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Heritage Communities Urban Living Lab (HeCo ULL): A Circular Methodological Approach for Co-Design Through Social Multi-Criteria Evaluation

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Abstract. This research aims to define an integrated methodological approach for activating and implementing Urban Living Labs focused on cultural resources, landscapes and assets, and their enhancement, shaped by the role of the local community and significant historical sites. The CHANGES project - Cultural Heritage Active Innovation for Next-Gen Sustainable Society - is the context to design a circular Urban Living Lab approach where evaluation acquires a central and enabling role. Social Multi-Criteria Evaluation (SMCE) is suitable for inclusion in this decision-making context, instigating a Collaborative Decision-Making Process within co-design phases that actively engage diverse stakeholders, incorporating preferences and facilitating consensus building. Specifically, SOCRATES represents an interesting multicriteria method to investigate for this purpose as part of a methodology that consists of multiple methods of work, design and research. The methodological proposal is the Heritage Communities Urban Living Labs (HeCo-ULLs) approach, a circular framework recognising multidimensional complex values and the aspiration to generate new, locally rooted, and community-driven values. The proposal incorporates the SOCRATES method across various Urban Living Lab development stages. This methodological approach has to be implemented and validated case-by-case, involving local actors and considering the peculiarities of different cultural heritages and related contexts.

Keywords: Urban Living Lab · Social Multi-Criteria Evaluation · Collaborative Decision-Making Process

1 Introduction

A cultural landscape represents a geographic expanse profoundly shaped by human culture and civilization, harmonizing natural and human-made elements across historical, ecological, social, and physical dimensions. These landscapes are visible repositories of

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societal growth and evolution across generations, as acknowledged by UNESCO (2019). This concept underscores the intricate interplay between human civilization and the environment, emphasizing the importance of preserving and celebrating both cultural and natural heritage for and with communities, whose relevance is widely recognised and highlighted by the "Convention on the Value of Cultural Heritage for Society", Faro Convention [1]. The Convention encourages and engages people to recognise the public interest in cultural heritage. It outlines the framework of citizens' rights and responsibilities in participating in heritage valorisation by defining them as "Heritage communities" [2]. More recently, the New European Bauhaus movement is based on the belief that cultural heritage and urban regeneration strategies are strongly connected at different scales: heritage can work as a "cultural capital" in shaping more beautiful, sustainable, and inclusive forms of living together, rebuild local identity and co-create sustainable and productive relationships among people and places [3].

In 2022, the CHANGES project (Cultural Heritage Active Innovation for Sustainable Society) started to explore the cultural heritage enhancement impact on society, with specific attention to archaeological sites. While numerous experiences have been acknowledged as successful instances, various criticisms have emerged [4]. Specific authors have highlighted that strategies for cultural and creative cities are frequently linked to urban branding, rendering central areas more appealing to tourists and a specialized creative workforce. Unfortunately, these interventions often trigger the phenomenon of gentrification, which poses a threat to the authenticity of many cities [5]. Culture should be a catalyst for building diverse and inclusive urban environments [6] by giving proper attention to the long-term social impacts of cultural strategies [7] and reimagining how communities can play a crucial role in city policies and the socio-economic transformation of resilient cultural landscapes and assets [8].

Different authors have underlined that cultural-led regeneration should be local, place-based, site-specific, and community-led [9] to reduce contemporary urban contexts' physical and social inequalities. The cultural texture of urban areas containing archaeological remnants forms a rich network of intricate values, encompassing economic and non-economic aspects. These values require recognition and practical application in local regeneration and development initiatives. These often interconnected but neglected cultural assets serve as a catalyst for engaging diverse stakeholders in valorization strategies that prioritise authentic experiences and cultural heritage enhancement [10]. This study incorporates the concepts of Living Labs, heritage preservation, collaborative decision-making processes [2], multifaceted value recognition, complex values and circular economy principles. A Living Lab is a user-centred innovation ecosystem that often operates in a spatial context, integrating research and innovative processes within a public-private-people partnership, including stakeholders and citizens as key actors [11]. It is founded on an inclusive philosophy, which aims to transform users into direct creators of value, contributing to the co-creation of new ideas, innovative scenarios, concepts, and related artefacts [12]. This is essential to facilitate more equal relational processes among the individual, local community, and organisational levels [13]. In particular, Urban Living Labs can play a key role in maintaining the relevance of cultural landscapes in rapidly changing urban environments. They bridge the gap between tradition and innovation, engage communities and contribute to the sustainability and

vibrancy of our cities by preserving cultural heritage and its values [2]. This research aims to define a methodology to activate Heritage Communities in Urban Living Labs by elaborating a circular decision-making process able to integrate the knowledge of local resources and elaborate situated strategies based on community-driven and culture-led approaches and providing a toolbox for implementing a Collaborative Decision Support System (CDSS).

