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Reframing entrepreneurship: an upside-down pyramid perspective on community-led social and cultural sustainability

Giusy Sica[1] · **Chiara Spiniello**[2] · **Maria Palazzo**[1] · **Giovanna Lusini**[3] · **Alessandra Micozzi**[1]

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Abstract
This study examines how community-driven and culturally embedded forms of entrepreneurship contribute to sustainable development beyond market-oriented models. We propose an "upside-down pyramid" methodological approach that combines a bibliometric analysis of 1,155 scholarly articles with a qualitative and sociological analysis of 15 interviews to stakeholders from *Officina Keller*, a community-oriented cultural and creative enterprise in Southern Italy. The bibliometric analysis identifies five thematic clusters, covering environmental governance, inclusive innovation, and cultural regeneration.. The qualitative analysis highlights the role of community cohesion, territorial reactivation, and cultural memory in driving entrepreneurial innovation, while revealing persistent challenges linked to weak institutional and techno-economic support. By connecting large-scale scholarly discourse with situated practice, the study advances a more inclusive understanding of entrepreneurship and calls for policy frameworks that better integrate social and cultural dimensions into place-based community initiatives, particularly in contexts of place-based transformation and community-led regeneration.

Keywords Community-based entrepreneurship · Social innovation · Bibliometric analysis · Cultural sustainability

Introduction

The role of entrepreneurship in advancing social and cultural sustainability is gaining renewed attention in academic and policy circles, particularly as traditional approaches to innovation and development face growing limitations in addressing entrenched inequalities, cultural fragmentation, and spatial exclusion (Duxbury

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et al., 2017; Silva et al., 2023). In this context, entrepreneurship is not limited to market-oriented ventures but is understood as a process of opportunity creation, resource mobilization, and innovation within specific cultural and territorial settings (Audretsch et al., 2024; Fernández-Guadaño & Montes Diez, 2023; Figueira & Fullman, 2025; Palazzo et al., 2023). This perspective encompasses initiatives such as grassroots renewable energy cooperatives (Anderson et al., 2019; Hargreaves et al., 2013), rural tourism projects that preserve and revitalize cultural heritage (Castro-Arce &Vanclay, 2020; Gao & Wu, 2017), and community-based cultural enterprises that mobilize identity and memory as resources for innovation (Chaves Júnior et al., 2024; Duxbury et al., 2017). These examples illustrate how entrepreneurship can generate social and cultural value that transcends conventional economic growth logics. This broader conception recognizes community-led action, cultural regeneration, and social experimentation as entrepreneurial practices in their own right (Chaves Júnior et al., 2024; Gu et al., 2023) and echoes the calls of the United Nations' Sustainable Development Goals (United Nations, 2015).

Over the past decade, concepts such as co-creation, inclusive innovation, and community-driven territorial regeneration have emerged as key frameworks for understanding how locally grounded initiatives contribute to the transformation of socio-cultural systems (Singh et al., 2022). These forms of innovation are typically situated, collaborative, inclusive and community-led (Molina-Betancur et al., 2021), rather than by market incentives alone, highlighting the need for entrepreneurial approaches that are sensitive to context, heritage, and place-based dynamics. Despite these developments, research in entrepreneurship and sustainability has tended to underrepresent the social and cultural pillars, favouring environmental and economic metrics (Sica et al., 2024). Recent reviews have mapped the evolving terrain of green entrepreneurship using structured frameworks (e.g., Singh et al., 2025) and re-emphasized the centrality of institutional, social, and ecological drivers, yet these dimensions remain insufficiently integrated in community-level analyses. Methodologically, the field still leans toward large-scale, quantitative approaches, often overlooking the rich insights offered by case-based and community-centred research (Khatami et al., 2021; Rosário et al., 2022; Santini et al., 2016). As a result, the epistemic space for understanding entrepreneurship as a socially and culturally transformative practice remains fragmented and incomplete.

This study seeks to address this gap through an 'upside-down pyramid' methodological design. We begin with a bibliometric analysis of 1,155 scholarly articles indexed in the Web of Science to map research trends. We then identify five thematic clusters through unsupervised machine learning and finally narrow our focus to an embedded field case, that of of Officina Keller, a Southern Italian initiative that exemplifies cultural and social regeneration from below. With this innovative layered approach, we are able to bridge macro-level academic narratives with micro-level lived practices, highlighting both convergence and disjunctions between theory and practice.

This study pursues two main objectives. First, we aim to map the conceptual and empirical development of research at the intersection of social innovation, community engagement, and social and cultural sustainability over the past three decades. Second, we seek to examine how the scholar discourse intersect with practice by

drawing on a grounded fieldwork example from a community-led initiative in Southern Italy. To achieve this, we design an "upside-down pyramidal" methodology that starts from a large-scale bibliometric analysis and then narrow down to an in-depth qualitative approach applied to a concrete example of community-driven cultural and social regeneration.

Based on the pyramid, we formulate the following research questions that guide this study:

> ***RQ1:*** *How have the social and cultural dimensions of sustainability been conceptualized and developed within the scholarly discourse on sustainable entrepreneurship over the past three decades?*
> ***RQ2****: What are the dominant themes, and how are they distributed in time and geographically?*
> ***RQ3****: What are the most productive countries, most used methodological approach and most cited works in community-based sustainable entrepreneurship research?*
> ***RQ4****: How does a practical case illustrate, challenge, or extend the entrepreneurial patterns identified in the literature, particularly in relation to community cohesion, territorial regeneration, and techno-economic innovation?*

This work makes three key contributions. First, it delivers a structured and replicable bibliometric mapping and clustering of the literature on social and cultural sustainability in entrepreneurship, with a particular focus on community engagement and cultural innovation. Second, it highlights the most influential journals, scholars, and institutions in shaping this interdisciplinary discourse, along with dominant methodologies and recurrent knowledge gaps. Third, it connects bibliometric patterns to grounded empirical insight through the case of Officina Keller, illustrating how cultural practices and collective agency can become drivers of sustainable, inclusive entrepreneurship.

We position this work within the scholarship on embedded entrepreneurship and sustainability transitions, building especially on Welter et al. (2016), who advocate for context-sensitive approaches to entrepreneurial behavior; Zahra et al. (2014), who highlight the transformative potential of socially oriented entrepreneurship; and Karatas-Özkan et al. (2021), who call for methodological pluralism and relational perspectives in social entrepreneurship research. These perspectives inform our epistemological commitment to exploring entrepreneurship not solely as an economic activity, but as a socially embedded, culturally mediated, and territorially situated process. Our upside-down pyramid approach thus positions itself in contrast to conventional views that treat entrepreneurship primarily as a market-driven activity aimed at economic growth. Instead, we foreground dimensions that are often marginalized, such as symbolic regeneration, informal governance, and spatial reappropriation, as legitimate forms of entrepreneurial practice, particularly in marginal or underserved contexts.

The paper is organized as follows. Sect. "Literature review" carries out a literature review focussing on three strands that are relevant to this study. Sect. "Methodology" presents our methodology, first introducing the "upside-down pyramidal" method-

ological design we propose to capture the interplay between theoretical discourse and entrepreneurial practice, and then describing the main methodological methods we utilise here. Sect. "Single level Results", presents the results for each level of the pyramid: the bibliometric analysis of the literature, the analysis of the main clusters we identify from it, and the qualitative zoom-in lens on one practical fieldwork example. Sect. "Cross-level synthesis of findings" synthesizes instead the cross-level findings of our analysis. Finally, the paper concludes with a discussion of the main challenges and opportunities emerging from the literature and proposes directions for future research in Sect. "Discussion and implications".

