes landscape attracts both locals and tourists for recreational purposes (e.g. hiking, biking, paddling) (Lauritzen, 2019a), and it is estimated that the lighthouse has approx. 20,000 visitors a year (Olsen & Gurandsrud, undated). The lighthouse is part of the Jærmuseum, and its tower exhibits how the lighthouse keeper and his family lived in the 1930s, whereas the outhouse/stable hosts themed exhibitions (Randaberg kommune, 2021). Tungenes buildings house also a gallery and a café (but no overnight facilities). Tungenes is also used for cultural activities such as conferences and concerts and is a popular place for hosting wedding celebrations. Close to the lighthouse – in Tungevågen – there is also a maritime museum which contains a large collection of fishing boats and equipment and a collection of used boat engines driven by the 'Tungene's engine association' (Olsen & Gurandsrud, undated). Currently, there are plans to build an interactive Maritime Museum to document the history of the Norwegian Coastal Administration close to the lighthouse (Lauritzen, 2019a).

Tungenes lighthouse is one of the material cultural heritage prioritized by the Randaberg municipality in its cultural heritage plan for 2019-2030. According to this plan, Tungenes plays a key role in building Randaberg's identity (Randaberg kommune, 2019a). In addition, the municipal's plan acknowledges the role of cultural heritage in developing an attractive village and in using culture – in a broader sense – as an inclusive arena (Randaberg kommune, 2019b). The municipality's plan strategy (2020-2024) integrates UN's sustainability goals in the municipal planning, by sorting the eight challenges they want to prioritize and corresponding planning needs under each of the three sustainability levels (Randaberg kommune, 2020). It also acknowledges the need to secure cultural heritage and environments and identifies the role of both the municipal cultural heritage plan and the agricultural plan to do so (Randaberg kommune, 2020).

### 6.3.4 Obrestad fyr

Obrestad lighthouse is located in Hå municipality (not far from Tungenes) and is the westernmost lighthouse on mainland Norway. The lighthouse was built in 1873, whereas the lighthouse keeper's residence dates from 1902 (Hå kommune, undated). During the second world war, Obrestad lighthouse was occupied by the Nazis and played a key role in the costal

defense of Norway (Hå kommune, undated). New residences were built in 1948 and in 1969 for those in charge of operating the lighthouse and their families (Hå kommune, undated). The lighthouse was automated in 1991 and, in 2006, Hå municipality bought the lighthouse from the Norwegian Costal Administration (Lauritzen, 2019b). Right next to the lighthouse lies Hå's parish farm/rectory (1637), which was home to the local priest and his family and owned by the Church of Norway (Lauritzen, 2019b), but is now also owned by the municipality.

Today, the lighthouse building is open to the public and used as a cultural arena (e.g. concerts, literature) and as museum for dissemination of the Norwegian coastal and lighthouse history, and the houses can be rented for accommodation (Lauritzen, 2019b). The lighthouse's ground floor contains a workshop and engine room (Hå kommune, undated), and further facilities at the site comprise a meeting room, a café and opportunities for a guided tour (Lauritzen, 2019b). The parish farm/rectory contains a café, art exhibitions and a concert hall (Lauritzen, 2019b). The site around the lighthouse comprises also several war memorials and further cultural heritage elements, including burial mounds, an old royal road and Jærmuseet's farm Grødaland – a collection of buildings with original Jær architecture (Lauritzen 2019b). Obrestad is also integrated in a cycle route and a national tourist road, and together with Tungenes, and Kvassheim, it is part of 'a chain of lighthouses', a joint exhibition project on coastal lighthouses, which is also part of the collaboration on the North Sea Trail – a hiking coastal route around the entire North Sea (Fylkesmannen i Rogaland, 2019).

Both the lighthouse and the parish farm/rectory have public conservation status as cultural-historical facilities. Obrestad lighthouse is protected under the Cultural Monuments Act (1992) and is considered to be a cultural monument of national value (Hå kommune, undated). In addition, Obrestad is part of Jærstrendenes landscape conservation area (protected in 1997), and south from the lighthouse there is a harbor, which is also listed by the national cultural heritage authorities (RA, 2022b).

