From Silent Ruins to Resilient Cultural Landscapes.
Rethinking Heritage, Ecology, and Transformation in the Campi Flegrei case study

Marica Castigliano
Department of Architecture, Università degli Studi di Napoli "Federico II", Naples, Italy
marica.castigliano@unina.it
orcid.org/0000-0002-8867-0820

Anna Attademo
Department of Architecture, Università degli Studi di Napoli "Federico II", Naples, Italy
anna.attademo@unina.it
orcid.org/0000-0001-9247-0429

Maria Simioli
Department of Architecture, Università degli Studi di Napoli "Federico II", Naples, Italy
maria.simioli@unina.it
orcid.org/0009-0000-3955-9037

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The paper explores the interplay between cultural landscapes and ecological systems, by adopting resilience as a unifying concept that bridges the preservation of heritage with sustainable and adaptive urban and territorial transformations. This approach has been developed in the research project carried out by DiARC (UNINA) within the PNRR Extended Partnership n.5 – Spoke 1. The focus is on Campi Flegrei: a highly vulnerable area due to structural factors, given its volcanic

1. Introduction

The European Union's commitment to achieving climate neutrality by 2050 represents one of the most ambitious environmental undertakings in contemporary policymaking. This transition, outlined in the European Green Deal (EC, 2019), requires comprehensive strategies that extend beyond conventional environmental protection to encompass the complex interplay between cultural heritage, ecological systems, and urban transformation. This multifaceted challenge becomes particularly crucial in historically and environmentally relevant territories, where the imperative for sustainable development must be reconciled with the preservation of irreplaceable cultural assets (Rodwell, 2007).

In this regard, the intersection of cultural landscapes and resilience thinking represents an emerging and critical frontier in contemporary heritage and urban planning studies, addressing fundamental questions about how we manage uncertainty and guide adaptive transforma-

nature, and the extractive use of resources where widespread historical assets and archaeological ruins emerge within the settlement fabric, often difficult to access, constantly exposed to risks, and experiencing degradation and abandonment. The research explores the interdependence between ecological-environmental values, history, communities, and ordinary landscapes through mapping activities and photographic campaigns for the activation of heritage communities as a factor of resilience. This allows the study to reveal place-specific resilience with the aim of developing strategies that shift the role of historical traces within the city - from static objects and barriers to contemporary transformation, to catalysts of resilient change.

tion in historically significant areas. In fact, while landscapes are widely recognized as living and perpetually evolving entities (Antrop, 2005; Russo et al., 2023), the scientific discourse on the relationship between cultural landscape and resilience has only recently gained prominence (Aimar, 2024; Aktürk and Dastgerdi, 2021). A significant gap emerges in current heritage management practices, which tend to prioritize the preservation of static conditions to ensure the continuity of values, thereby creating a fundamental misalignment with the inherently dynamic nature of environmental challenges and social transformations (Crowley et al., 2022; Harvey and Perry, 2015; ICOMOS, 2019). Nevertheless, the recognition of "cultural landscapes" as comprising not only monumental heritage but also stratified urban fabrics, traditional settlements, and culturally modified natural environments (Council of Europe, 2000) requires focusing on sustainable development as a key aspect for balancing economic, social, and environmental capital in heritage contexts, as also stated by the European Framework for Action on Cultural Heritage (EC, 2018).

The regulatory landscape supporting this transition includes multiple interconnected frameworks. The European Landscape Convention (Council of Europe, 2000) established the foundational understanding of "landscape" as territory perceived by populations, shaped by natural and human factors. This was further reinforced by Agenda 21 for Culture (UCLG, 2004) and subsequently integrated into the UN Sustainable Development Goals, particularly Target 11.4, which addresses the protection of cultural and natural heritage. These frameworks collectively acknowledge that the preservation of cultural landscapes cannot be separated from broader ecological and social sustainability objectives. The concept of resilience, when applied to cultural landscapes, enables the understanding of underlying dy-

namics that drive change while promoting the recognition of landscapes as processes rather than fixed entities. In this sense, this contribution argues that within a resilient framework, historical traces should be reinterpreted not as "silent ruins", mere vestiges of the past, but as active agents within processes of transformation. The material and symbolic persistence of stratified fabrics – where archaeological ruins may be difficult to access and where the local communities may struggle to recognize themselves due to the perception of degradation and abandonment[1] – offers the ground for adaptive strategies that combine continuity and change. This perspective aligns with urban ecology principles, which emphasize the importance of investigating multiple relationships, such as those between historical-archaeological heritage and territorial contexts, as essential for managing cities' transition toward more resilient and inclusive settlement models (Alberti, 2008; Pickett et al., 2013). In this regard, resilience provides a lens for identifying gradients of landscape modification where culture and nature must be considered simultaneously, in coherence with the current cultural context of the Anthropocene (Crutzen and Stoermer, 2000), acknowledging that human impact on natural systems has reached unprecedented scales. Nevertheless, there is insufficient understanding of how resilience intersects with landscape and operates within it, particularly concerning its dual implications of adaptation and identity (Davidson et al., 2016; Stephenson, 2008) and the related acceptable boundaries between persistence and change (Antrop, 2005). In fact, the UNESCO-required systemic robustness and effective management of dynamic transformations imply that planning decisions intervene at different scales through adequate policies and tools, however, this process still has limited practical testing and remains conceptual (Ripp et al., 2024).

While UNESCO's definition of cultural landscapes as "combined works of nature and man" provides important foundation (1992), this research adopts a broader interpretation originally introduced by geographer Carl Sauer, who defined cultural landscape as landscape shaped by human cultural groups from natural landscape (Sauer, 1925). This expanded definition extends beyond UNESCO's focus on "universal exceptional value" to encompass "ordinary" landscape – territories not necessarily distinguished by exceptional scenic or historical-environmental values, but rather by stratification of human uses and transformations. This reconceptualization recognizes that cultural landscapes represent expressions of community culture, ways of life, and relationships with surrounding environments, carrying cultural meanings and values that extend far beyond monumental heritage. Such landscapes include public heritage, reserves of natural resources, and local communities

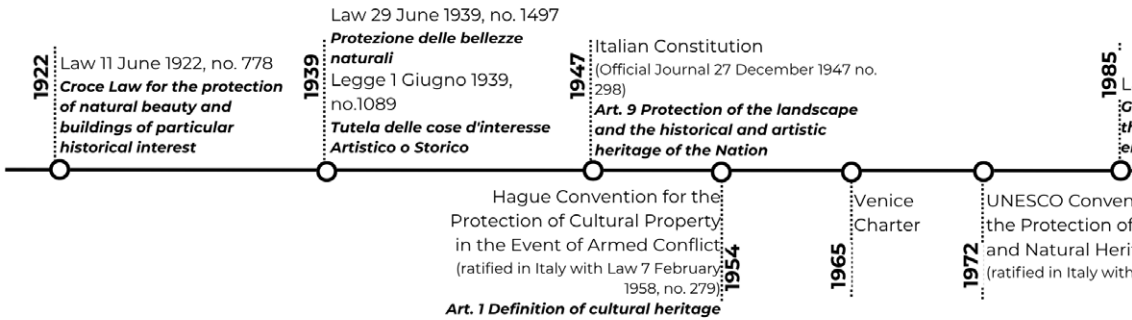
as integral components of territorial identity (Plieninger and Bieling, 2012). Following Folke and colleagues (2006), this paper builds on the premises that, by interpreting local knowledge – both tangible and intangible cultural heritage, traditional know-how, land use practices, construction technologies, etc.– it becomes possible to uncover place-specific resilience comprising both spatial and social dimensions. This approach acknowledges the fundamental connection between cultural aspects and sustainable development, recognizing that both cultural and ecological issues share communal and plural dimensions, as well as conditions of fragility where threats of irreversible loss of finite resources require collective attention and action (UNESCO, 2013).

Although scientific and policy realms widely acknowledge these considerations, there is a limited understanding of how resilience, when applied to cultural landscapes, can move beyond conceptual abstraction to inform planning practices and urban policies (Davoudi, 2012). While existing scholarship recognizes the interdependence between cultural and ecological dimensions and the importance of adaptive and participatory approaches (Berkes and Ross, 2012; Walker et al., 2006), methodological pathways capable of translating these principles into effective territorial instruments are still underdeveloped. Few studies explore how resilience can serve as an interpretative and operational lens for understanding landscapes as evolving socio-ecological systems, where cultural identity, environmental adaptation, and collective action converge in shaping more sustainable cities (Vale, 2014). Moreover, recent critiques highlight how resilience discourse, when detached from social justice concerns, risks legitimizing neoliberal approaches to urban governance and reducing communities to self-managing units (MacKinnon and Derickson, 2013).