Literature review

Although the field of sustainable entrepreneurship has expanded rapidly in recent years, it remains unevenly developed across its four pillars (economic, environmental, social, and cultural), which makes a synthetic review of its state of the art necessary. Understanding how entrepreneurship contributes to sustainability therefore requires situating the field within its broader scholarly development. While early studies primarily emphasized economic growth and technological innovation, more recent work highlights the importance of social value creation, cultural regeneration, and community engagement. This section reviews three main strands of literature that inform our study: (i) community-based entrepreneurship and its role in advancing sustainability, (ii) persistent gaps in the treatment of social and cultural dimensions compared to environmental and economic ones, and (iii) methodological advances, particularly the use of bibliometric and mixed-method approaches, that enable a more integrated perspective.

Community-based entrepreneurship and sustainability

Entrepreneurship research has traditionally focused on economic growth and firm-level performance. However, a growing body of work emphasizes the social and cultural dimensions of entrepreneurship, often captured under the umbrella of community-based entrepreneurship. This stream highlights collective agency, shared identity, and embeddedness in local contexts as central features of entrepreneurial activity (Peredo & Chrisman, 2006; Welter et al., 2016). Community enterprises have been shown to mobilize local resources, build social cohesion, and foster cultural regeneration, particularly in marginalized or rural areas (Ballal et al., 2022; Duxbury et al., 2017; Zahra et al., 2014). Despite these contributions, the mainstream entrepreneurship literature still tends to prioritize market-oriented logics, with social and cultural outcomes often treated as secondary or intangible (Scartozzi et al., 2024). This underscores the importance of repositioning entrepreneurship as a socially and culturally embedded process, which forms the starting point of our study.

Gaps in social and cultural sustainability research

While environmental and economic dimensions of sustainability are widely represented in entrepreneurship studies, the social and cultural pillars remain comparatively underexplored (Halko et al., 2011; Sica et al., 2024). Research on social entrepreneurship, for instance, has made significant strides in framing inclusion, empowerment, and social value creation (Chaves Júnior et al., 2024), yet it rarely addresses how cultural heritage, symbolic meaning, and territorial reactivation shape entrepreneurial practices. Similarly, studies on sustainability transitions often emphasize technological innovation and institutional governance Khatami et al., 2021; Vivero-Pol et al., 2023, overlooking how place-based practices such as heritage preservation, grassroots energy initiatives, or cultural cooperatives contribute to transformative forms of entrepreneurship. As Karatas-Özkan et al. (2021) argue, advancing the field requires methodological pluralism and a greater recognition of context, culture, and relational dynamics. Our study addresses this gap by explicitly foregrounding the social and cultural dimensions of sustainability and examining how they intersect with entrepreneurial practice. This call resonates with the recent study by Passarelli and Bongiorno (2025), which highlight how entrepreneurship education research increasingly recognizes the importance of human, cultural, and social capital, yet still struggles to integrate these dimensions systematically.

Methodological advances: bibliometric and mixed-method approaches

Recent scholarship increasingly employs bibliometric techniques to map entrepreneurship research and trace its intellectual structure (Baier-Fuentes et al., 2019; Contreras Cruz et al., 2022). These methods provide systematic, replicable insights into thematic clusters, citation networks, and methodological trends. At the same time, case-based and qualitative approaches remain crucial for capturing the lived realities of entrepreneurial practice, particularly in community-led and culturally embedded settings (Vlasov et al., 2018; Welter et al., 2016). Mixed-method designs that combine bibliometric mapping with qualitative fieldwork are still rare but have strong potential to integrate macro-level scholarly discourse with micro-level dynamics of practice. Building on these methodological advances, our study proposes an "upside-down pyramid" design that links large-scale bibliometric mapping with a situated case study, thereby bridging theoretical abstraction with empirical groundedness.

Methodology

This study employs a mixed-method, multi-level research design that combines quantitative bibliometric techniques with qualitative case study analysis. The aim is to capture both the macro-level evolution of sustainability and entrepreneurship research and the micro-level practices of a specific community initiative. By struc-

turing the methodology in an integrated way, the study ensures that statistical mapping of scholarly debates is connected to the lived experiences of entrepreneurs and stakeholders. The section is organised into four parts: (i) the conceptual framework underpinning the upside-down pyramid approach; (ii) the selection and screening of documents; (iii) the quantitative methodology used for bibliometric and clustering analysis; and (iv) the qualitative methodology applied to the Officina Keller case study.

Conceptual framework: the upside-down pyramid

This study adopts an integrated analytical framework with an upside-down pyramidal structure: from a general, broad view through bibliometric mapping of the literature, to a single place-based specific example of a community regeneration project. The design foresees three methodologically distinct, yet analytically complementary levels, as visualised in Fig. 1. We begin with a broad bibliometric mapping of the scholarly field and progressively narrows to a qualitative case study. This structure is justified by the need to capture both macro-level discursive patterns and micro-level entrepreneurial practices, and to examine how they inform and challenge each other.

Selection and screening of the papers (Level 1)

At level 1 of the upside-down pyramid, we carried out a quantitative and rigorous bibliometric design approach (Baima et al., 2021; Yan & Zhiping, 2023) aimed at mapping and interpreting the scientific literature addressing the intersection of social innovation, cultural sustainability, community engagement, and sustainable development. Following the structure and transparency required for replicable research,

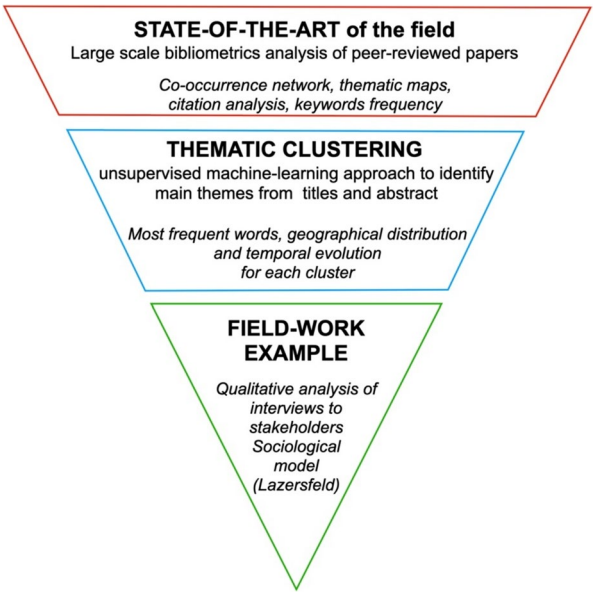

Fig. 1 The upside-down methodological design of this paper. Source: Authors' elaboration

and in alignment with recent studies in the area (e.g., Sica et al., 2025), this section details the full bibliometric methodology across three critical phases: selection of documents, screening, and analysis, as described below.

The bibliographic dataset was extracted from the Web of Science (WoS) Core Collection, a leading academic indexing platform known for its comprehensive coverage of peer-reviewed scientific publications (Cuccurullo et al., 2016), particularly within the social sciences domain (Hicks & Wang, 2011; Liu et al., 2024). An advanced query was carefully structured to target publications that intersect social or cultural sustainability with bottom-up, participatory, or community-based innovation practices. We nevertheless stress that the exact formulation of the string might slightly influence the final selection as different combinations of words and operators could originate slightly different samples of (MacFarlane et al., 2022).

The exact search string used was:

> *TS = ("social sustainability" OR "cultural sustainability" OR (sustainab* AND (social OR cultural))) AND ("bottom-up" OR "community-led innovation" OR "grassroots innovation" OR "participatory innovation" OR "inclusive innovation" OR "community-based innovation")*

This initial query returned 1,448 records, starting from 1991 and extending up to 2025, which was then further screened according to two factors:

1. Document type filter: only items classified as articles were retained, excluding conference proceedings, book chapters, editorials, and reports, in order to ensure the inclusion of peer-reviewed and replicable research (Bickley et al., 2022).
2. Language filter: only publications written in English were included, to ensure comparability and consistency of textual analysis.

After applying these criteria, the final dataset comprised 1,155 articles, which formed the basis for the bibliometric and machine learning analyses. All metadata (titles, abstracts, author keywords, and cited references) were downloaded in plain text format for processing in Bibliometrix (R package) and with Python scripts specifically developed for clustering and topic modelling.