Hå municipality's cultural heritage plan is currently under revision (Hå kommune, 2020). The previous cultural heritage plan (Hå kommune, 2005) prioritized Obrestad, and follow with an action plan aimed to use the lighthouse to "*facilitate good experiences for both the public, overnight guests and hikers*" and to keep-up buildings' condition and activities up to the same level within the disposable budget (Hå kommune, undated, p. 6). The facility depends on high visitor numbers to ensure sufficient income for maintenance, and keeping the site open and providing income opportunities were important factors in the prioritization of short-term and long-term maintenance measures (Hå commune, undated, p. 46). The municipal plan strategy identifies the most relevant sustainability goals for the municipality, and the municipality is currently working on developing a simpler plan with clearer focus areas that build on those goals (Hå kommune, 2020). The previous municipal plan stated that expected growth in the region should take place in ways that take into account natural and cultural values as well as cultural landscapes (Hå kommune, 2014), and the new municipal plan will look into cultural heritage protection and cultural landscapes (Ha kommune, 2021).

In sum, by December 2022, all municipalities in which RUVIVAL's cases are located have developed cultural heritage plans, although two of them are being revised or pending adoption. Moreover, the municipalities of Kongsvinger, Randaberg and Hå have also initiated work to integrate UN's sustainability development goals into municipal planning, and Hemnes municipality has also stated the intention integrate UN's sustainability goals in their planning.

Importantly, all four municipalities recognize cultural heritage's contribution to sustainability to varying degrees.

## 6.4 Potential applications of the framework/tool

Based on the description of general and case-specific formal and voluntary cultural heritage management practices, we envision that following actors could benefit from using RUVIVAL's sustainability framework/tool in particular scenarios:

- Municipalities: in planning processes and sustainability assessments. For instance, RUVIVAL's sustainability framework/tool could be used in case municipalities to:
    - increase awareness about how using cultural heritage may contribute to prioritized sustainability goals
    - evaluate (ex-post) how using cultural heritage contributes to local and/or regional sustainability
    - inform selection of uses in planned cultural heritage reuse projects (e.g. Abborhøgda) and/or on further development of established reuse sites (e.g. construction of the interactive Maritime Museum at Tungenes).
- Counties: in management of cultural heritage for which they are responsible and/or in processing applications for grant schemes.
- The Directorate for Cultural Heritage in their ongoing work to integrate sustainability goals to their mandate and strategy
- Cultural Heritage Fund: in processing applications for financial support
- The non-profit sector: in increasing awareness about their contribution to protect and safeguard cultural heritage (SDG 11.4) as well as the contribution of cultural heritage reuse processes to encouraging and promoting effective public, public-private and civil society partnerships (SDG 17.17).
- Cultural heritage owners: in selecting appropriate use functions for obsolete heritage sites they owned. For instance, RUVIVAL's sustainability framework/tool could be used in ongoing discussions on potential use alternatives for Abborhøgda.

Based on these reflections, we can anticipate that these actors may be interested in testing RUVIVAL's sustainability framework tool. However, these impressions need to be discussed and evaluated in subsequent interviews, workshops and fieldwork. It is, for instance, not clear that the voluntary sector is interested in using RUVIVAL's sustainability framework/tool, considering that volunteers already make large contributions in protecting and managing heritage sites with scarce resources.

# 7 Conclusion

Policies are increasingly calling for enhancing the contribution of cultural heritage to sustainable development by encouraging reuse of underutilized heritage. However, there is insufficient empiric-based documentation on whether and how reusing cultural heritage contributes (or not) to sustainable development. Moreover, designing and implementing cultural heritage reuse processes in ways that contribute to sustainable development is far from easy.

The project *RUVIVAL - RUral VItalization through Various Adaptations of cultural heritage and Landscape,* seeks to produce tools and knowledge that supports cultural heritage adaptive reuse processes in ways that preserve cultural heritage values while contributing to sustainable development of rural environments. In work package 4, RUVIVAL aims to develop and test a framework to facilitate consideration of sustainability principles and elements in the design, implementation and evaluation of cultural heritage reuse projects to both guide decision-making processes and demonstrate projects' contribution to sustainable development.