In order to embrace these challenges, this study addresses the following research question: How does the concept of resilience, when applied to cultural landscapes, support their recognition as dynamic processes, and what role does this socio-ecological perspective play in managing urban transition toward more inclusive settlement models?

Through a comprehensive approach, the research aims to demonstrate how "silent" archaeological ruins and historical landscapes can shift from being perceived as passive, residual urban fragments and barriers to contemporary transformation into catalysts of resilient change, fostering new evolutionary trajectories for territorial development.

To contribute to this wide research topic, the study develops a methodological approach that focuses on understanding territorial transformation processes going beyond a single analytical lens. Through the development of community engagement environments in a case study, the research provides knowl-

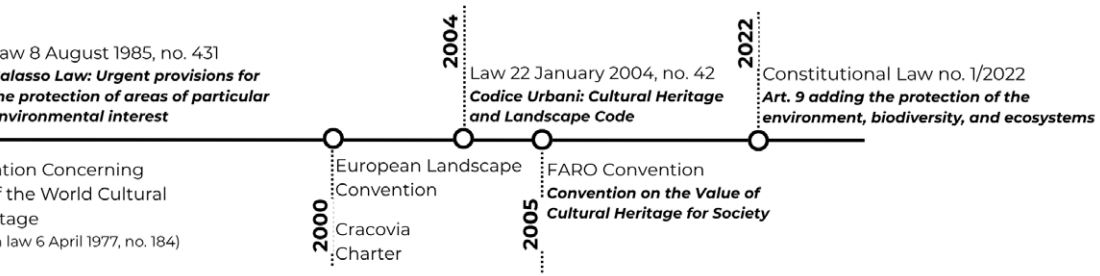


Legislative Framework.

Source: Architectural Sciences Bachelor Thesis Dissertation, entitled "Enhancement strategies between archeology and peri-urban landscapes. The case study of Baias cultural heritage". Student: A. Vigoriti. Supervisor: A. Attademo, Co-Supervisor: M. Simioli. Academic Year: 2024/2025
Fig. 1

edge on how to overcome the building of limited and sectorial knowledge and suggest tools to achieve a strategic integration of quantitative analysis – to measure patterns –, qualitative interpretation – to decode meanings and relations –, and experiential awareness – to capture embodied knowledge and situated perspectives. This approach leads to building sustainable trajectories and scenarios, even though the definition of resilient territorial transformations lies beyond the scope of the data and materials hereby reported.

The paper explores the interplay between cultural landscapes and ecological systems, by adopting resilience as a unifying concept that bridges the preservation of heritage with sustainable and adaptive urban and territorial transformations within the framework of the research project "Strategies4CHANGES - Strategies of interventions on historical landscapes" led by DiARC as part of the Spoke 1 "Historical Landscapes, Traditions and Cultural Identities", in the PNRR Extended Partnership no.5 "CHANGES - Cultural Heritage Active Innovation for Nex-Gen Sustainable Society"[2]. The research focuses on a specific cultural landscape in Campania Region: the Campi Flegrei, representing a highly vulnerable area due to structural factors, given its volcanic nature, and the extractive use of resources. By introducing this territory, this paper highlights the methodological interplay between theoretical principles and spatial analysis. Following this section, the paper examines the conceptual framework linking the concepts of cultural landscapes and resilience (Ch. 2), analyzes the methodology to operationalize the conceptual framework (Ch. 3), presents the outputs of the methodological application to the case study (Ch. 4) and discusses the implications for developing strategies focused on enhancing ecological and archeological networks (Ch. 5). The concluding section (Ch. 6) outlines future research directions and the potential for scaling these approaches to other vulnerable cultural landscapes facing similar challenges.



2. Theoretical Background. Cultural Landscape Resilience: a reconceptualization from local to global

The theoretical framework is developed in relation to the recent reconceptualization of landscape's role as a device that intersects protection regulations with the valorization of an increasing number of identity features defining the territories we inhabit (Council of Europe, 2000). In this sense, we start with a specific focus that reinterprets regulatory evolution as a dynamic process of aligning the scope of planning tools with contemporary conceptualizations. This is where the tradition of "landscape" (landschaft), rooted in ecology, is seen as a systemic and relational science, capable of a complex reading of the relationships between inhabitants and local contexts (Magnaghi, 2020). Therefore, this section is divided into two subsections, respectively focusing on the evolution of the fundamental concepts of landscape and cultural heritage, then to understand their conjugation in terms of cultural landscapes, as socio-ecological systems where resilience plays a role not just in the capacity to absorb disturbances and reorganize (Walker et al. 2004), but more in the proactive ability to adapt and co-evolve with nature through dynamic processes (Folke, 2006). In this perspective, resilience is explored as a bridging concept that connects cultural values, ecological adaptation, and governance practices, offering a framework to interpret landscape as a socio-spatial dimension with an evolving and relational capacity that intersects culture and ecology.

2.1 The notion of cultural landscape in the Italian legislation

The landscape is a structural dimension of our territories (Poli, 2012; Magnaghi, 2012; 2016; Marson, 2016), aligning with a heritage-based perspective of these areas (Magnaghi, 2012). Its contemporary forms are not just the backdrop of ongoing transformations, but dynamic spaces in evolution, shaped by flows, even if

they are recognizable and classifiable through specific components and relationships (Forman, 1995; 2008). For this reason, an effort to understand its characteristics and invariant rules requires an integrated approach of reading . The landscape is thereby understood simultaneously as a milieu, a complex of cultural values, and a regulatory context within which territorial and urban planning processes are carried out. (Attademo et al., 2022).

In the legislative framework, the concept of "cultural heritage" and "landscape" have evolved significantly over time (Fig. 1).

With a specific focus on Italy, the analysis of the evolution of the legislative framework can start from the Croce Law of 1922 which marked a turning point in Italian environmental law by establishing protections for natural beauty and historically significant sites, with the aim to stop unjustified destruction and to valorize natural and artistic treasures. Later, the Laws n. 1497 and 1089 of 1939 further defined landscape as composed of "things" and "places," focusing on aesthetic-perceptual values—places distinguished by their beauty and exceptional qualities – listed and protected by the state through cultural and environmental authorities. It is worth noting that these initial laws exclusively considered outstanding natural beauty and monumental assets as worthy of protection. A first relevant turning point should be considered the Italian Constitution's Article 9, which emphasized that the Republic promotes cultural development, scientific research, and safeguards the landscape, historical, and artistic patrimony. This statement refers to the landscape as not merely a territorial feature, but a primary and absolute good of the nation.

In the same years, after the definition of Article 1 of the Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict (ratified in Italy with the Law 7 February 1958, no. 279), the concept of cultural heritage was formalized in the 1964 Venice Charter, which recognized that monuments include not only individual architectural works but also urban landscapes with artistic, historical, or cultural significance. The UNESCO 1972 Convention (ratified in Italy with law 6 April 1977, n. 184) expanded this understanding globally, including monuments, sites, and ensembles of universal value, with an update in 2003 adding the "intangible heritage".

Subsequently, forty years after the first acts in this matter, the legislative framework started to be updated, thanks to legislative provisions promoted by Giuseppe Galasso (culminating in Law No. 431 of August 8, 1985). connecting aesthetics with ecological value and establishing the development of landscape planning, integrating protection with sustainability and territorial design.

As presented in the Introduction, in recent decades, especially following the European Landscape Convention of 2000 (in Italy ratified with

the Law n. 14/2006) and the ICOMOS Cracovia Charter for restoration (2000), landscape has then been interpreted as a part of territory as perceived by communities, shaped by natural and cultural factors and their interactions. This perspective emphasizes that landscape is not only environmental but also a product of human activity and perception, highlighting the importance of community involvement in its preservation. This opens to a strong connection between landscape and inner resilience of communities, as mutually advantageous and self-perpetuating throughout history (Aimar, 2024). The European Convention also marked a shift in the conceptual approach: landscape is considered a "common good", and its protection involves social participation. It recognizes that even degraded or everyday landscapes are valuable and deserving of safeguarding, between degraded and extraordinary landscapes, including all the intermediate zones, in a dynamic process of redefining identity landscapes—an approach aligned with what was once outlined by the European Landscape Convention.