2 Urban Living Labs: Collaborative Decision-Making Process for Circular Design

2.1 Evolutions and Approaches of Living Labs

Living Labs (LLs) are open innovation ecosystems that operate in real-world settings. They employ iterative feedback mechanisms throughout the innovation lifecycle to generate sustainable impact. Penny Evans [14] of the Bristol Living Lab describes LLs as "places where citizens, artists, technologists, businesses and public sector organizations can come together to co-create ideas, tools, and technologies that address local challenges; a place for innovation and the exploration of new possibilities, where reflection and evaluation are integrated into the work process" [13]. Their main focus is co-creation, rapid prototyping and experimentation. The approach of LLs is specific to the world of open innovation and defines a user-centred ecosystem based on a systemic co-creation approach that integrates research and innovation processes in communities and real-life contexts where users are considered co-producers [15]. In November 2006, the European Network of LLs was founded under the Finnish Presidency of the Council of the European Union (EU). In the European interpretation of LLs, five main elements are combined [16]: active user involvement, a real-life environment, the participation of multiple stakeholders, a multi-method approach and co-creation. The European Network of Living Labs (ENoLL) has grown steadily over the years, parallel with the development of LLs approaches. Although there are common features between the various LLs, they can be implemented differently. Starting from structured methods for organizing user participation in innovation processes, multiple implementations of the LLs approach have occurred over time through the FormIT method [17], through the Belgian iLab.o [18], the Helsinki Living Lab and the Catalan Living Lab [19], up to the prototyping of the Territorial and Urban Living Lab [20].

Steen and van Bueren [21] describe Urban Living Labs (ULLs) as distinct from LLs because they have a clear territorial focus. They utilize various methods and modalities to encourage the social inclusion of residents and other stakeholders in experimenting with new ways of operating in their daily lives. Indeed, the Territorial Living Labs provide a coherent space for experimentation with the co-governance model of the Quadruple or Quintuple Helix [22]. This innovation model, implemented by the Amsterdam Pact in 2016, involves collective decision-making by at least five key actors: public and cognitive institutions, the private sector, civil society organizations or the third sector, and the unorganized public [23]. The latter refers to social innovators, creatives and other actors who wish to contribute and participate in local economic, cultural, and institutional development [24]. This alternative, open and multi-stakeholder governance

model promotes a balancing of public, private, and community interests, which becomes essential for addressing new urban challenges. It requires consideration of a multitude of aspects simultaneously while operating in a field of complexity [25].

The ULL thus acts as a forum for innovation and dialogue in urban environments. It addresses real challenges by bringing together various stakeholders and interests for mutual learning and knowledge exchange. It is designed as a model of innovation for urban areas and aims to create active citizenship communities that promote co-creativity and serve as micro-centralities capable of innovating and supporting existing centralities or activating new ones [26]. In this perspective, ULLs provide an innovative environment to preserve and regenerate cultural heritage in urban areas by actively involving local communities in developing their neighbourhoods. This involvement increases the sense of belonging to the cultural resources, landscape, and assets, and promotes positive social and cultural impacts, generating new multidimensional values. This research proposes an innovative methodology for conducting Urban Living Labs in contexts where cultural landscapes have multidimensional wasted resources, and need to be considered from a circular perspective, with particular attention to evaluation processes.

2.2 Circular Design, Values Chain, and Urban Living Labs

The effective implementation of Urban Living Labs processes necessitates a deep understanding of diverse stakeholders' values, interests, and motivations. Navigating the complexity of these processes requires forging new connections and identifying partnership opportunities among people, institutions, industries, resources, and information. Cooperation and collaboration are essential to achieve meaningful scale and impacts in the sustainable and circular economy perspective. The Ellen MacArthur Foundation (2023) emphasizes the systematic integration of design to achieve circular economy goals. Their adaptive strategy, informed by the experiences of various design leaders, identifies six key design leverage points (Fig. 1) that, when combined, create an environment for circular transformation. Aligning with circular economy principles, the circular design encourages interventions upstream, addressing root causes. Collaborative action involves bringing together resources to respond systematically to circular design challenges. Successful collaborative action brings together qualities, expertise, innovation, capabilities, and community to answer a circular design challenge, engaging systematically across a dynamic and evolutive value chain, considering that working together in the creation process increases the possibilities of optimising the value for everyone (Fig. 1).