This working document summarizes results from the first task aiming towards this objective: the initial literature review. The review was mainly conducted between June 2021 and December 2021, and the search comprised two searches in Scopus database (on the topics of 'cultural heritage reuse' and sustainable development') and a screening of key institutional websites. The literature review was guided by four objectives:

- finding evidence on *how can adaptive reuse contribute to sustainable development* (section 5.1)
- getting an overview of methodological approaches that can inform the initial design of RUVIVAL's sustainability framework/tool (section 5.2);
- identifying elements to be included in RUVIVAL's sustainability framework/tool (section 5.3)
- learning from cases where attempts have been made to systematize and operationalize sustainability in cultural heritage reuse processes (section 5.4)

In addition, this working document presents potential applications of RUVIVAL sustainability framework/tool based on cultural heritage management practices in Norway (chapter 6).

The literature review suggests that a substantial number of studies documenting the **relationship between cultural heritage and sustainable development** is empiric-based, partly contradicting previous research (Bullen & Love, 2010, 2011; Calder, 2015). We have attempted – not without challenges – to categorize impacts across four dimensions: cultural, social, environmental and economic. Following this categorization, we find that approximately a third of the studies can be categorized as 'holistic' in so far as they investigate aspects across all four traditional sustainability dimensions (economic, social, cultural and environmental), although half of them are reviews. Moreover, the review also suggests that studies cover a wider range of issues, dedicating more attention to environmental, social and cultural aspects (including intangible ones), that were previously largely neglected (Europa Nostra, 2015; Guzman et al., 2017; Nocca 2017). Interestingly, most impacts reported by the studies reviewed are positive, and we, thus agree with Storrank (2017) who argue that more studies are needed investigating positive and negative impacts. We also find that there are relatively fewer studies documenting the impacts of cultural heritage reuse in rural than in urban contexts, as well as few studies

focusing on the Nordic region. Based on our review, we argue that (re)use of cultural heritage has the potential of contributing to various dimensions considered relevant for sustainable development. Yet, whether these impacts are positive or not depends on the selection of use functions in relation to their context and the buildings' characteristics as well as on how reuses are managed on the long-term. First and foremost, this substantiates the need for developing tools to enhance the contribution of reusing cultural heritage for sustainable development and confirms, thus the relevance of RUVIVAL.

The literature review was also useful to get an ***overview of methodological approaches that can inform the initial design of RUVIVAL's sustainability framework/tool***. However, there are still gaps that will need to be close in subsequent research. The review retrieved various sustainability frameworks to integrate sustainability related criteria in cultural heritage reuse processes. However, we found no frameworks guiding heritage reuse projects from design to evaluation. Most frameworks are developed to be used at early stages of the process to e.g. collect information and select potential heritage reuse alternatives based on selected criteria. Alternatives may comprise use functions, heritage buildings or reuse interventions and criteria can englobe various aspects relevant for sustainability, such as community needs, preservation of historical and cultural values, economic and financial feasibility, circular economy, environmental impacts and performance, socio-cultural aspects, building usability, regulatory aspects and/or multidimensional benefits. We also find some frameworks proposed to be used at the end of the project (to e.g. evaluate their contribution to selected criteria). However, we find no frameworks guiding implementation of reuse processes.

Frameworks found are developed using various methodologies (e.g. desk research, workshops, focus groups, surveys, observations and fieldwork, and statistical and spatial analysis). Yet, most of them depart from a literature review and some rely only on existing documented studies. Others are grounded on particular cases and draw on stakeholder consultation. Yet, broad stakeholder consultation is often limited, particularly in developing (less so in applying) the frameworks, to experts, technicians and/or administration representatives. This can be unfortunate, as stakeholder engagement is fundamental in balancing various interests, raising the acceptability for agreed solutions and building on multiple sources of knowledge, providing a more thorough understanding of opportunities and challenges to inform the decision.