Quantitative methodology (level 1 and 2)

The quantitative component of the study combined bibliometric techniques with unsupervised machine learning to capture both the structural/metodological and thematic dynamics of the literature. The analysis proceeded in three steps.

First, we calculated descriptive indicators of scientific production, including publication counts, annual growth rates, average document age, and citation statistics, using the Bibliometrix R package and its Biblioshiny interface (Aria & Cuccurullo, 2017). These tools provided standardized processing of the dataset and ensured replicability of trend analyses.

Second, we performed a structural mapping of the intellectual, conceptual, and methodological characteristics of the field. Author keyword co-occurrence matrices

were generated in Biblioshiny and analysed using the Walktrap community detection algorithm (Pons & Latapy, 2005), producing clusters of related concepts that were projected onto thematic maps (Bamel et al., 2024; Cobo et al., 2011). A frequency threshold of five occurrences per 1,000 documents was applied to reduce noise. In thematic maps, each keyword is positioned in a two-dimensional space according to two key metrics: centrality and density. Centrality, represented on the x-axis, reflects a theme's degree of interaction with other themes, essentially its relevance and influence across different areas of the literature. Density, shown on the y-axis, captures the internal strength and cohesion of a theme, indicating the level of development and conceptual consistency within its own thematic cluster. Based on the distribution of keywords and clusters along the two axes, four types of themes can be distinguished according to the quadrant in which they are located (Cobo et al., 2011). Motor themes, found in the upper-right quadrant, combine high centrality and high density, meaning they are both well-developed within their own domain and highly influential across others. Basic themes, situated in the lower-right quadrant, show high centrality but low density; these themes play a bridging role across domains but remain underdeveloped internally. In the upper-left quadrant, niche themes are characterized by strong internal development but limited influence beyond their specific area. Finally, the lower-left quadrant captures emerging or declining themes, which are both weakly developed and marginal to the broader literature.

Citation patterns were also assessed in this stage to highlight the most influential papers within the sample. However, rather than ordering them by total number of citations, we renormalise this number by the number of years since they were published with the following formula:

$$< \text{Citation per year} >= \frac{\text{Time cited (WoS)}}{\max(1, \text{Current year - Publication year})}$$

where we use max (1, Current year - Publication year) to avoid division by zero for very recent papers (e.g., published in 2025, the year at the time of writing). Using this normalized metric helps to account for the fact that older papers have had more time to accumulate citations, while more recent publications, despite having lower absolute citation counts, may exhibit stronger influence relative to their age (Bornmann et al., 2020). This approach therefore allows us to capture both established, foundational contributions and emerging works that are gaining rapid traction in the scholarly conversation.

We also generated a co-authorship network to visualize collaboration patterns among researchers and a co-citation analysis to map the intellectual structure of the field. Both networks were constructed in VOSviewer applying association strength normalization and fractional counting and generating the layout with the LinLog/modularity method (Waltman, 2017). For the co-authorship one, we included only authors at least two publications in the dataset. In the resulting network, nodes represent authors, node size corresponds to the number of citations received, and edge thickness reflects the strength of co-authorship links. Clusters of authors were identified through VOSviewer's built-in modularity-based clustering algorithm, with the resolution parameter set to 1.0 and a minimum cluster size of 2. This procedure pro-

vides a reproducible mapping of collaboration structures within the field, complementing the thematic analysis described above. For the co-citation netweork we used "cited authors" as the unit of analysis, with a minimum threshold of 20 citations. In this visualization, nodes represent cited authors, node size corresponds to total citations, edge thickness reflects the frequency with which two authors are cited together, and colors denote clusters of closely related authors. This approach provides a complementary view to the co-authorship analysis, highlighting intellectual affinities and the most influential theoretical communities in the field.

Finally, metadata from abstracts and keywords were processed through Python scripts to extract references to methodological approaches and to detect funding acknowledgments. We grouped the methodologies in four macro-groups, distinguishing between qualitative analysis (e.g., interviews, focus groups, etc.), quantitative analysis (survey, bibliometric, regression, etc.), case studies and mixed methods (fuzzy logic, qual + quant, triple bottom line, etc.).

These procedures provided a systematic overview of how research in this field is designed and supported, offering a first broad picture of the scholarly discourse (Level 1). Building on this foundation, the third step of the quantitative analysis (Level 2) focused more directly on the content of the selected papers, with the aim of identifying their main topics, themes, and points of emphasis. To do so, we began by extracting and combining the titles and abstracts of the 1,155 articles in the dataset. To prepare the text for analysis, we implemented a standard preprocessing routine that included converting all text to lowercase, removing punctuation and common stop-words, and breaking the text into individual words (tokens). We deliberately chose not to include author-provided keywords at this stage. While useful for indexing, these keywords often repeat across papers on similar themes, such as social or cultural sustainability, which could artificially inflate similarity among documents and reduce the effectiveness of the clustering process. The cleaned and processed text was then transformed into a matrix representation that captures the importance of each word within each document, relative to the entire collection. This representation, known as TF-IDF (Term Frequency–Inverse Document Frequency), provides a quantitative foundation for grouping similar texts. To identify thematic structures in the dataset, we applied K-means clustering, an unsupervised machine learning algorithm that partitions a dataset into k groups by minimizing the variance within clusters and maximizing the variance between clusters (Ikotun et al., 2022). In practice, the algorithm assigns each document to the nearest cluster centroid, iteratively updating centroid positions until stability is reached. This makes it particularly suitable for high-dimensional textual data, where patterns are not evident a priori. The analysis was implemented in Python, using the scikit-learn library for the clustering itself, pandas for data handling, and matplotlib for visualization. These tools ensured reproducibility, transparency, and the ability to link bibliometric information to graphical representations of thematic structures. The chosen number of clusters was guided by the elbow method, a widely adopted approach that balances model complexity with explanatory power (Ketchen & Shook, 1996), which in our case showed a clear inflection point at $K = 5$. Furthermore, the choice was further validated by interpretability: clusters with $K = 4$ merged heterogeneous themes, while $K = 6$ fragmented coherent streams. Thus, $K = 5$ offered the most balanced solution between parsimony and explanatory depth. Each

of the five resulting clusters was then interpreted inductively by examining the 30 most frequent terms and thematic patterns that emerged. Finally, to trace temporal and geographical patterns of mainstream topics, we applied unsupervised machine learning (clustering via term–document matrices) using Python's scikit-learn library. This step allowed us to complement bibliometric mapping with data-driven identification of topic evolution and distribution across regions (Contreras Cruz et al., 2022; Dada, 2018; Singh et al., 2022). In addition, the thematic clusters provided the conceptual anchors for Level 3, shaping both the selection of interview prompts and the comparative framework used to interpret the Officina Keller exploratory case study. Results of this analysis will be presented in Sect. "LEVEL ONE: bibliometric landscape of sustainability and entrepreneurship" for Level 1 and Sect. "LEVEL 2: from mapping to meaning, mainstream topics and themes" for Level 2.

Qualitative methodology (level 3)

To complement the macro-level bibliometric and clustering analyses, the study incorporated a qualitative case study aimed at capturing the situated and context-dependent dynamics of entrepreneurial practice. The case selected was Officina Keller, a cultural and creative enterprise for social and cultural regeneration located in Ostuni, Puglia (southern Italy). Established in a former industrial site, it was chosen because it exemplifies how artistic expression, civic collaboration, and local memory can be mobilized as resources for sustainable and inclusive entrepreneurship.

A total of 15 semi-structured interviews were conducted with stakeholders directly involved in the Officina Keller ecosystem, including founders, artists, community partners, and local policy-makers. Participants were recruited purposively to ensure diversity of perspectives, and the interview protocol was developed in light of the bibliometric and clustering results, focusing particularly on themes such as grassroots innovation, participatory entrepreneurship, and territorial regeneration. In this way, the macro-level mapping directly informed both the selection of stakeholders (e.g., actors engaged in cultural regeneration, ecological projects, or participatory governance) and the framing of interview questions, ensuring coherence between the quantitative and qualitative stages. All interviewees gave informed consent, and data were anonymized to protect confidentiality.