Following the Convention, in Italy the Legislative Decree No. 42 of 2004 (the Urbani Code) defines landscape as the expressive territory of identity, shaped by natural and human factors. Its protection aims to preserve and recover cultural values expressed through its patterns, which serve as material and visible representations of national identity. The same code defines cultural heritage as a collection of assets of historical, cultural, and aesthetic importance that constitute the wealth of a place and its people. Cultural Heritage becomes the linking component between cultural and landscape elements, such as sites, customs, and traditions, reflecting societal identity. Coherently, the Faro Convention of 2005 (in Italy ratified with the Law n. 133/2020), emphasizes the societal value of cultural heritage, recognizing it as an inheritance that communities identify with, regardless of ownership. It promotes accessibility and community involvement, through the concept of "Heritage Community", i.e. the people who take public action to support and transmit specific aspects of cultural heritage (Article 2b).

Historically, landscape protection was narrowly defined by the laws of 1939, focusing only on "exceptional beauty." This narrow view was only partially superseded in 1985 with the Galasso Law (No. 431), but the real shift belongs to recent years with the ratification of said Convention on landscape and cultural heritage and when the Italian Constitution's original mandate to protect the landscape and historical heritage (Article 9), was expanded to include the environment, biodiversity, and ecosystems for the interest of future generations (Constitutional Law n. 1/2022). These amendments, along with changes to Article 41 that restrict economic activity detrimental to the environment, solidify a constitutional vision

that, if fully implemented, could mean a major shift toward limiting resource consumption and promoting non-extractive valorization processes (Maddalena, 2020).

The current Italian legislative framework has evolved aligning with a contemporary view of landscape. This modern understanding moves beyond the traditional, purely aesthetic perspective (still rooted for example in the 1922 and 1939 laws) to define landscape as a systemic field of interrelations and dynamic interactions. This shift draws upon the Anglo-American and German tradition of the "landschaft" (Formato, 2022), connected to ecology which can use it to orient the coexistence of natural ecosystems and urban habitats.

2.2 Resilience at the Crossroads of Cultural Heritage and Socio-Ecological Systems

2.2.1 Landscape resilience interpreted as adaptive condition

The widely used concept of resilience offers a crucial theoretical framework to reconceptualize the relationship between cultural heritage and ecological sustainability (Jones, 2022). In fact, through the dynamic lens of resilience, historical landscapes can be challenged in the face of anthropogenic and natural risks by considering and developing their potential for change. This perspective fundamentally contrasts with traditional preservation approaches that treat heritage sites as isolated entities to be protected from changing contexts, by instead embracing the adaptive capacity of complex socio-ecological systems (Walker et al., 2004). The integration of resilience thinking with heritage discourses considers how cultural and ecological systems co-evolve through processes of adaptation, transformation, and reorganization (Folke, 2006). This theoretical foundation has been further developed within political ecology frameworks, where landscapes emerge as contested terrains where power relations, environmental processes, and cultural practices intersect, revealing the inherently political nature of heritage-environment relationships (Robbins, 2012). In this context, ecological values become essential to address the potential of the relationship between resilience and heritage in the face of the political pitfalls of resilience. In fact, while it offers a framework to understand cultural landscapes as evolving systems, recent critiques caution against its instrumentalization as a depoliticized, technocratic narrative that can obscure questions of value, agency, and justice (Zhu and González Martínez, 2022). The process of patrimonialization, whereby certain landscapes are recognized as heritage sites, can inadvertently prioritize elite-driven economic interests over community needs, transforming resilience into a tool for speculative development rather than a means to foster community-led adaptation (Salemme and Horlent, 2018).

Considering the evolution of the cultural landscape concept and resilience approaches, landscape resilience (Schmidt, 2022) is crucial for understanding how human-shaped environments can maintain their historical and identity values while adapting to inclusive changing conditions. Following Schmidt's distinction between "given resilience" – the initial natural conditions of a landscape – and "acquired resilience" – the product of society's interaction with those conditions – cultural practices and heritage formation processes emerge as key drivers in redefining resilience itself. In this view, resilience is not an external element but an intrinsic condition of landscapes arising from their stratified nature and from the dynamic coexistence of heterogeneous elements that allow continuity through transformation. The given resilience framework is therefore essential for understanding the adaptive capacity of cultural landscapes over time where complex systems are made of natural baseline conditions that interact with urbanization processes, cultural practices, and heritage recognition.

Understanding that landscapes are living systems in constant transformation, the concepts of permanence, identity, and memory become integral to landscape planning, alongside change and evolution. This implies a direct correlation between preserving cultural identity and adaptive capacity – extending beyond single monuments to encompass whole territorial systems. In this perspective, Carl O. Sauer's (1925) foundational idea – that cultural landscapes are the result of human groups acting on natural environments over time – is extended to include the dynamic capacity for adaptation and transformation.

The convergence between landscape resilience and cultural landscape theory is especially apparent in Wu's (2010) argument that culture and nature must be understood simultaneously to improve the relationship between spatial patterns and ecological processes. This aligns with the evolution of the UNESCO Convention, which has shifted from protecting sites of "outstanding universal value" toward recognizing cultural landscapes as integrated systems. This integration requires acknowledging that, in living landscapes, permanence and identity demand the introduction of co-evolutionary resilience concepts in planning: an urgency highlighted by the lack of adaptability found in many UNESCO Cultural Landscape Management Plans, which often overlook these values in the face of new environmental and social challenges (Aimar, 2019). In architectural and urban planning discourse, this theoretical convergence has been operationalized through what Davoudi and colleagues (2012) and Meerow and colleagues (2016) define resilience thinking: an approach that transcends sectoral boundaries and enables integrated strategies addressing heritage conservation, climate adaptation, and social

Overview of Key Literature on Landscape, Resilience, and their intersection

Tab. 1

equity. Contemporary cultural landscape management increasingly focuses on strengthening landscapes' ability to cope with stress and environmental change. This resilience is supported by key system characteristics such as diversity, redundancy (the presence of multiple elements performing similar functions), network connectivity, modularity (the ability to isolate disturbances), and adaptability over time. In this way, both the natural foundation and the cultural layer of a landscape contribute to its overall resilience through their ongoing interaction and mutual reinforcement (Ahern, 2011; Beagan and Dolan, 2015).

This integrated approach is particularly critical in risk-prone areas, where volcanic, seismic, and human-induced hazards converge. In such areas, comprehensive strategies are needed to treat the entire cultural landscape as an interconnected system of heritage, ecology, and community agency. In recent decades, the resilience approach has progressively expanded from the purely ecological field to the systematization of social, economic, and interconnected socio-ecological field (Pu and Qiu, 2016; Brand and Jax, 2007; Folke, 2006). This refers to the definition of resilience as socio-ecological resilience (Folke, 2016), deepening the influences between resilience and urban and political ecology (Adger, 2000; Peterson, 2000). Thus, "resilient" is an adjective corresponding to the inner characters in which places are organized, shaped, and managed by society (Schippers et al., 2015).

This perspective is especially relevant in contexts like the Campi Flegrei, where scattered archaeological remains, degraded natural habitats, and vulnerable communities coexist within complex, risk-laden landscapes. These contexts require adaptive co-management, meaninga collaborative governance framework that merges local knowledge with technical expertise (Fabbricatti et al., 2020). The landscape resilience framework enables a radical re-conception of heritage sites as embedded within broader territorial systems, paving the way for planning strategies capable of regeneration:strengthening existing cultural identity assets and fostering collective adaptive capacity.

2.2.2 A socio-ecological resilience: a concept between culture and ecology

The conceptualization of a resilient social–ecological system matches the definition of cultural landscape as first introduced by German geography school as in the work of Carl Ritter (1818), and then more broadly by Carl Sauer, as the landscape shaped from a natural environment by a cultural group (Sauer, 1925), in a dynamic, reciprocal relationship between a community and its land.