Approaching ULLs from a circular economy perspective involves redefining the role of designers, influencing design briefs, addressing skills gaps, offering the ideal decision space to practice enabling tools, communicating the value of circular products and services, and fostering mutual learning opportunities. A cross-disciplinary ULLs approach [25] brings together formal and informal leaders with circular design knowledge to build innovation capacity in a synergistic and symbiotic way. It shifts away from siloed design functions and embeds design upstream in collaborative decision-making processes. Implementing a ULLs approach necessitates exploring new rules at every process level to accelerate change and incorporate shared values. Organizations benefit from translating circular economy principles into language, approach, and aspirations. Different actors can collaborate to co-create organizational design principles, influencing

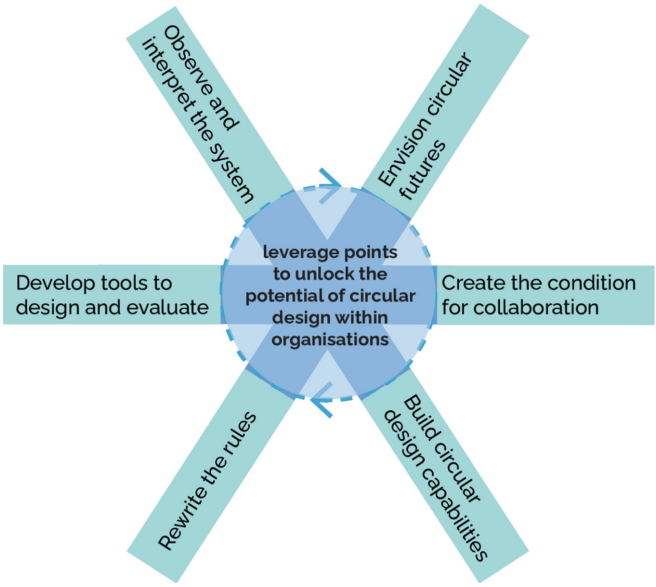

Fig. 1. Six design leverage points to unlock the potential of circular design within organisations (source: Ellen Macarthur Foundation, 2023, authors' elaboration)

governance, ownership models, and financing mechanisms for systemic change toward a circular economy regenerative by design.

3 Methodological Approach

3.1 Embedding a Social Multi-Criteria Evaluation in Urban Living Labs

ULLs' literature analysis shows that evaluation is not often addressed despite their process's focus on the recognition and co-production of multidimensional complex values. The MOVE21 research project [27] carried out an impact analysis framework for LLs, selecting three levels, which mark the methodological approach implemented so far: *Level* 1: Innovation enabling topics; *Level 2*: LLs procedures, to assess their processes, impacts and implementations, by a reflective monitoring guide designed to create a continuous loop of observations, reflections and actions to improve the operation of the LLs and the deployment of the innovations; *Level 3*: Impact-oriented result indicators, to assess the project results. In this perspective, a suitable adaptive evaluation approach [28] for LLs is required to include multi-dimensional and multi-actor perspectives, supporting the different steps of a collaborative decision-making process and improving the potential of an open innovation context. Social Multi-Criteria Evaluation (SMCE) has been characterized as highly pertinent for addressing the concept of a "sustainable economy" [29] and implementing "circular processes" with related feedback loops (Fig. 2).

Etxano & Villalba-Eguiluz [30] highlight three primary reasons for considering SMCE's relevance in the context of sustainability: it actively incorporates the principle