The interview protocol was structured around three thematic areas derived from the bibliometric clusters and refined through field engagement: community cohesion (participation, diversity of actors, intergenerational knowledge transfer), territorial regeneration (spatial reuse, ecological restoration, reactivation of cultural traditions), and techno-economic innovation (sustainable agriculture, adoption of digital/low-impact technologies, access to funding and policy instruments). This ensured that the qualitative case study was not isolated, but explicitly connected to the conceptual landscape outlined in the quantitative phase. The questions were designed to capture both concrete practices and participants' perceptions of their capacity to act collectively, reinterpret territory, and mobilize resources under institutional constraints.

The interviews were analysed using the Lazarsfeld framework (Lazarsfeld, 1969), chosen because it provides a structured lens to examine the interplay between agency, context, and innovation, and thus enables micro-level practices to be systematically

related to broader structural conditions. Lazarsfeld's framework offers a socio-semantic process for moving from general concepts to empirically observable indicators, enabling the organization of rich qualitative narratives into comparable analytical dimensions. While the 15 interviews generated diverse accounts of community-led entrepreneurship, to operationalize and compare them we required a model that could structure narratives into coherent categories. Lazarsfeld's steps—conceptual representation, specification, choice of indicators, and formation of indices—allowed us to define three analytical dimensions (community cohesion, territorial regeneration, and techno-economic innovation) and to structure the interview data accordingly. Alternative approaches such as grounded theory or thematic analysis were considered, but these would have provided less systematic tools for cross-case comparison, whereas Lazarsfeld's model ensured methodological integration with the quantitative stages of this study.

Each interview was coded independently by three researchers, with discrepancies resolved through discussion to achieve consensus and intercoder reliability. Coding was iterative and combined inductive identification of emergent categories with deductive mapping onto the Lazarsfeld dimensions, following the principles of mixed coding strategies outlined by Creswell and Plano Clark (2011). Scores were then parameterized into ordinal values ranging from 0 (low) to 2 (high) to evaluate their presence and intensity. These were aggregated at the indicator and dimension level and used to construct a heatmap that visualized variation across cases and highlighted the relative prominence of different dimensions. All coding, aggregation, and visualization procedures were conducted in Python (pandas, NumPy, matplotlib), ensuring reproducibility and clarity of the analytical process.

This qualitative design establishes the third level of the upside-down pyramid, where grounded insights from a community-led initiative are mobilized to interrogate and refine the broader discursive patterns identified in Levels One and Two. The results of this qualitative analysis are presented in Sect. "LEVEL 3: exploring community entrepreneurship in practice".

Single level results

This section presents the findings of the upside-down pyramidal design, moving from the broad bibliometric mapping of the literature (Level 1), through the clustering and thematic analysis of mainstream topics (Level 2), to the qualitative exploration of a community-based initiative in southern Italy (Level 3). Below we describe the results obtained at each level in separate sections.

LEVEL ONE: bibliometric landscape of sustainability and entrepreneurship

At the first level of the upside-down pyramid, we provide a broad bibliometric mapping of the literature at the intersection of sustainability and entrepreneurship. This stage offers a quantitative overview of the field's scope and evolution, tracing how research output has expanded over time, what thematic areas have emerged or declined, which works and authors have been most influential, and how methodolog-

ical preferences and funding patterns shape the scholarly agenda. By establishing these descriptive and structural contours, Level One sets the foundation for the subsequent stages of analysis, where clusters are examined in greater depth (Level Two) and empirical practices are explored through a qualitative case study (Level Three).

Descriptive statistics

The main descriptive statistics of the final sample was retrieved from Bibliometrix (Aria & Cuccurullo, 2017). The oldest paper is dated 1991, however the dataset exhibits a robust annual growth rate of 13.25% over the last 10 years, indicating an accelerating scholarly interest in the intersection of sustainability, social innovation, and community-driven practices. The average age of the documents is 3.62 years, suggesting that the literature is relatively recent and reflects ongoing developments in sustainability-oriented research. The total number of references cited across the entire corpus is 30,981, reflecting the field's rich intellectual grounding and connectivity to broader scholarly debates.

Thematic maps

The thematic map using the centrality–density framework (see Sect. "Quantitative methodology (level 1 and 2)") for the full dataset is shown in Fig. 2. This was based on the 50 most frequently occurring keywords and produced using the Biblioshiny web interface for the Bibliometrix R package (Aria & Cuccurullo, 2017). The colored circles associated with group of keywords represent clusters of closely related

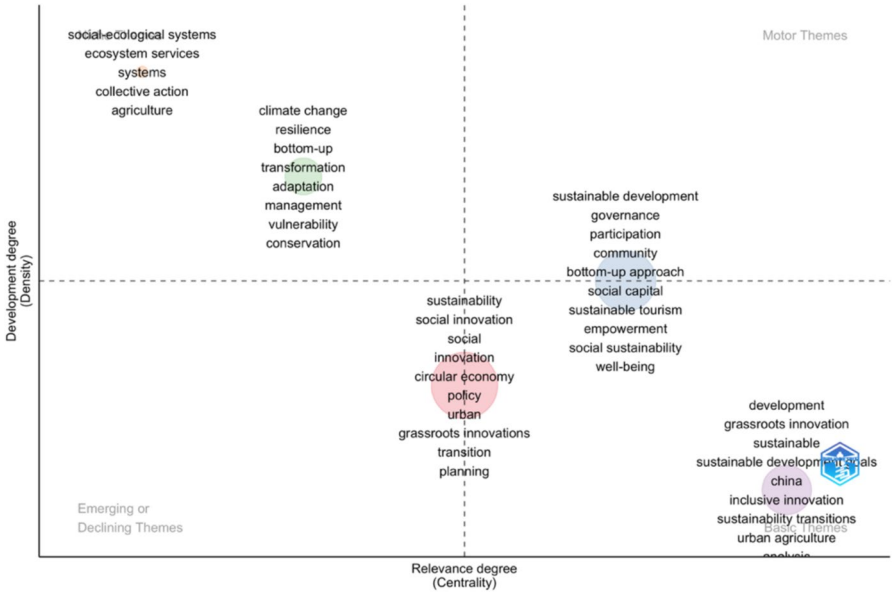

Fig. 2 Thematic map for the entire dataset, produced using the 15 most frequent keywords. Source: Bibliometrix with WoS data. Visualisation on Biblioshiny

words that frequently co-occur in the literature. The size of each circle represents the number of associated documents (Lim et al., 2024). Among the motor themes (top right quadrant), we observe a strong emphasis on community-oriented concepts. These themes are not only cohesive within their own domain but also highly interconnected with others, indicating the increasing importance of community engagement in shaping the field. The presence of themes linked to bottom-up approaches, social capital, empowerment, participation and grassroots innovation suggests that academic discourse increasingly recognizes entrepreneurship as a vehicle for social experimentation, cultural regeneration, and territorial transformation. The strategic positioning of these concepts within the thematic map illustrates the growing theoretical convergence between entrepreneurship and broader discussions of sustainability, inclusion, and place-based development. In contrast, terms such as vulnerability, resilience, agriculture, and ecosystem services appear as niche themes (top left quadrant). Although these are well-developed in their specific subfields, they exhibit limited connections to other areas, suggesting that while they are central to particular academic discourses, they remain relatively isolated. Basic themes (bottom right quadrant) include several keywords related to the sustainable concept in general, as well as urban agriculture and development, with a more territorial connotation. These themes are widely referenced across multiple domains, given the high centrality, but are not yet deeply elaborated or consolidated within any single thematic area, as shown by their low density. This pattern indicates that these are cross-cutting but conceptually shallow themes, with considerable potential for future development and integration into more coherent theoretical frameworks. The emerging/declining quadrant (lower-left) is sparsely populated and marked by low-frequency labels, suggesting topics that are either nascent or waning; we refrain from strong interpretation given their instability. Notably, governance functions as a bridging keyword at the interface of motor and basic themes, underscoring coordination and policy linkages across clusters.