In the above-mentioned evolution of concepts, the structural dimension of cultural landscapes continuously interacts with physical and relational changes, across diverse and

Area of Literature	Core Focus	Key Concepts	Basic References
I. Foundational Landscape Studies	The cultural, ecological, and perceptual character of place; the structure of the human-shaped environment.	Landscape Ecology, Cultural Landscape, Perception, Planning, Heritage	Sauer (1925), Tuan (1977), Antrop (2005), European Landscape Convention (2000), Forman (1995, 2008), Magnaghi (2012, 2016), Corner (1999, 2006)
II. Foundational Resilience Studies	The capacity of socio-ecological systems to cope with disturbance and maintain function; adaptability and transformation.	Ecological Resilience, Adaptability, Transformability	Adger (2000), Folke (2006, 2010, 2016), Walker et al. (2004), Walker & Salt (2006), Peterson (2000), Brand & Jax (2007), Davoudi et al. (2012)
III. The Intersection (Landscape Resilience)	How the spatial structure and cultural identity of a place enable adaptive planning and management.	Identity, Resilient Cultural Landscape, Planning Integration, Socio-Ecological Resilience, Heritage Community	Ahern (2011), Plieninger & Bieling (2012), Opdam et al. (2013), Schmidt (2022), Aimar (2019, 2024), Aktürk & Dastgerdi (2021), Beagan & Dolan (2015), FARO Convention (2005)

broadly multiscale temporal perspectives, in a symbiotic connection among societies and nature (Folke, 2006). These are spatialized within an integrated infrastructure of landscape assets and inhabited territories. Cultural landscapes are places in the meaning of Geddes's triadic "places, work, folk", as the integration of people and their livelihood into the environment as the shaping factors of inhabited regions. In this perspective, researchers have interpreted ecology as the key to interpreting and addressing the balance of culture and nature within the landscape itself (Waldheim, 2006). This is especially true with regards to community activism in ecological matters, raising the importance of awareness and education in landscape design, as complementary to addressing contemporary challenges like climate change (Orff, 2016).

Then, landscape design often follows this interpretation focused on new ways of inhabiting the risk, coexisting in resilient communities able to reconnect themselves with the natural environment by establishing mutual and adaptive strategies (Corner, 2006).

The ways in which landscape is described and represented show a systematic reciprocal relationship between knowledge and intervention. Specifically, the most innovative cognitive strategies and design approaches unite in defining a plural, multi-dimensional concept of landscape that gives form to the various components of the evolving territory. As a planning tool, landscape plans are designed to balance conservation with the regeneration of compromised or at-risk areas, ensuring development aligns with recognized landscape values, especially in rural and UNESCO World Heritage sites. The efforts to gain knowledge also addressed the fragile components, which face high exposure to contemporary risks, where the balance between human action and territorial vulnerability is lost, endangering collective habitability and sustainable transformation, dramatically expanding social inequality.

These plans aim to shape the structural di-

Definition of key concepts

Fig. 2

mension of inhabited areas, preserving their characteristics and key elements – even at interfaces of the most degraded zones – while also outlining development paths and opportunities for enhancement connected to territorial cultures and ecologies. These perspectives on fragile, vulnerable, and at-risk landscapes can work to reinforce resilient communities, re-interpreting the fragility of these landscapes, not through a prohibitive regulatory approach, but as a driver of development processes. These processes center on local resources, fully recognized by inhabitants, citizens, and local stakeholders.

While global agendas focus on technical efficiency and resilience, often neglecting the everyday lived experiences of the city, alternative practices of inhabiting and shaping space develop, creating novel ecosystems (Marris et al., 2013) that operate in informal, community-based ways (Formato and Attademo, 2025). This shift highlights how components from natural and human processes are increasingly blending, making the boundary between nature and culture more difficult to clearly define, but as a clear sign of co-evolutionary connection in the meantime (Keitumetse, 2017; Crane, 2010).

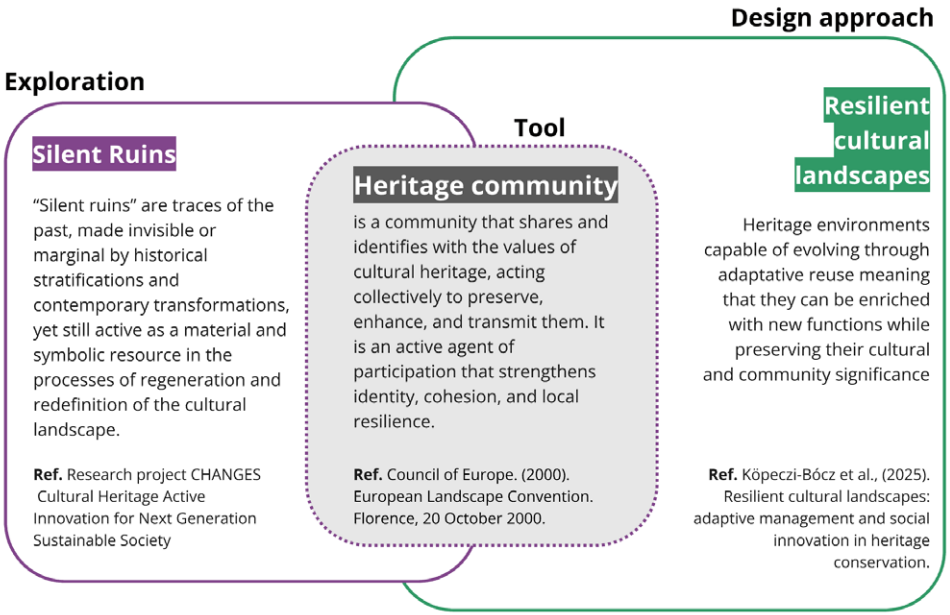
Therefore, this connection refers to socio-ecological systems that encompass intricate adaptive, multi-level networks of spaces, and the continuous flow of people and resources both within and across systems (Wu, 2013; Viganò, 2013). These multi-dimensional environments incorporate identity components, such as cultural heritage, historical and natural reminiscences, and all places systematically organized within a cohesive territorial framework, acknowledged by communities as symbols of their unique local character and as starting point for community-based valorization. In this context, they almost serve as an "archaeological record", a *resilience*-artifact that proves the combined preservation of the historical and environmental heritage.

Nevertheless, Plieninger and Bieling observe that the terms "landscape" or "cultural landscapes" as coupled to resilience have rarely been employed within the resilient-thinking scientific community (2012): a combined (cultural) landscape and resilience approach should then enhance the understanding of land change processes, emphasizing social values and ecosystem services, while recognizing spatial drivers that can help protect cultural landscapes and promote biodiversity alongside agricultural and forest productivity. An integrated approach can guide effective landscape planning, addressing human–nature coupling at the appropriate scale.

3. Methodology

3.1 Research approach

In light of the aim to demonstrate that resilience can serve as a concept encompassing a



socio-ecological perspective on cultural landscape – capable of enhancing historical heritage even in at-risk contexts – the methodology framed by this study focuses on the development of a Living Lab as both a field and an operational instrument for fostering Resilient Cultural Landscapes meaning acknowledging the contributions of communities and local ecologies as key territorial resources for adaptive transformations (Köpeczi-Bócz et al., 2025 n Fig. 2). The research study assumes that cultural heritage is not only an asset to be preserved, but an engine of resilience that acts through the participation of communities, making them more ready, cohesive and capable of facing crises and imagining sustainable futures. The "building" of heritage communities (Bulley, 2013) as complex configurations that activate forms of resilience on local, global and inter-local scales is not just an end goal, but an ongoing process of learning and adapting to change (Cutter et al., 2008). However, only recently have cultural and social factors linked to heritage become prominent in discussions of resilience, highlighting the importance of building resilience at the community level (Jigyasu, 2013). From this perspective, this study integrates the concepts of Urban Living Labs, cultural landscapes, and territorial resilience in the definition of a Heritage Communities Urban Living Lab (HeCo-ULL), as an operational and research methodology capable of fostering more resilient cultural landscapes through the development of communities that are more aware, heterogeneous, integrated, adaptive, and self-regulating (Rodin, 2014). From the perspectives of possible impacts on the institutional and planning level, new territorial arenas could benefit from expanding place-based, multi-level and cross-domain connections allowing for proactive coalitions and fertile collaborative actions