The literature review was also instrumental in ***identifying elements to be included in RUVIVAL's sustainability framework/tool***. Elements typically included in frameworks comprise: a) sustainability criteria and indicators to conduct ex-ante and/or (ex-post) evaluation of heritage reuse projects and b) multicriteria decision analysis (MCDA) methods to allow consideration of different criteria and perspectives in prioritization/ranking of heritage reuse alternatives.

Together, the range of criteria and indicators suggested by the studies reviewed is quite comprehensive. That being said, criteria and indicators vary across studies, and they differ on their level of detail (not all of them follow with corresponding units of measurement) and on the level of analysis (site, local, regional). Moreover, criteria is not always categorized along traditional sustainability dimensions. This and the high number of indicators makes it challenging to categorize identified criteria and indicators into one set that can be integrated in RUVIVAL's framework/tool. Nevertheless, we acknowledge that it can be helpful because working with indicators can be useful to operationalize sustainability and monitor projects.

MCDA methods are also a recurrent element included in frameworks to attend to and integrate multiple criteria and perspectives, facilitate systematic evaluations and transparent decision-making processes. There are, however, various ways of performing MCDA, and these methods differ in their capacity to engage various stakeholders and to include large number of criteria and/or alternatives, their clarity and transparency, whether they allow for intercriteria compensation; the types of relationships considered and whether we want to assess convergence/divergence between stakeholder groups' interests. These features will need to be considered when selecting which MCDA methods to include in RUVIVAL's sustainability framework/tool, and eventually suggest their combination with other participatory methods to include broader perspectives and increase the legitimacy of decisions taken.

The literature review also retrieved various documents providing general guidance on processes (usually limited to the design phase) and guidance on particular tasks. However, to the best of our knowledge, there are, no guidelines integrating sustainability considerations in cultural heritage reuse projects from design to evaluation, which is what RUVIVAL actually scopes. We may, however, build on and/or integrate recommendations on how to use cultural heritage resources to contribute to broad value creation and tools and guidelines to identify relevant stakeholders and requirements to implement uses; develop business models; conduct landscape assessments and/or identify and assess cultural heritage values, facilitate participation of various stakeholders and identify strengths, weaknesses, opportunities and threats.

The literature review provided also some, yet limited, insights into ***practices where attempts have been made to systematize and operationalize sustainability in cultural heritage reuse processes***. Yet, gathering existing evidence on the application of frameworks, research projects and similar processes, in which sustainability criteria and indicators are incorporated in planning processes, we can identify opportunities, challenges and key issues that seem critical for the success of heritage reuse.

Among the opportunities, we find that application of frameworks and models at an initial stage of the process are helpful to increase understanding on the implications of cultural heritage reuse processes and facilitate decision-making processes by providing tools to evaluate and rank options according to selected criteria. Also, ex-post assessment frameworks facilitate monitoring and benchmarking, as well as increase awareness about the potential (and risks) of reusing cultural heritage and provide learning opportunities. Moreover, inclusion of a wide range of stakeholders facilitates consideration of a wider range of perspectives and interests, provide a more comprehensive understanding of the case and generate balanced choices that are more likely to be accepted. And indicators and MCDA methods are useful tools to consider a wide range of criteria and engage stakeholders. In addition, indicators can help to be explicit about what is meant by sustainability and MCDA methods can be instrumental in making conflicts visible.

However, attempts to integrate sustainability criteria into planning and/or cultural management processes reveal also important challenges. Application of formalized procedures can be time demanding. For instance, utilization of indicators demands time, resources and expertise. It can be challenging to select a set of manageable and relevant indicators that provide a comprehensive picture, and data to measure them may not be available. Moreover, lacking a clear conceptual understanding of sustainability can lead to a biased selection of indicators and a deficient operationalization, particularly if their selection is guided by data

availability. Similarly, MCDA methods can be too complicated to understand and use in practice. And lack of engagement, which in turn can contribute to downplay existing conflicts and increase the risk of taking skewed choices.