Citation analysis

Table 1 provides the top 10 papers in terms of normalised citation counts. For each of them we report authors, titles, the year of publication, total number of citatios and one normalized by years.

Interesting none of the most cited papers is older than 2006, and half of them are no older than 10 years, confirming that the field is quickly evolving.

The most cited paper of all, Smit and Wandel (2006), is a landmark paper in the field of climate change adaptation studies. The article, titled “Adaptation, adaptive capacity and vulnerability”, published in Global Environmental Change, is foundational because it synthesizes and clarifies key concepts that were, at the time, inconsistently used across the literature. Their central argument, that adaptation is not merely a technical or ecological process but fundamentally a social and contextual one, has profoundly shaped how scholars understand communities' responses to environmental and socio-economic stressors. By situating adaptive capacity within the lived realities of specific places, institutions, and practices, the authors shift attention from abstract risk models to the capacities and constraints of real communities. This

Table 1 The ten most cited papers

Authors	Title	Pub year	Total citations	Cit per year
Smit, B; Wandel, J	Adaptation, adaptive capacity and vulnerability	2006	3086	162.42
Scheidel, A., et. al	Environmental conflicts and defenders: A global overview	2020	281	56.20
Seyfang, G; Haxeltine, A	Growing grassroots innovations: exploring the role of community-based initiatives in governing sustainable energy transitions	2012	613	47.15
Gao, J; Wu, BH	Revitalizing traditional villages through rural tourism: A case study of Yuanjia Village, Shaanxi Province, China	2017	374	46.75
Anderson, CR, et. al	From Transition to Domains of Transformation: Getting to Sustainable and Just Food Systems through Agroecology	2019	207	34.50
Hargreaves, T; Hielscher, S; Seyfang, G; Smith, A	Grassroots innovations in community energy: The role of intermediaries in niche development	2013	413	34.42
Purcell, WM; Henriksen, H; Spengler, JD	Universities as the engine of transformational sustainability toward delivering the sustainable development goals Living labs for sustainability	2019	201	33.50
Spake, R, et. al	Unpacking ecosystem service bundles: Towards predictive mapping of synergies and trade-offs between ecosystem services	2017	255	31.88
Fraser, EDG, et. al	Bottom up and top down: Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management	2006	592	31.16
Castro-Arce, K; Vanclay, F	Transformative social innovation for sustainable rural development: An analytical framework to assist community-based initiatives	2020	144	28.80

Source: Authors' own elaboration

perspective aligns closely with the present study, which examines community-led entrepreneurial initiatives as vehicles for enhancing local adaptive capacity.

Co-authorship and co-citation networks

To complement the bibliometric mapping, we examined collaboration structures through a co-authorship network analysis (Fig. 3, left panel). The network includes 167 authors with at least two publications in the dataset, grouped into clusters (colours) according to the strength of their collaborative ties. Node size reflects the number of citations received by each author, while edge thickness indicates the frequency of co-authorship links. The visualization reveals a field that is both clustered around highly cited hubs and fragmented into smaller communities. Central figures such as Seyfang, Hielscher, Martinez-Alier, and McAlpine appear as large nodes, highlighting both their high citation impact and their centrality in connecting multiple research strands, particularly those focused on grassroots innovation, sustainability transitions, and socio-technical change. Beyond these hubs, several regional and thematic clusters are visible. For example, one group (green cluster) connects Central

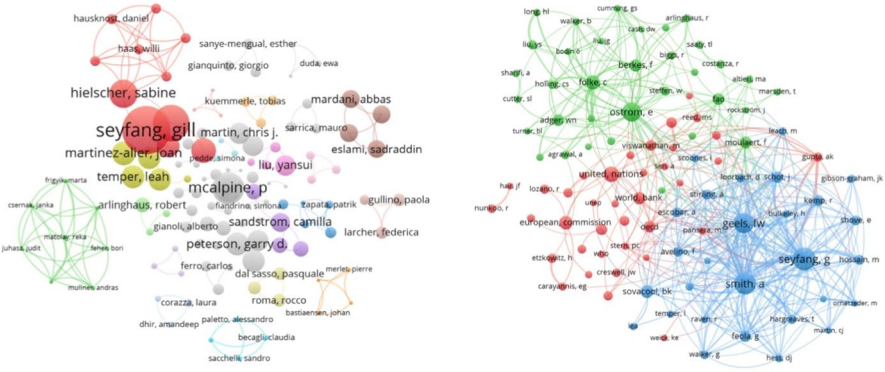

Fig. 3 Co-authorship (left) and co-citation (right) networks visualized in VOSviewer. Node size indicates citation count, edge thickness reflects link strength, and colors represent collaboration or intellectual clusters. Source: VOSviewer

and Eastern European researchers engaged in agro-ecological and community innovation. Another (red cluster) coalesces around sustainability transitions in the UK, while additional groups reflect collaborations on inclusive innovation, participatory governance, and cultural sustainability across Southern Europe and Latin America. Overall, the co-authorship network demonstrates the existence of influential, highly cited hubs, but also limited cross-cluster integration. This suggests that while a few key scholars anchor the field, much of the scholarship remains organized in relatively self-contained communities. These findings reinforce the thematic patterns identified earlier: a vibrant but somewhat fragmented field, where community-focused and grassroots innovation research achieves strong internal recognition but remains less connected to mainstream policy- or technology-driven streams.

In addition to mapping collaboration, we examined the intellectual structure of the field through a co-citation network of cited authors (Fig. 3, right panel). The network includes authors with at least 20 citations in our dataset, resulting in a map that highlights both canonical figures and thematic schools of thought. The visualization shows three major clusters: the green cluster (upper left), centered on Elinor Ostrom, Carl Folke, and Brian Walker, reflects the literature on social–ecological systems, resilience, and adaptive governance. The red cluster (center), anchored by organizations such as the United Nations, World Bank, and European Commission, captures policy-driven and institutional perspectives on sustainability and innovation. The blue cluster (right), dominated by Frank Geels, Gill Seyfang, and Adrian Smith, represents the socio-technical transitions and grassroots innovation community. Together, these clusters illustrate the field's dual anchoring in both policy-oriented governance frameworks and community/grassroots innovation scholarship, with resilience studies providing an additional conceptual foundation.

Most used methodologies and funding

The full breakdown of methodologies is visualized in Fig. 4. In 20.7% of the corpus, the case study (or case studies) were explicitly mentioned. Other frequent approaches

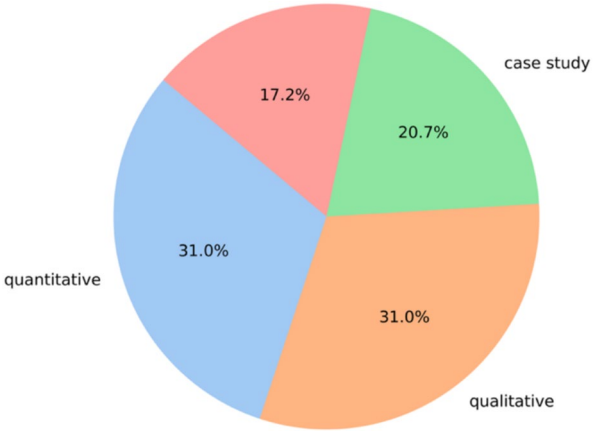

Fig. 4 Pie diagram showing the percentage of papers mentioning each methodology. Source: Authors' elaboration in Python

included cluster analysis, stakeholder analysis, network analysis, and structural equation modeling. Interestingly, the sample is split equally between qualitative and quantitative analysis (31% each) with mixed method used only in 17.2% of the analysed papers. It is interesting to note that the vast majority of community-focused papers employ a case study approach, emphasizing the embedded, situated, and participatory nature of this research stream. This confirms the relevance of qualitative, place-sensitive methodologies for investigating social and cultural sustainability but also underscore a shift toward a more quantitative approach to research also in social science (Brayne, 2021; Chaves Júnior et al., 2024; Welter et al., 2016).