Methodological Scheme
Source:
Fig. 3

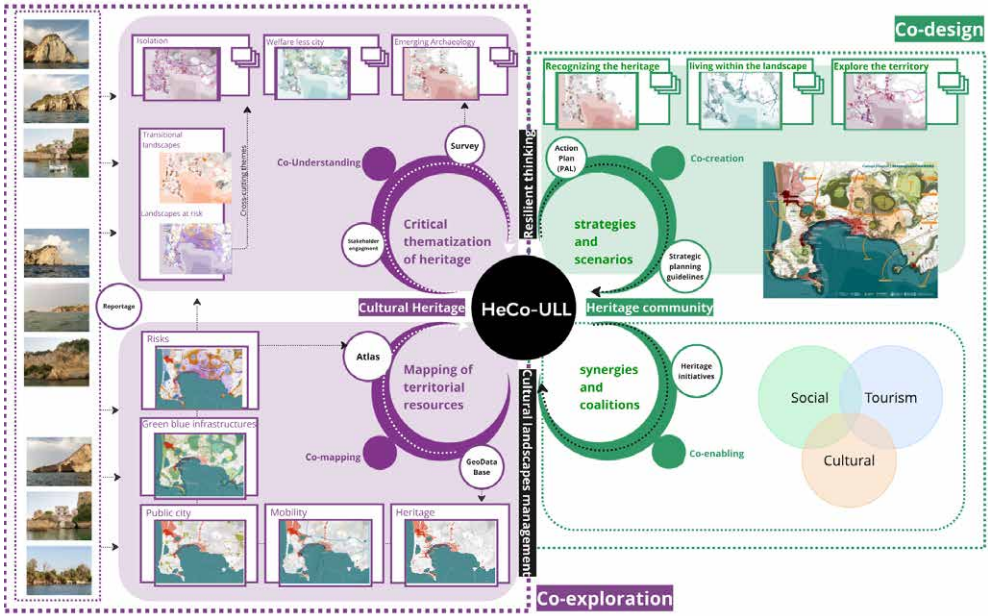
(Wolfram et al., 2019). The contribution examines the case study of the Campi Flegrei, developed within the framework of this research "Strategies4CHANGES" research project conducted by the Unina team as part of Spoke 1 – WP4, the proposed methodology establishes a Heritage Communities Urban Living Lab (HeCo-ULL): a user-driven environment of actual end-users with common goals, and various competences (Innovation Alcotra, 2013) that acknowledges complex and multidimensional values through co-creation, aiming to generate new locally rooted values (Evans et al., 2017). Recent experiences of Living Labs applied to cultural contexts demonstrate that this methodology is frequently used to support the creative reuse of cultural heritage in virtual environments (Llamas et al., 2025), for the adaptive reuse of buildings in real-world contexts (Fava, 2024), and as a tool to promote participation in decision-making processes (Thees et al., 2020).) also considering its challenges such as inclusiveness (Laborgne et al., 2021) and the effective capacity to inform urban transformations (Wolfram et al., 2019)

The HeCo-ULL methodology introduces an innovative approach by applying systemic thinking to widespread heritage rather than focusing on isolated sites, and by building a permanent community of stakeholders and citizens that continues to interact even beyond the conclusion of the project. This enables a co-evolutionary perspective (van Knippenberg, 2022), attentive to adaptability, flexibility, and the complexity arising from the diversity of community perspectives on heritage. Such a perspective allows for moving beyond the traditional goal- and process-oriented approach (Pace, 2021), favoring instead a practice-based approach in which Living Labs act as catalysts for changes in behaviors and values, fostering interaction between local communities, global heritage communities, and other disciplines through knowledge production.

In particular, Heritage Communities Urban Living Labs can play a crucial role in preserving the relevance of cultural landscapes within rapidly transforming urban environments. They serve as mediators between tradition and innovation, fostering community engagement and contributing to the sustainability and vitality of cities through the safeguarding and enhancement of cultural heritage and its inherent values (Fig. 3).

The HeCo-ULL methodology is structuredintostructured into tasks that also outline the interaction among the different disciplines involved in the research group. Specifically, a distinction can be made between tasks aimed at co-producing knowledge (co-exploring phase) and those focused on co-designing scenarios for adaptation (co-design phase).

The phases structuring the HeCO-ULL methodology are aimed at building and strengthening community resilience, understood as the



capacity of a collective to recognize and enhance its strengths and available resources, while also identifying weaknesses, vulnerabilities, threats, and risks that affect its stability.

The methodology is grounded in situational awareness, enabling the community to critically interpret the context in which it operates. The co-exploring phase constitutes a preliminary stage of critical reconnaissance through the collection, analysis, and correlation of data sources – spatial data and photos – with the aim of developing a nuanced interpretation of territorial and urban evolution.

These data are developed in interpretative and thematic mappings, aimed at integrating the knowledge dimension with processes of shared reading and thematic framing of territorial values.

The research adopts a quantitative approach, developed within a GIS environment, and a multiscale perspective that draws on hard data (open-access databases) and soft data – collected through photographic surveys and fieldwork – for the creation of analytical-interpretive maps. These maps, together with the photographic campaign, can convey the complexity of the landscape according to a relational logic at the territorial scale. Critical mapping becomes an essential tool for understanding the territory, and bridge to light hidden values and heritage.

The co-design phase is grounded in situational awareness, that promotes integration and coordination among functions, actors, and systems, fostering a systemic approach capable of generating operational synergies. Finally, the resilience pursued through HeCO-ULL is adaptive in nature: the community is able to evolve in response to changing circumstances by developing new strategies, actions, and behaviors within a dynamic process of learning and transformation.

Terme di Baia.
Source: authors
Fig. 4

3.2 Case Study: Campi Flegrei

The Campi Flegrei represent a territory of inestimable value, shaped over centuries by the interplay between its natural composition and human activity. The history of this area, strategically situated in the Gulf of Naples, is intertwined with episodes of colonization and urban development, as well as a profoundly unstable natural environment punctuated by the numerous archaeological remains scattered throughout the area, including Roman ports, the thermal buildings of Baia, and tunnels and cisterns carved into the tuff. Over the centuries, alternating phases of agricultural development, industrialization, and abandonment have left material and immaterial traces that continue to shape the territory's identity today (Di Liello, 2022). Uncontrolled urban growth in protected and high-risk areas has damaged the landscape, effectively reducing the region's attractiveness (Fralicciardi et al., 2013).

Volcanic activity and bradyseism continue to influence the coastal morphology and settlements, creating a permanent risk condition that coexists with extremely high demographic pressure: over 400,000 inhabitants within an area of approximately 130 km².

Despite these difficulties, Campi Flegrei preserves a cultural and environmental heritage of extraordinary value. The establishment of the Campi Flegrei Archaeological Park has enabled the protection and enhancement of a network of archaeological sites. Alongside the major sites, numerous smaller cultural assets – such as villas, necropolises, and Roman infrastructures – are widespread but often lack adequate conservation and fruition strategies. These smaller sites exist within a complex system of stratifications and overlaps among different historical layers, frequently embedded within modern and contemporary ones, sometimes of illicit origin, rendering the historical-archaeological heritage at times "invisible," and "silent" (Fig. 4) meaning poorly accessible, and thus insufficiently valorized within cultural, touristic, and economic promotion circuits (Miano et al., 2016). The natural landscape is distinguished by unique environments, including volcanic lakes, craters, and nature reserves, which the Campi Flegrei Regional Park and other protected areas, such as the Monte Nuovo Oasis and the Astroni Nature Reserve, protect. These elements represent a potential resource for a development model that recognizes landscape conservation and the regeneration of widespread heritage as an opportunity for territorial revitalization.

Investigating the relationship between historical-archaeological heritage and the territorial context, also in alignment with the principles of urban ecology, is therefore fundamental for managing and planning the transition of cities toward more sustainable, resilient and inclusive settlement models.

4. Results

The HeCo-ULL methodology involved the participation of numerous stakeholders – around 30 different entities – identified on the basis of three thematic focuses: Planning, including public bodies responsible for planning at different scales (national, regional, metropolitan/provincial, and municipal) and within their respective sectors (urban policies, mobility, conservation, etc.); Heritage, encompassing superintendencies, the Archaeological Park of the Phlegraean Fields, local and regional authorities, and enterprises directly engaged in cultural heritage management policies; and the theme of Protection and Enhancement, which includes associations, cooperatives, and both public and private actors involved in the safeguarding and promotion of the complex system of cultural, landscape, and environmental assets of the Phlegraean Fields.

All the invited institutions and associations took part in the entire co-production process, with an average of 15 stakeholders per event.

The four workshop sessions of the ULL Campi Flegrei have the goal to: (1) sharing local knowledge, (2) mapping places through personal memories, (3) visioning scenarios, (4) planning actions based on actor coalitions.

During the four meetings with stakeholders, it was possible to generate new spatial data, both quantitative and qualitative, which enhanced the knowledge and mapping work conducted within the research. The thematic maps, initially developed through desk research, were updated through the identification of new areas and additional themes to be represented, with particular focus on heritage, welfare systems, and mobility. This material was subsequently reprocessed within a GIS environment, enabling the transformation of qualitative data into georeferenced spatial elements and the coherent integration of the various information collected.