Based on the literature review, we believe that the following aspects that can contribute to successful heritage reuse projects:

- Engaged, trustworthy and legitimate facilitators
- Stakeholder participation and engagement
- Collaboration and networking
- Local anchoring and ownership
- Being aware of conflicts and dilemmas
- Having access to guidance material, data and easy-to-use tools and methods, adapted to different needs, including guiding frameworks

WP4 is best positioned to address the later point directly, although we see potential for addressing the other aspects indirectly. Based on our findings, we consider that RUVIVAL sustainability framework/tool can benefit from containing the following:

1. Criteria and indicators to assess impacts across sustainability. In chapter 5.3.1 we raised some questions on how these criteria and indicators may be defined and organize. Considering the complexity of the concept of sustainable development, but also its elasticity and the risk of overly focusing on particular dimensions, we consider it relevant to organize criteria and indicators into the four traditional sustainability dimensions. Moreover, since RUVIVAL's sustainability framework/tool attempts to guide cultural heritage reuse projects from design to evaluation, it could be useful to include both a) criteria at a first level to be used in early stages of the process to e.g. prioritize use functions and/or projects) and b) more specific indicators and corresponding measurements to be used in ex-post evaluations to e.g. assess impacts on selected criteria. In doing so, we consider it is important to allow for integration of perspectives beyond the cultural heritage site itself and see the later in relation to the broader socio-economic and environmental context, in order to attend to societal needs and challenges (e.g. prioritized municipal goals, environmental risks and vulnerabilities) as well as impacts on local communities (e.g. economic regeneration, local identity).
2. MCDA methods to enable consideration of multiple criteria and perspectives in decision making processes. It is not defined yet, whom RUVIVAL sustainability framework/tool will be addressed to. However, based on the description of potential users, it becomes clear that MCDA methods should match the level of expertise, which can be limited in small communities and/or in cases, in which the goal is to engage non-expert audiences (e.g. civil organizations or local populations). Alternatively, RUVIVAL's framework/tool could consider the possibility of combining MCDA method  to experts with bottom-up participatory approaches.
3. Considering that few municipalities have experience with operationalizing sustainability principles, the scarcity of role models and the substantial lack of resources, time, skills and knowledge, there is a clear demand for easy and accessible guidance material, as well as action-oriented tools and evaluation methods for measurable and non-measurable aspects. An orderly compilation of relevant, yet currently fragmented, pieces of guidance material on particular tasks to be performed at different stages of the reuse process can be useful to guide cultural heritage reuse process from design to

evaluation. RUVIVAL's sustainability framework/tool could, thus, either integrate guidelines in a new holistic set of guidelines aimed to assist cultural heritage reuse processes and/or provide an overview of existing guidelines by topic (e.g., criteria assessment; planning work), type of stakeholder (e.g., municipal planners, heritage owners) and/or stage of the reuse process (design, implementation and evaluation). This could include relevant data sources to measure selected indicators, as well as methods to collect information on aspects for which no data exists.

Based on the literature review and existing cultural heritage management practices, we anticipate that a framework/tool with these characteristics could be useful for a range of actors to evaluate and prioritize use alternatives of currently unutilized cultural heritage from a sustainability perspective; and to evaluate how using cultural heritage contributes to local and/or regional sustainable development; and increase awareness about it. In addition to these potential application scenarios, more generally, we envision that the application of RUVIVAL's sustainability framework/tool could support integration of cultural heritage in local and regional planning processes; facilitate the collection of empiric-based evidence on the impacts documented in previous studies; and lower the threshold to use existing data and methods by making them more accessible to interested parties.

Yet, despite these opportunities, we also can anticipate some ***aspects that we will need to consider in our further work*** when developing RUVIVAL's sustainability framework/tool.

*First*, consideration of sustainability in cultural heritage reuse processes necessarily implies attending to both heritage intrinsic values, human needs and societal challenges, as sustainability goals do address the need to protect cultural heritage (SDG no. 11.4), "*support the needs of present and future generations*" (UN, 2015) and tackle societal challenges such as environmental degradation and climate change (SDG no. 13, 14, 15). However, sustainability is a very elastic concept and ways to operationalize the concept are diverse, as heritage intrinsic values, human needs and challenges can differ across heritage cases and places. RUVIVAL's framework/tool will, thus, need, to integrate two apparently contradicting notions: being wide enough to embrace various values, needs and challenges while allowing for concretization in particular heritage cases and places. A possibility would be to include a wide range of sustainability dimensions and indicators among which interested parties could choose based on locally specific needs and challenges and the values people attach to the particular cultural heritage cases. This indicator set could be accompanied of methods to select and prioritize sustainability dimensions and indicators through participatory processes. Another possibility could be to provide guidelines to link decisions pertaining heritage reuse processes to ongoing efforts to integrate sustainability development goals into municipal and regional planning.