Funding declarations were found in approximately 54% of the papers, suggesting that funded research constitutes a significant share of the field, although a considerable proportion of studies still proceed without explicitly reported financial support (Contreras Cruz et al., 2022; Derdabi & Dvouletý, 2025).

For instance, multiple studies involving case studies in grassroots innovation, community participation, or cultural regeneration acknowledge financial support from public agencies (e.g., EU Horizon 2020 (European Commission, 2014), national science foundations, or ministries of education and innovation). In contrast, papers relying on conceptual reviews, bibliometric mapping, or short commentaries are slightly less likely to include funding declarations. This suggests a non-random relationship: funded studies are more likely to deploy in-depth, qualitative methods such as case studies and interviews. The community-based and applied nature of qualitative fieldwork research aligns well with the goals of funders prioritizing impact, inclusion, or regional transformation.

LEVEL 2: from mapping to meaning, mainstream topics and themes

At the second level of the pyramid, the analysis moves beyond descriptive bibliometrics to uncover the thematic organization of the field through unsupervised machine learning. Whereas Level One established the overall size, growth, and methodological orientation of the literature, Level Two focuses on how research topics cluster together, how these themes have evolved over time, and where they are concentrated

geographically. By classifying the corpus into coherent thematic clusters, this stage provides a clearer picture of the intellectual structure of sustainability and entrepreneurship research, highlighting both dominant and marginal areas of inquiry. The results reported here therefore trace the field's mainstream trajectories, reveal its emerging lines of inquiry, and situate them within broader temporal and spatial contexts, setting the stage for the qualitative exploration in Level 3.

Machine learning clustering

To identify the main thematic areas within the dataset, we applied K-means clustering to the TF–IDF representation of article abstracts and titles (see Sect. "Quantitative methodology (level 1 and 2)"). This unsupervised approach partitions the literature into internally coherent groups, allowing us to map how research on sustainability and entrepreneurship organizes into distinct topical streams. The core focus of each cluster is summarized as follows:

Cluster 0 (65 papers): Sustainable Tourism and Cultural Heritage in Rural Contexts
Cluster 1 (113 papers): Energy Transitions and Low-Carbon Policy Innovation
Cluster 2 (56 papers): Grassroots and Inclusive Innovation Ecosystems
Cluster 3 (809 papers): Sustainability and Environmental Governance
Cluster 4 (112 papers): Smart and Inclusive Urban Sustainability Planning

Our clustering echoes debates in entrepreneurial ecosystem scholarship (e.g., Cavallo et al., 2018) about how actor configurations, resource flows, and institutional settings co-evolve.

A PCA (Principal Component Analysis, Gewers et al., 2021) projection was performed to visualize the spatial distribution of clusters in a two-dimensional space. PCA is a dimensionality reduction technique that transforms the dataset into a new coordinate system such that the greatest variance lies on the first principal component, the second greatest variance on the second component, and so forth. This visualization, shown in Fig. 5, helps to interpret proximity and overlaps among topic areas. In the figure, a different position of the points indicates different topics and themes, given the different values of their weights. Hence, by plotting the data in terms of the first two components, we visualized the key structures or patterns in the data.

The middle red points, belonging to Cluster 3 are central and lie in a region with strong overlap with blue (Cluster 0) and orange (Cluster 1) points. This indicates similarities in the topics covered by papers belonging to clusters 0, 1 and 3, which account for the great majority of the total production.

As hinted by the PCA figure, the number of papers for each cluster is very different, with Cluster 3 dominating the production with more than 800 papers (70% of the entire sample), as shown in Fig. 6.

In addition to providing a robust thematic classification, this clustering approach enabled us to trace how each theme evolved over time by examining annual publication trends, and to analyze their geographical distribution through author affiliations.

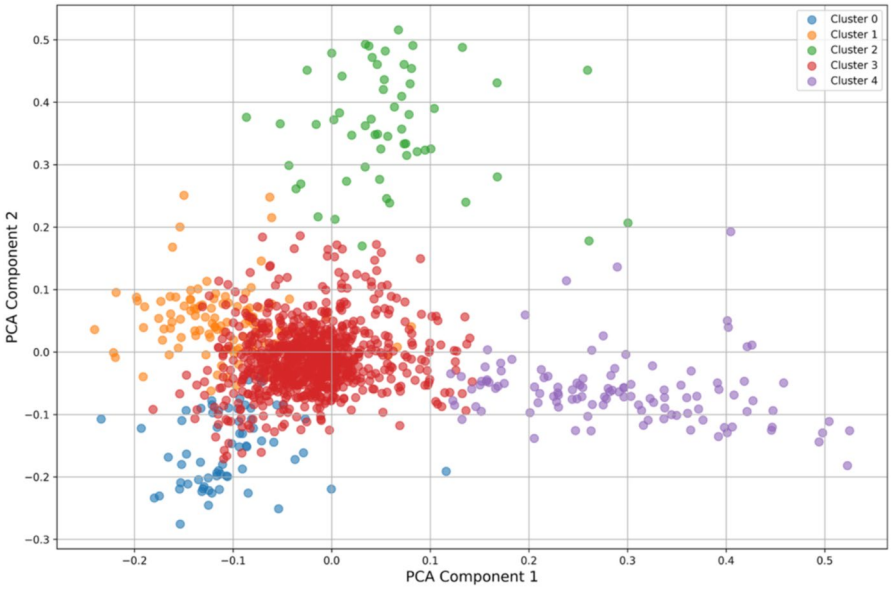

Fig. 5 Visualization of K-Means Cluster (K = 5) in the PCA 2D space. Source: Authors' elaboration in Python

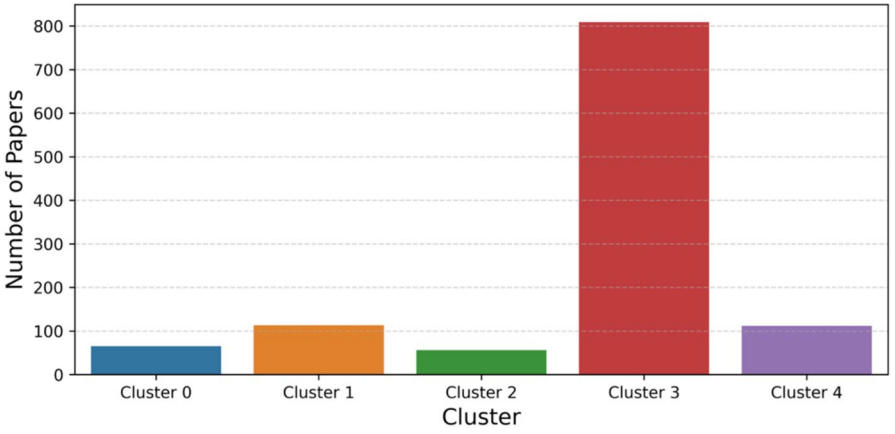

Fig. 6 Number of papers per cluster. Source: Authors' elaboration in Python

These insights are crucial for understanding not only what the dominant and emerging research areas are, but also when and where they have developed. Such contextual information allows us to situate the field's intellectual dynamics within broader institutional and territorial settings. Moreover, the resulting thematic clusters served as the conceptual anchors for the third stage of our analysis, guiding the design of the interview protocol for Officina Keller and providing a comparative framework for interpreting the qualitative findings.