This decoding process – from narratives to spatial data – was carried out through focused exercises in which the researchers mediated the collective recognition of significative areas and topics, starting from the collection of individual memories and stories. The improved knowledge implemented the existing mapping categories allowing participants to collectively acknowledge shared cartographies.

Moreover, the methodology employed in this study integrates critical mapping practices with photographic documentation to develop a comprehensive understanding of territorial dynamics in the Campi Flegrei area. This approach recognizes that territorial knowledge

Knowledge Framework, mapping Campi Flegrei.
Source: Strategies4Change map team
Figg. 5 - 6

cannot be constructed solely through traditional planning documents but requires the co-development of interpretative tools capable of revealing the complex layering of historical, environmental, and social processes that shape contemporary landscapes.

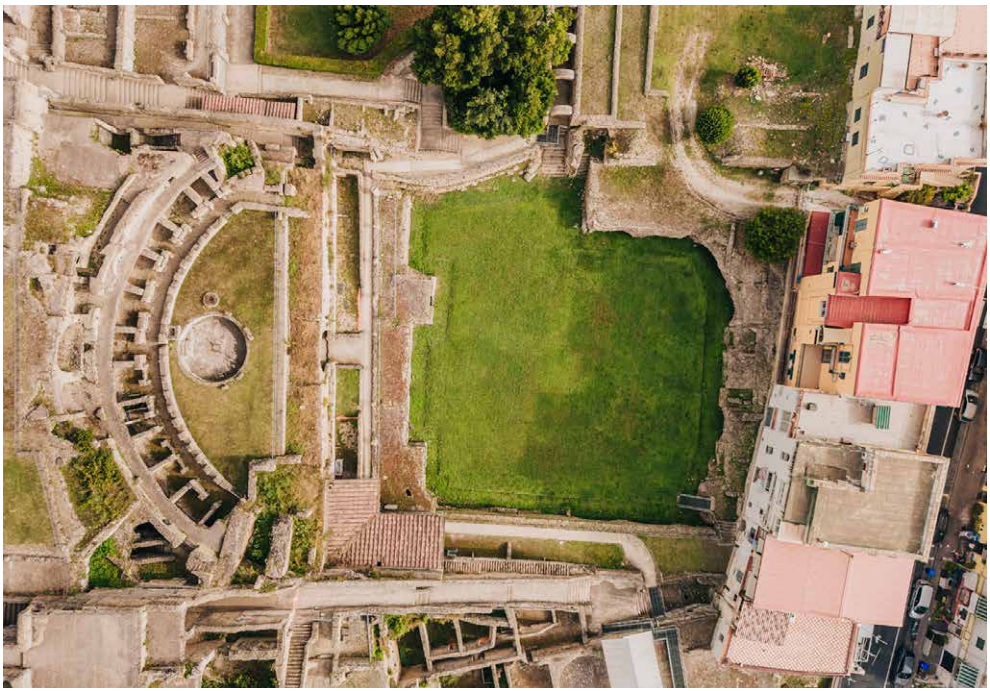
The construction of territorial knowledge begins with a survey of the existing planning framework and the design of an atlas composed of thematic maps (Fig. 5 and 6). The adopted methodology attempts to represent the characteristics of a territory exposed to risk through an interpretative reading capable of revealing existing criticalities and latent potentials within a cognitive perspective oriented toward identifying trajectories for sustainable transformation.

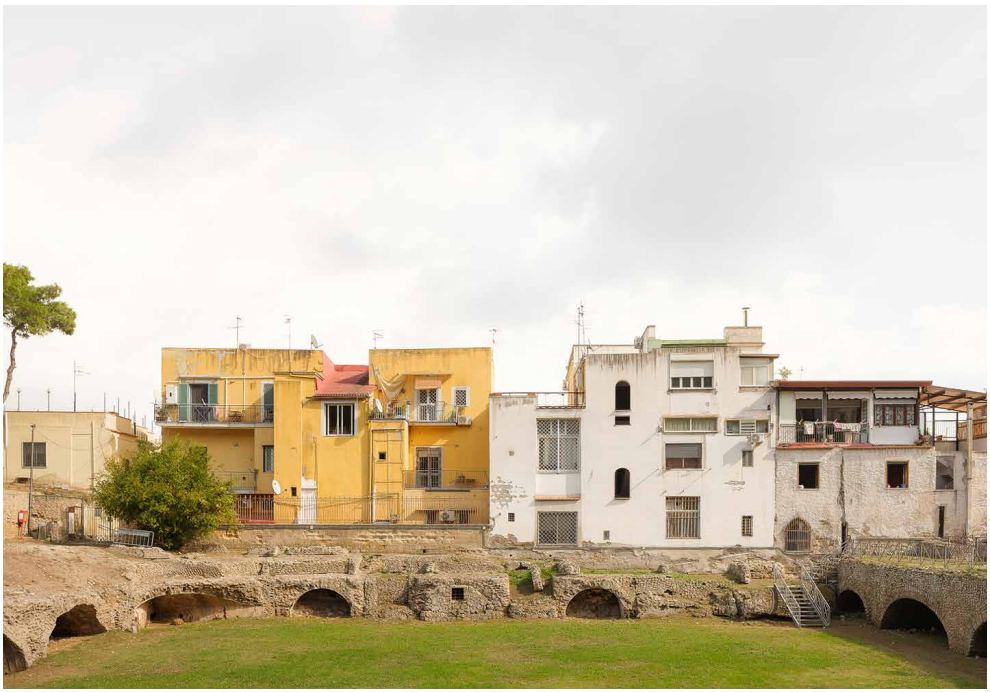
Building upon Corner's (1999) foundational work on mapping as agency, this research positions maps not merely as representational instruments but as tools for study and interpretation, capable of generating new knowledge, facilitating understanding of existing dynamics, and guiding intervention possibilities. Corner's conceptualization of mapping as a creative, projective practice - that "does not simply record existing facts but constructs new realities" - provides the theoretical foundation for understanding maps as active agents in territorial transformation processes. The mapping methodology implemented in this research acknowledges the constructed nature of cartographic knowledge and its role in shaping spatial understanding (Harley, 1989; Crampton, 2010), treating maps as cultural artifacts that reflect and construct particular ways of seeing and organizing space (Wood and Fels, 1992).

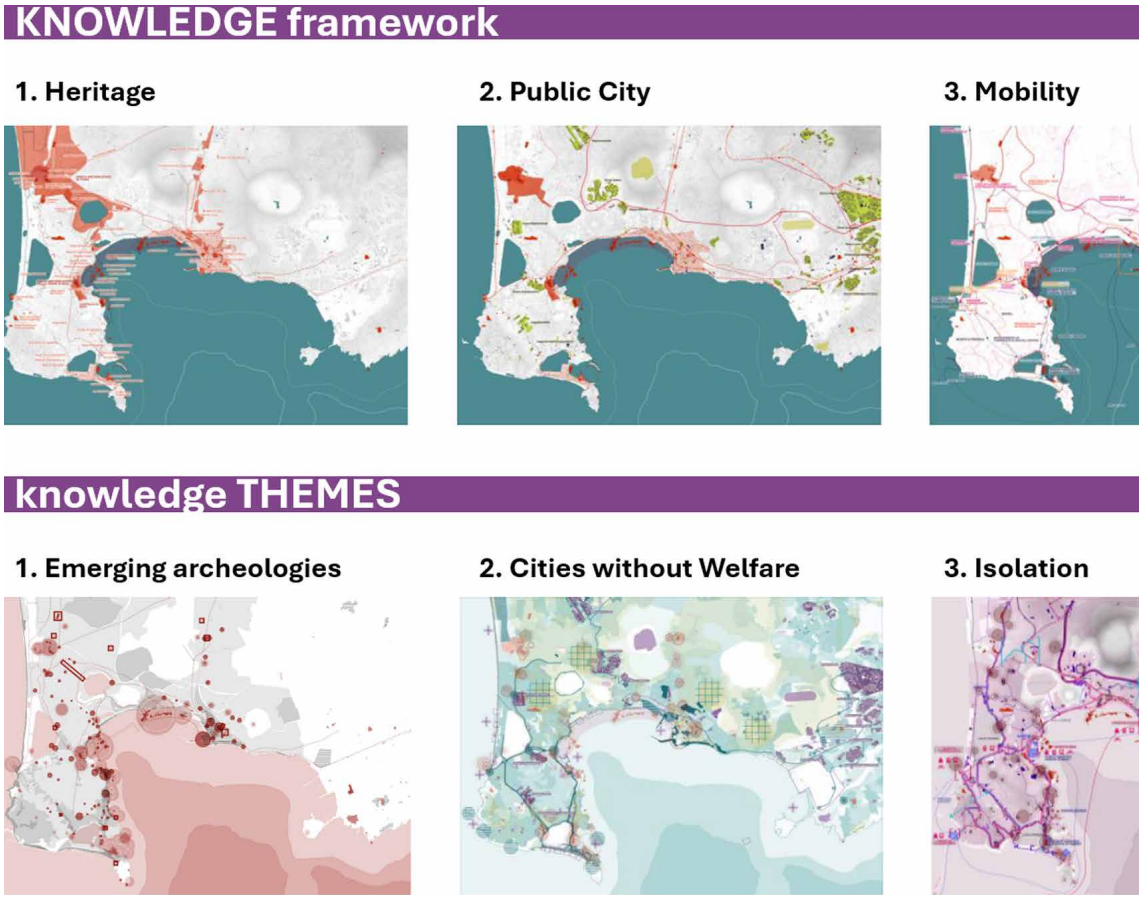
Following approaches developed in landscape architecture and urban planning contexts, the mapping process functions as a form of landscape literacy that reveals hidden processes and potential within territorial systems (Girot, 1999; Desimini and Waldheim, 2016). Together with the mapping activity, photography served as a fundamental tool for territorial investigation, functioning as both documentation and interpretation device (Rose, 2014).