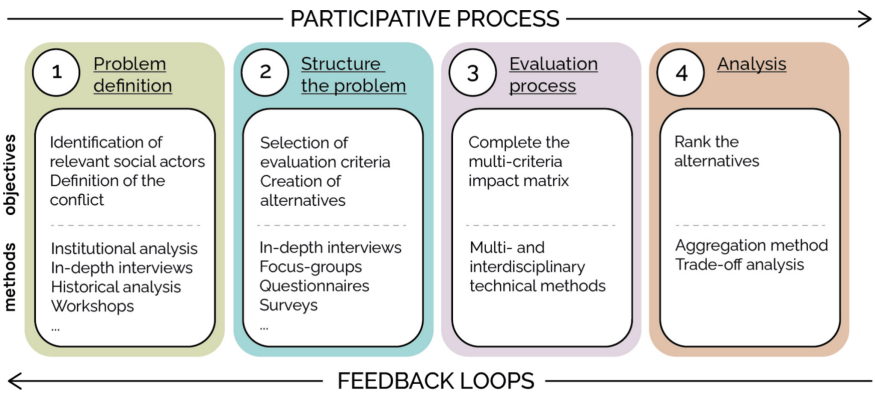

Fig. 2. SMCE process by steps. Adapted by Etxano & Villalba-Eguiluz [30].

of strong sustainability into the decision-making process, by including different criteria with both qualitative and qualitative metrics; it emphasizes participatory processes thanks to multi-group equity analysis; it seeks for compromise solutions. This last point is of particular significance, especially for ULLs, which involve negotiations between different ideas and points of view in compromise solutions. Traditionally, addressing equity concerns in Multi-Criteria Decision Analysis (MCDA) relied on adjusting criteria weights or introducing ethical evaluation criteria. NAIADE [31] has been the first method to implement SMCE, utilising an equity matrix for social evaluation. This analytical tool sheds light in the decision-making process, providing insights into where various stakeholders stand regarding each evaluation alternative. It also identifies groups that stand to benefit or lose the most. Consequently, conducting a conflict analysis through the equity matrix, it contributes to pursuing socially oriented compromise solutions. This approach presents a distinct advantage in decision-making processes. SOCRATES [32] is an evolution of the NAIADE method that implements the participatory approach using an open-source evaluation method in sustainability assessment for European policies. It can be considered suitable for ULLs and useful to support a Collaborative Decision-Making Process consistent with the circular economy perspective and oriented to build a community-driven enhancement of cultural heritage.

3.2 The Heritage Communities Urban Living Labs (HeCo-ULLs) Approach

The proposal aims to foster interaction between ULLs and cultural landscapes for supporting the building of Heritage Communities and consists of three main iterative phases (Fig. 3). Embedding the SOCRATES method into a ULL process involves integrating it into the various phases and stages to guide the lab's activities and enhance sustainability assessment and actors' cooperation means to identifies the main phases of a Collaborative Decision-Making Process able to implement circular economy principles for Heritage Communities building.

Therefore, the proposal of a Heritage Communities Urban Living Labs (HeCo-ULLs) approach has been articulated in the following phases:

Fig. 3. Phases and steps of the Heritage Community Urban Living Lab (HeCo-ULL) (authors' elaboration).

1. *Preparation phase: Stakeholder Engagement*: use SOCRATES to identify key sustainability indicators relevant to the stakeholders' concerns and actor main groups for the equity analysis. Collect baseline data on these indicators as part of the stakeholder engagement process; *Site Selection*: Evaluate potential living lab sites using SOCRATES criteria, considering factors like ecological impact, social cohesion, and economic development; *Resource Management*: apply the SOCRATES framework to assess the sustainability of funding sources and resource allocation for the ULL.
2. *Activation phase: Infrastructure Setup*: designing and constructing ULL facilities with sustainability principles, adhering to SOCRATES eco-efficiency and resource management indicators; *Data Collection and Documentation*: utilising SOCRATES as a structured framework for data collection, categorising data into economic, environmental, and social dimensions; *Community Involvement*: engaging the community in sustainability awareness campaigns and workshops based on SOCRATES principles. Encourage community members to participate in data collection and sustainability assessments; *Co-Design and Research:* collaborative design carried out by partners with academic institutions and researchers to make proposals and conduct studies on the places of the cultural landscape using SOCRATES criteria; *Evaluation:* implementing SOCRATES evaluation tools (impact assessment and equity analysis) to assess the sustainability performances of the ULL. Compare data with baseline measurements to track progress over time. Begin by incorporating sustainability goals and indicators from the SOCRATES framework into the lab's mission and objectives. At this stage, a selection of general objectives and meaningful indicators describing the environmental, social, economic, and cultural characteristics of the project/strategy goals must be identified, and a decision tree must be developed; *Heritage Preservation Initiatives*: applying SOCRATES to assess the sustainability impact of cultural heritage preservation efforts, considering economic, environmental, and social dimensions.
3. *Learning phase: Feedback Loops*: continuously gather feedback from stakeholders on sustainability-related issues, using SOCRATES as a framework for discussion and analysis of the different points of view; *Knowledge Sharing:* share sustainability findings and best practices with other communities and ULLs, emphasising using

SOCRATES for assessment and benchmarking; *Long-Term Sustainability:* develop a sustainability plan based on SOCRATES indicators to guide the ULL's long-term strategies and ensure ongoing assessment.