Temporal distribution

Temporal evolution across clusters was also analyzed to track the rise or decline of specific thematic areas over time. The number of publications per cluster per year is plotted in Fig. 7, to highlight growth patterns. The production per year start to grow for all clusters around 2013, but Cluster 3 (Sustainability and Environmental) has dominated publication trends, peaking around 2023. This mainstream cluster has many keywords referring to policy and decision-making processes. As expected more than half of the most cited papers listed in Table 1 belong to Cluster 3 (6 out of 10), confirming the intellectual dominance of the environmental governance and mainstream sustainability literature. This is unsurprising given the global relevance of adaptive capacity, vulnerability, and ecosystem service frameworks (e.g., Purcell et al., 2019; Scheidel et al., 2020; Smit & Wandel, 2006; Spake et al., 2017). Interestingly, however, some of the most influential contributions are rooted in community-led and grassroots innovation perspectives, notably Fraser et al., 2006; Hargreaves et al. (2013) and Seyfang and Haxeltine (2012), which support the importance of bottom-up approaches in energy transition and sustainability governance Gao and Wu's (2017) study on rural tourism revitalization offers a strong example of cultural regeneration as a key mechanism in local development strategies, tying directly into Cluster 0. These high-impact papers provide conceptual and empirical depth to the themes surfaced in the K-means clustering and thematic map, confirming their relevance not only in frequency but also in scholarly influence. The only cluster that is not covered by the ten most cited papers is Cluster 1, despite its close relation to national and international policy agendas such as the EU Green Deal (European Commission, 2019).

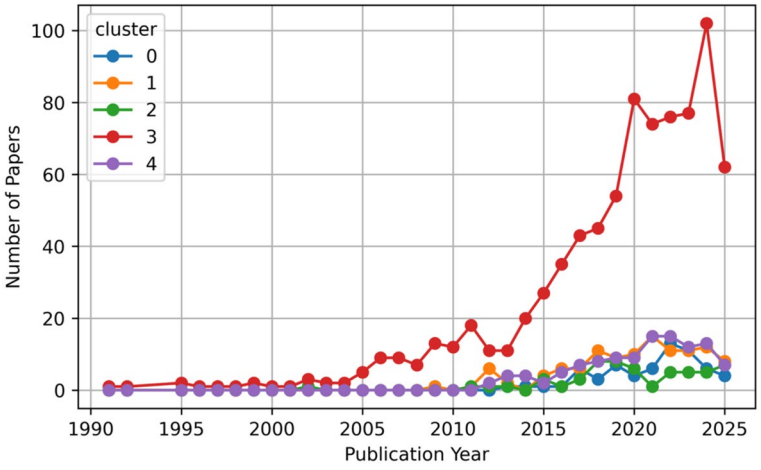

Fig. 7 Number of papers per year in each cluster, as indicated by the legend on the top left corner. Source: Authors' elaboration in Python

Geographical distribution

To complement the thematic clustering, we examined the geographical distribution of publications based on author affiliations (first and corresponding authors). This step highlights how national and regional research communities shape the field's priorities, revealing where different aspects of sustainability, community engagement, and innovation are most actively investigated. Geographic affiliation data were extracted from author metadata (from the Affiliations and Addresses columns, relative to the first and/or corresponding author). The leading countries in terms of scholarly output were Italy, England followed by China, Spain, Germany and USA. The breakdown by cluster, shown in Fig. 8, reveals distinct patterns of thematic specialization

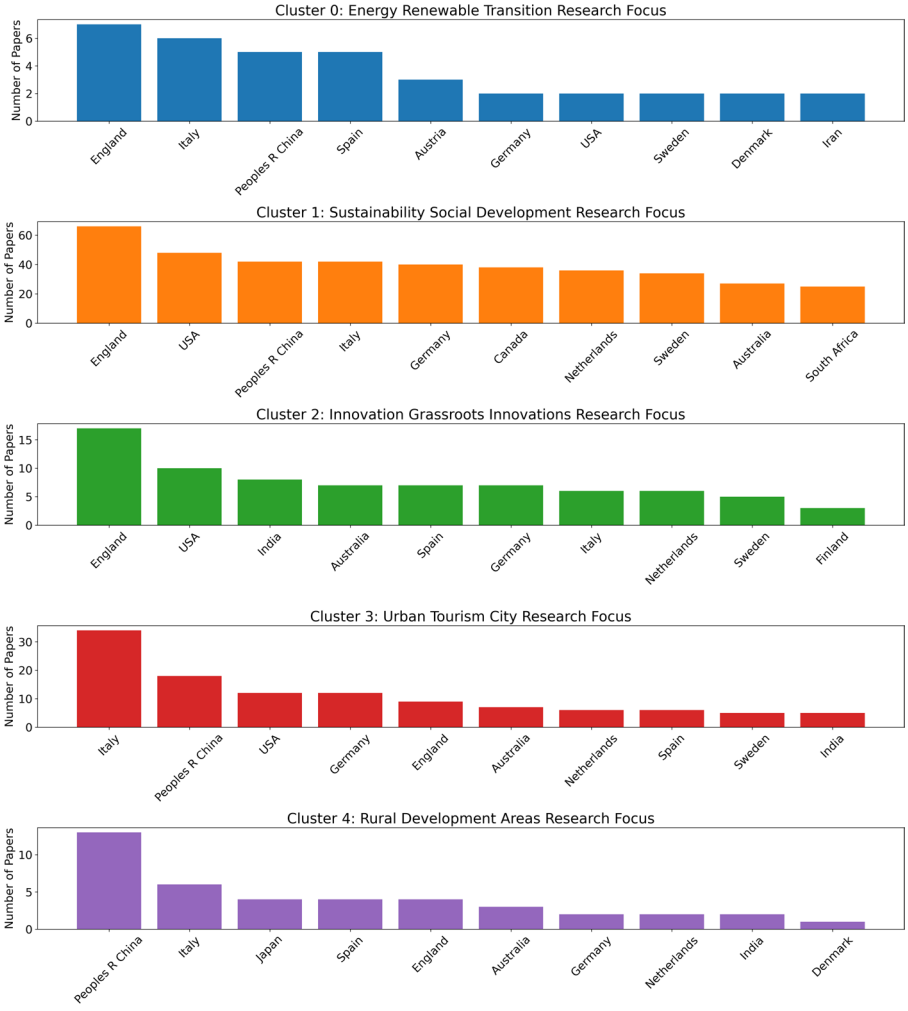

Fig. 8 Geographical distribution of the number of papers. For each cluster, we restrict the plot to the top 10 countries. Source: Authors' elaboration in Python

and regional concentration across the five K-means clusters hence highlighting how different national research communities prioritize specific aspects of sustainability, community engagement, and innovation.

Notably, Cluster 0, labeled Sustainable Tourism and Cultural Heritage in Rural Contexts, sees dominant contributions from Italy, followed by countries like China, Spain, and Greece. This aligns with Italy's well-established tourism sector, UNESCO heritage density, and policy emphasis on cultural preservation in rural and village contexts. Cluster 1, Energy Transitions and Low-Carbon Policy Innovation, is led again by Italy, reflecting the country's recent regulatory efforts in decarbonization and energy efficiency, especially within EU policy frameworks. Countries like Germany, USA, and Sweden also appear, which is consistent with their strong national strategies in renewable energy deployment and climate action. Cluster 2, focused on Grassroots and Inclusive Innovation Ecosystems, is more dispersed, with contributions from England, Italy, and Spain. This reflects how grassroots innovation is often studied in social contexts involving civic engagement and bottom-up experimentation, especially within European and Global North policy labs. Cluster 3, the largest by volume, relates to Mainstream Sustainability and Environmental Governance, and shows broad participation of all the most productive countries (England, China, USA, and Italy all appear prominently). This suggests that mainstream policy and governance debates attract international attention, possibly due to their transversality across urban, ecological, and institutional frameworks. Finally, Cluster 4, Smart and Inclusive Urban Sustainability Planning, is clearly dominated by England, but also includes diverse contributors such as USA, India, Spain, and Mexico, showing how smart city agendas have diffused globally, often in tandem with infrastructure investment and digital urbanism. Overall, the geographic distribution reflects how national policy agendas, regional sustainability priorities, and academic traditions shape the thematic clustering of sustainability scholarship. Europe appears somewhat central across clusters, possibly due to EU funding frameworks (like Horizon 2020) and strong alignment with the SDGs in national policy planning.