The research methodology, through critical-interpretative analysis of the territory, identified several conflictual nodes that orient future resilient design strategies in collaboration with local stakeholders. These critical maps reveal five primary territorial conditions that emerge from the intersection of natural processes, historical stratification, and contemporary urban development (Fig. 7):

- *Emerging Archaeologies* represent historical emergencies and settlements that are positioned within stratified systems of "superimpositions" between different historical layers.
- *Isolation of Campi Flegrei* results from infrastructural pressure exerted by commuters, citizens, and tourist flows, determining incisive geographical isolation





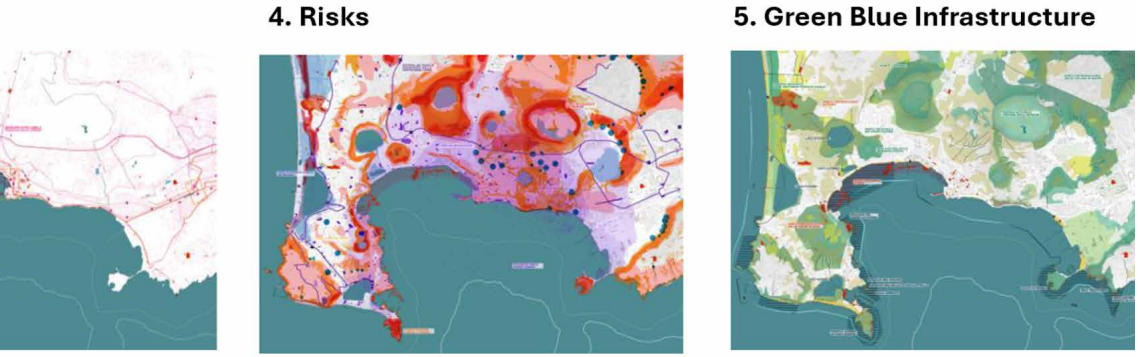


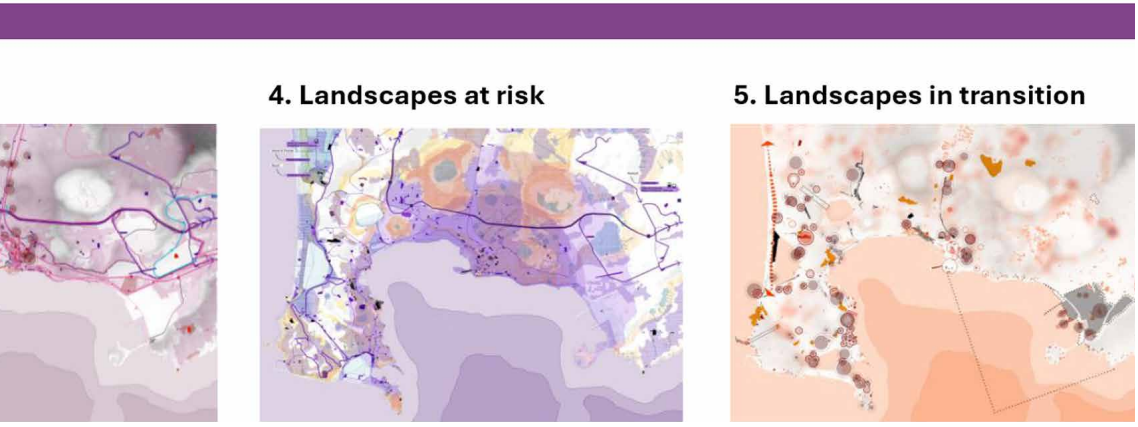
Emerging Themes and Strategies, mapping Campi Flegrei .
Source: S. Strategies4Change map team, adapted by M. Castigliano
Fig. 7

conditions affecting both socioeconomic and cultural aspects.

- *Landscapes at Risk* characterize the Phlegraean area through multiple significant risk situations both natural and anthropogenic.
- *Cities without Welfare* as a territory lacking public endowments.
- *Landscapes in transition* encompass the network of interstitial spaces within dense settlement systems, infrastructural buffer areas, margins of large public housing enclaves or archaeological parks.

The integration of critical mapping and photographic documentation creates a comprehensive analytical framework that operates simultaneously at multiple scales and temporal dimensions (Arcidiacono et al., 2021). The mapping process reveals structural relationships and territorial dynamics, while photographic documentation captures phenomenological experiences and material conditions that emerge from direct territorial engagement. This creates the ground for opening discussions through working sessions in living labs, where the local community can participate in





the co-production of knowledge and, subsequently, have a voice in the definition of strategies.

Stakeholder engagement took place through initiatives that include thematic walks focused on heritage in relation to mobility and risk; workshops with international architects addressing intangible heritage; seminars and photographic exhibitions aimed at visualizing the cultural landscape in connection with the thematic maps. These initiatives allowed for testing the effectiveness of the methodology, positioning the community as an active participant in the process of change. Moreover, the diversity of events enabled the mobilization of multiple competencies, involving technicians, professionals, and academics, and engaging a heterogeneous audience, including citizens and activists.

5. Discussion. Toward an operational methodology applied to cultural landscapes

Landscapes represent dynamic and continuously evolving entities, where the concepts of permanence, identity, and safeguarding cultural values require the integration of in-

cremental principles into their management strategies. In this sense, the integration between resilience and cultural landscape opens the possibility of interpreting the territory as a socio-ecological system capable of evolving without losing symbolic ties and collective functions (Walker et al. 2006).Through this integration, the cultural landscape is critically interpreted as a dynamic system, where transformation does not necessarily coincide with loss (Till et al., 2024).

From this perspective, it becomes crucial to deepen the understanding of how to manage sustainable development through community involvement as a factor of resilience, to further design landscape strategies with adaptative conditions (Adger, 2000). A combined reading of the two approaches can therefore contribute not only to understanding but also to the active co-management of landscapes in transition. This perspective is particularly relevant in contexts such as the Campi Flegrei, where culture, understood as an active force within communities, shapes the natural environment, integrating the different dimensions of the issue into a unified vision – widespread settlements and architectural heritage, cultivated landscapes and degraded natural systems, practices and communal experiences that coexist within complex and risk-prone landscapes.

The case study – through co-mapping structured according to a dichotomous reading of heritage in relation to territorial components such as ecology, settlements, infrastructure, and risks –reveals the necessity of jointly considering culture and nature to understand and enhance the relationships between spatial patterns and ecological processes (Wu, 2010). These relationships are increasingly threatened by anthropogenic and natural risk factors, which endanger many forms of heritage and pose the risk of an irreversible loss of collective memory and community values.

This awareness prompts a reflection on how a resilience-based approach to cultural landscapes allows for action across multiple temporal and spatial dimensions. The temporal dimension is expressed through an incremental and provisional approach – rather than a rigidly evolutionary one – capable of envisioning interconnected scenarios of prevention, emergency management, and post-event recovery. The spatial dimension, in turn, calls for critical engagement with the irreversible processes affecting territories, which often result in geographies of abandonment and underuse. These conditions demand a circular and adaptive design strategy that recycles spaces, reuses buildings, and reimagines landscapes.