Depending on the case, the time frame available for the ULL may influence the different phases, the level of depth of work in each step, and the final outcomes of the Collaborative Decision-Making process. Therefore, it is essential to define the time and economic resources available in the first stage of the process.

4 Conclusions

The ULLs are dynamic spaces for cross-scale collaboration and sustainable urban development. They can support national-level objectives outlined in the Italian National Recovery and Resilience Plans (PNRRs) by providing platforms for innovation, stakeholder engagement, and sustainable urban development. Through experimentation and collaboration, ULLs enable the testing and implementation of innovative solutions to urban challenges, aligning with PNRR goals of fostering economic growth and resilience. By engaging diverse stakeholders in the co-creation process, ULLs ensure that PNRR objectives reflect local needs and priorities, enhancing the effectiveness of national strategies. Furthermore, ULLs contribute to capacity building, knowledge sharing, and evidence-based policymaking, supporting PNRR objectives related to building institutional capacity, promoting innovation ecosystems, and enhancing different form of governance structures. Despite the challenges of such processes, ULLs can be dynamic environments for translating national-level priorities into actionable strategies at the local level, driving inclusive and sustainable urban development.

Specifically, the implementation of ULLs can be considered a tool to implement the Sustainable Development Goal 11 (SDG 11), which aims to make cities and human settlements inclusive, safe, resilient, and sustainable. Literature shows that urban living labs serve as collaborative platforms engaging diverse stakeholders to co-create solutions for sustainable urban development, emphasizing the conservation and integration of cultural heritage into urban environment, thereby fostering inclusive and sustainable urbanization (SDG 11.3). By preserving and revitalizing historical sites, traditions, and innovative community practices, ULLs contribute to safeguarding cultural heritage and promoting cultural diversity, key components of sustainable cities (SDG 11.4). Additionally, they integrate landscape management strategies to enhance environmental quality and resilience, such as incorporating green spaces and sustainable land use practices, addressing aspects of SDG 11.7. Thus, through fostering innovation, knowledge sharing, and ensuring access to public spaces, these living labs further contribute to creating inclusive, safe, and accessible urban environments in alignment with SDG 11 objectives. Building mutual trust between actors and stakeholders can give the ULLs environment the characteristics of a place of knowledge and mutual learning, co-creation, co-design and co-evaluation. The circular HeCo ULL methodology presented in this paper bridges theory and practice, integrating local knowledge, a community-driven approach, and the Social Multi-Criteria Evaluation (SMCE) with the SOCRATES method for systematic cultural heritage diffusion and the heritage impact evaluation on the communities. It has a holistic approach by considering various dimensions of sustainability, including

environmental, social, and economic aspects, whose view is crucial to understanding the interdependencies between different components of the cultural landscape. Furthermore, the participatory nature of SOCRATES aligns well with the need for inclusive decision-making and co-creation of sustainable solutions and encourages cooperation between experts from various disciplines. This method incorporates scenario analysis, allowing for exploring different future scenarios and their implications. Indeed, ULLs often require scenario analysis and transdisciplinary research from collaboration between urban planners, social scientists, environmental experts, and more. SOCRATES facilitates such collaboration by providing a framework with an equity analysis and a transparent approach to exploring the actors' conflicts, adapting to different contexts and scales. ULLs vary widely in terms of their focus, size, and goals, and so SOCRATES can be tailored to suit the specific needs and characteristics of each decision context by combining both quantitative and qualitative knowledge. The SOCRATES method's participatory, flexible and adaptable nature makes it well-suited for ULLs, including three main phases (preparation, activation, and learning), emphasizing holistic development through heritage preservation, community engagement, and sustainability perspective, making operative a circular design process. Key elements embrace stakeholder engagement, the quintuple helix model, circular design, collaborative research, and a long-term sustainability plan. Adaptation on a case-by-case basis is crucial, with continuous commitment until the heritage community becomes autonomous. In perspective, the research aims to test the HeCo ULL methodology in a ULL activation for the cultural landscape in the Campi Flegrei area, in Naples, to support the building of a local heritage community.

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