A *second* (but related) aspect to be considered is the utilization of indicators. Several of the frameworks reviewed comprise criteria and indicators against which cultural heritage reuse alternatives could be evaluated. Working with indicators can be useful to operationalize sustainability, define and monitor goals, as well as create commitment and action. However, working with indicators demand substantial resources and skills and placing too much focus on indicators can contribute to bureaucratization in detriment to meaningful action. It seems unviable to integrate all criteria and indicators suggested by the studies reviewed in RUVIVAL's sustainability framework/tool, as one would risk ending up with an unmanageable number of indicators. The selection of indicators to be included in RUVIVAL's sustainability framework/tool should, thus, be carefully considered. Not least because studies documenting efforts to

integrate sustainability goals into regional and municipal planning work indicate that there is a substantial lack of resources, skills and, knowledge. In doing this, it may be important to consider what kind of criteria is relevant in the Norwegian context. At the same time, we can capitalize on the diversity of selected cases to ensure that selected criteria and indicators are relevant for various types of heritage reuse cases. The framework/tool could also provide information about relevant data sources on criteria and indicators proposed as well as methods to evaluate aspects for which no data is readily available.

*Third*, much indicates that RUVIVAL's sustainability framework/tool should strive to support wide stakeholder engagement. One reason is that this facilitates capturing the full range of values, needs, challenges, sustainability aspects affected by cultural heritage reuse projects, thus providing a more comprehensive picture of the implications of reusing but also widening the possible range of reuse alternatives. For instance, engaging a wide range of stakeholders may increase awareness about potential negative and/or conflicting issues instead of overly focusing on positive aspects. The later can heighten expectations and increased dissatisfaction, whereas by being aware of negative impacts, alternatives can be re-considered and measures can be implemented to mitigate those impacts. A further reason for facilitating broad engagement is that management of cultural heritage extends beyond formal structures, with individuals and the non-profit sector being carriers of relevant knowledge. Also, decisions reached through wide stakeholder engagement are more likely to be accepted. Moreover, by facilitating engagement and participation, RUVIVAL's framework/tool would also be aligned with national policy goals for the sector aimed at engaging society at large in cultural heritage protection and use. However, while MCDA techniques are useful in considering multiple criteria and facilitating stakeholder engagement, they are not always necessary to understand and utilize. We will need to translate methodologies into accessible, understandable and transparent tools, which brings us to the last point.

*Fourth*, based on the analysis of practices and the complexity of some of the frameworks, methods and criteria suggested, particular attention should be paid to developing a framework/tool that does not imply an additional burden for potential interested parties. Not least because different actors and cases have different needs, and RUVIVAL's sustainability tool will need to adapt to their reality. This is illustrated by RUVIVAL cases, which can be considered to be at different stages in the reuse process and are, thus, likely, to demand different tools. Tungenes and Obrestad lighthouses are consolidated cultural and recreation arenas actively used by both locals and visitors. The recent development of a new cultural arena at Laphella has expanded use opportunities of its cultural environment. And, at Abborhøgda a process has just been initiated, in which new uses are being discussed. RUVIVAL's sustainability framework/tool needs to adapt to users' reality and be easy, clear and accessible.

The final design of RUVIVAL's sustainability framework/tool will depend on who will use it and their needs, which by December 2022 is still an unresolved question. Do potential users face situations in which they need to find new functions to already prioritized heritage objects? Or do they rather face situations in which they need to find a location to host a new function to satisfy a community demand? Or are they rather interested in evaluating specific projects than in choosing among alternatives? These are open questions that we seek to answer through subsequent interviews, workshops and fieldwork.

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