This is particularly relevant when considering the risk that resilience thinking is applied to oversimplify urban complexity and depoliticize risk management (Walker and Cooper, 2011), with its projects triggering or accelerating processes of social exclusion for the most vulner-

able groups and increasing the value of assets (Anguelowski et al., 2018). To avoid this, it is fundamental that the design of transformative conditions in terms of resilience already embeds social protection policies (e.g. financial incentives, revenue controls, support for local businesses, etc.) to manage the transition and prevent the increase in asset values from resulting in exclusion. Resilience needs to be fully shaped by the communities inhabiting the territories, to ensure that projects respond to their real needs and not just to a generic, top-down transition agenda.

In this view, this contribution goes beyond theoretical reflection by proposing a methodological framework – the HeCo ULLs – conceived as an operational mechanism applied to cultural landscapes to enhance effective long-term community empowerment in the active care and management of cultural landscapes. The interconnections between resilience and cultural landscapes offer a lens through which the landscape can be recognized as the foundation around which the community itself is formed and thus reasserted as a primary carrier of social, place-based, and contextual values (Tuan, 1977), while acknowledging the pivotal role of communities in confronting and navigating contemporary challenges.

By introducing the concept of HeCo ULLs as participatory territorial laboratories, this study positions the creation of Heritage Communities as a strategic asset for reinforcing territorial resilience, particularly within contexts characterized by crises and accelerated transformation (Berkes et al., 2013).

The methodology developed in the research (Fig. 3) can be transferred into other similar cases, particularly considering that it is still very rare that ULLs are used to jointly develop actions and design strategies for vulnerable, risk-prone contexts that are characterized by the overlapping of different risks, multiplying their impact through compound or cascade interactions. Nevertheless, research proves that it is precisely in these contexts, often characterized by conflicts of interest between different stakeholders, that Urban Living Labs can represent an innovative approach, capable of integrating knowledge from different disciplines and social roles (Laborgne et al., 2021) by creating inedited partnerships between different sectors, empowering actors in a long-term perspective other than just building for mitigation and disaster risk response (von Wirth et al. 2018; Marciano et al., 2024).

Indeed, the nexus between culture and the adaptive capacities of communities is increasingly central to European policy discourse and is formally acknowledged in international frameworks such as the 2030 Agenda and the United Nations Disaster Risk Reduction Strategy. As previously mentioned, this is also coherent with the Faro Convention (2005), emphasizing the active role of people in recognizing, valuing and passing on their cultural her-

itage to future generations, which becomes fundamental to building a "resilience of the heritage community", understood not only as the capacity to withstand shocks, but also as an evolutionary process that strengthens the sense of belonging, social cohesion and local innovation (Mulligan et al., 2016). Cities, as complex socio-ecological systems, draw strength from conscious and active communities, capable of learning, adapting and transforming in the face of challenges. In the urban context, communities are therefore considered as dynamic actors capable of transforming resilience itself from an abstract and static concept to a concrete and continuous practice (Folke et al., 2010), fueled by social capital, participation, inclusive institutions and shared culture (Davoudi et al., 2012).

6. Conclusions

The paper investigated the relationship between cultural landscapes and ecological systems, spacing from a recent re-conceptualization of resilience as a unifying framework – interpreted as the background connection of heritage valorization with sustainable and inclusive development – to developing an operationalization of the concept through the creation of an ULL-based community.

The theoretical and methodological framework for the paper has been granted by the research project "Strategies of Interventions on Historical Landscapes," led DiARC (Department of Architecture, UNINA), as part of Spoke 1 "Historical Landscapes, Traditions and Cultural Identities," under the PNRR Extended Partnership no. 5 "CHANGES - Cultural Heritage Active Innovation for Nex-Gen Sustainable Society".

The methodology has been validated through the case study of Campi Flegrei (Campania Region), which has been chosen due to the presence of cultural assets and of particularly critical factors, namely its volcanic origin and the spread of unregulated human activities.

With regards to the theoretical state of art, the result of the project reflects the creation of an open environment in which the results of scientific research, usually shared only within the scientific community, could be properly conveyed to non-experts to increase community's awareness and perception of their potential role (Abarquez and Zubair, 2004).

Positioning itself regarding the traditional definition of resilience, the project refers to disasters as longer-term chronic stresses due to disrupted ecologies, rather than acute shocks as in the multi-hazard perspective, as it wants to address the process of social innovation that can start in a community constantly exposed to man-made conditions. That is why, the chosen case study is relevant, because even if it is clearly characterized by acute shocks due to natural aspects (e.g. the current bradyseism crisis), it has always been characterized by an attitude to co-living with the natural risk (the typical, mere emergen-

cy condition) and, at the meantime, the inability to counteract extractive economic supply chains and de-regulation in urban and landscape planning and design.

To finalize the perceptive reading and the valorization of the immaterial relationships that exist between the tangible elements of the places, the analytical-interpretative phase has seen, in addition to the quantitative method of analysis (GIS database) the qualitative methodology which results consist in the outputs of the workshop activities developed in the four meetings. Moving from desk-research, the HeCoULL outlined an original Manifesto shaping the resilient "Cultural Landscape" composed by the stakeholders involved. This has been the foundation for the establishment of real-world strategical goals that the "constituent" Heritage Community of Campi Flegrei decided to pose itself to move forward to activate its full potential through objectives such as re-imagining the relationship with its latent assets and resources, promoting and improving communication in tangible and intangible infrastructures, curating and valorizing all forms of natural and cultural heritage, etc. (Mazzarella et al., 2023)[3]. Interpreting local knowledge, tangible and intangible cultural heritage, traditional know-how, land use, construction technologies, the research Strategies4Changes establishes a place-specific resilience, to involve the local Heritage Community in the drawing up of and management process of scenarios for heritage care, preservation and dissemination to future generations, paying attention to being active in the care of the contexts in which they invest their public action (Hillier, 2005; Holtorf, 2018). Their local knowledge becomes fundamental to developing shared visions of future changes, because here the knowledge and the production of knowledge equal the social opportunity to act, therefore, to perform their agency of mapping resources, assets, cultures in society. From community involvement and co-exploration/co-design, next steps provide cultural resilience initiatives, under the lead of HeCo participants, that can reinvigorate feedback loops for the LL learning phase, acquisition of wider awareness on project limitations and then reiterate in long-term sustainability plan the whole process.

Limitations of this research study refer to time-bound processes of community engagement constrained to four collaborative encounters, which may prove insufficient to capture the full complexity of community dynamics and territorial knowledge. Furthermore, while the methodology aspires to integrate experiential and local knowledge, the translation of qualitative data into cartographic representations remains mediated by scientific expertise, potentially reinforcing epistemic hierarchies rather than fully democratizing knowledge production. Perhaps most significantly, the "constituent" community lacks a

structured management plan due to limited technical and financial resources.

Central to the described tool/processes is the recognition of the value of cultural landscapes and their inner ecologies, especially in layered and compromised contexts like those of the case study, as an indicator of their potential in decreasing established socio-ecological vulnerability (Magis 2010; Chelleri et al., 2016). In the case emerged the difficulty of cataloging emerging, hidden, or forgotten components, but in the meantime, "silent ruins" can be retraced as the foundation of a cognitive and relational dimension of a new cultural landscape in need to "speak", revealing itself in the territory, projected to enhance the Community Resilience (Mulligan et al., 2016) in the creation of the place-based Heritage Community (Berkes and Ross, 2013; Chaskin, 2008).

Notes

[1] Colavitti defines it "silent territory" as opposed to a "speaking" one, that is already part of communities identity (Colavitti, 2018).

[2] Changes "Cultural Heritage Active Innovation for Sustainable Society". "PE5. Humanities and cultural heritage as laboratories of innovation and creativity" Spoke 1 – Historical Landscapes, Traditions and Cultural Identities. Codice progetto MUR: PE00000020 – CUP E53C22001650006. Mission 4 Component 2 Investment 1.3, NextGenerationEU (01/12/2022-30/11/2025).
The Work Package 4 "Strategies of interventions on historical landscapes" is a collaboration between partners: UniNa (leader), PoliBa, UniTo, UniPi.

[3] Further impacts will be assessed in the near future, as the research activities have just been concluded (last edit: Nov 2025). HeCoULL activities for a potential research spin-off are already planned (Dec, 2025 – Feb, 2026) in collaboration with other national institutions and the local stakeholders already involved

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