Taken together, these findings not only clarify how sustainability and entrepreneurship scholarship is distributed thematically, temporally, and geographically, but also provided the conceptual anchors for the qualitative exploration at Level 3. In particular, themes such as grassroots innovation, territorial regeneration, and governance informed the design of the interview protocol and the selection of stakeholders for the Officina Keller case study, to which we now turn.

LEVEL 3: exploring community entrepreneurship in practice

The first two levels of the analysis traced the intellectual contours, thematic organization, and geographical distribution of scholarship on sustainability and entrepreneurship. Yet bibliometric mapping and clustering cannot capture the lived, relational, and community-anchored dimensions of entrepreneurial practice. Level 3 therefore turns to the qualitative case study of Officina Keller, a cultural and creative enterprise in southern Italy, to explore how these dynamics unfold in practice. The initiative promotes activities closely aligned with the themes identified in the quantitative analysis (grassroots innovation, territorial regeneration, and adaptive governance)

and provides a situated lens through which to interrogate and refine broader discursive patterns.

As illustrated in Fig. 9, the qualitative analysis identified three core dimensions that structure community-led innovation: Community Cohesion, Territorial Regeneration, and Techno-Economic Innovation. Derived inductively from the interviews and mapped through the Lazarsfeld framework, these dimensions provide an analytical lens for understanding how entrepreneurial practices are embedded in social relations, spatial imaginaries, and material infrastructures. Scores were assigned using a 0–2 ordinal scale derived from the coding scheme: 0 = minimal or sporadic evidence, 1 = partial or emerging practices, and 2 = structured, continuous, embedded practices. Examples include active co-design and diverse participation for high community cohesion, systemic landscape restoration for high territorial regeneration, and strategic use of appropriate technologies with stable multi-level funding for high techno-economic innovation. Iterative coding across the research team ensured consistency.

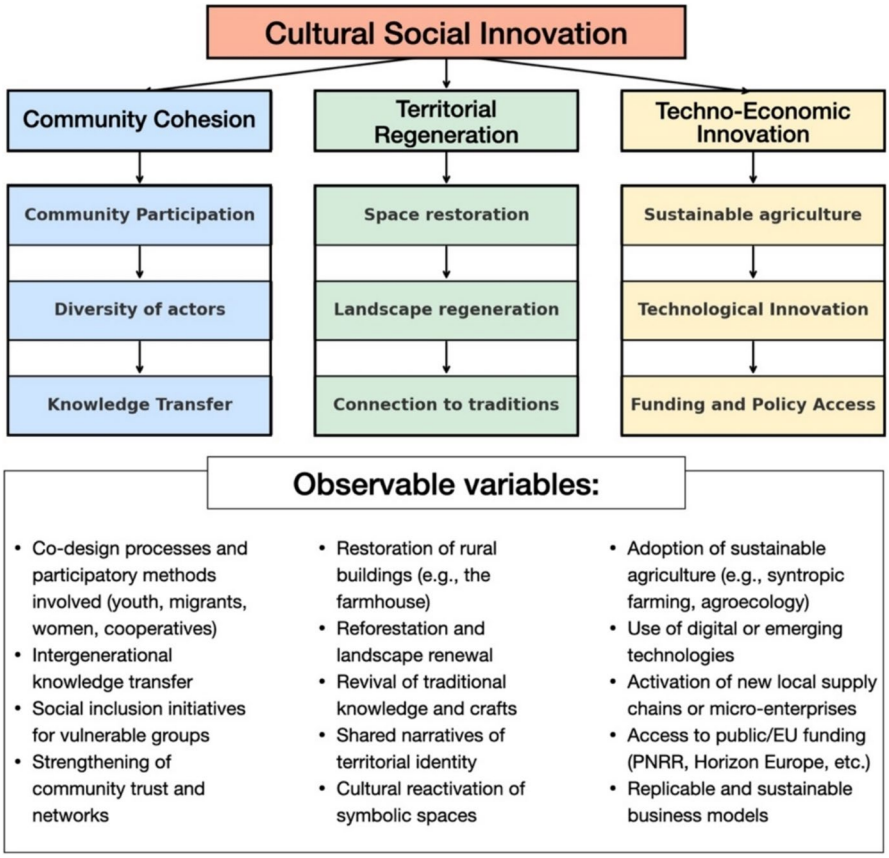

Fig. 9 Lazarsfeld Model diagram on Cultural Social innovation (main dimension of analysis, sub-dimensions and indicators). Source: Authors' owns elaboration

The heatmap of coded interviews shown in Fig. 10 reveals consistently high scores for both Community Cohesion and Territorial Regeneration (mean = 1.58, SD = 0.57 and mean = 1.58, SD = 0.51, respectively). This indicates a strong and widespread commitment to participatory practices, cultural heritage revitalization, and ecological regeneration. Interview narratives confirm these findings, often emphasizing trust, collaboration, and care as central resources. As one participant explained, "The network of relationships is more important than any funding. It already creates a strong base of market and demand" (Interview 5). Another added, "We need to build community, stay close, be clear on what we are doing" (Interview 8). Such accounts demonstrate that cohesion is not only a functional resource but also an affective and symbolic foundation for collective action.

Territorial regeneration was equally prominent in the interviews, with participants describing practices that combined material restoration and symbolic re-signification of space. One interviewee noted, "We cultivate ancient varieties on abandoned land, using sustainable methods, without irrigation" (Interview 3), while another emphasized replanting lost Mediterranean vegetation (Interview 6). For some, regeneration was explicitly framed as a response to decline: "What we do here is also a way of responding to the disintegration of the territory, of giving it meaning again" (Interview 10). These reflections underscore how regeneration encompasses ecological, cultural, and emotional dimensions simultaneously.

By contrast, Techno-Economic Innovation emerged as weaker and more fragmented (mean = 0.87, SD = 0.48). This lower and more variable performance reflects systemic barriers rather than lack of creativity: participants highlighted small-scale experiments in sustainable agriculture, occasional adoption of digital tools for visibility, and improvised technological solutions. Yet many stressed difficulties in

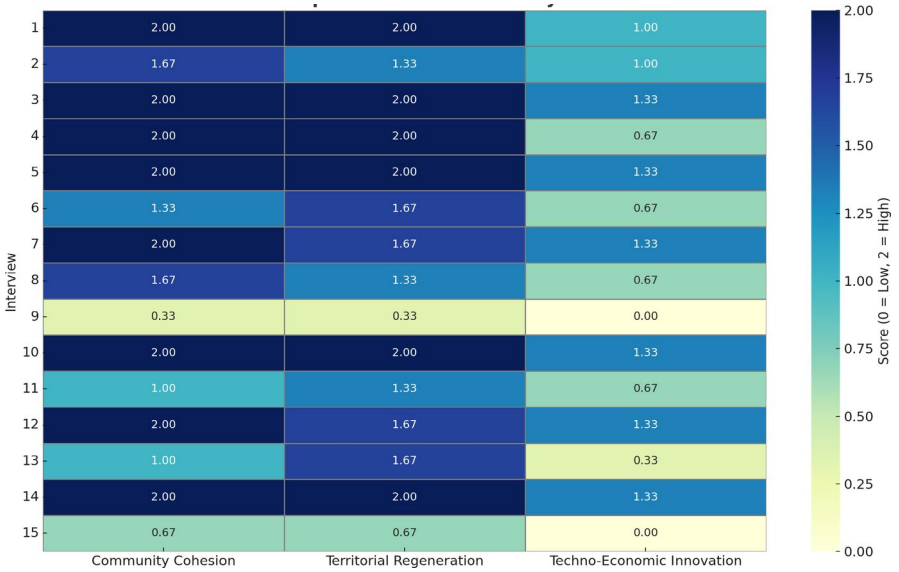

Fig. 10 Heatmap of dimension scores by 15 interviews. Source: Authors' elaboration in Python

scaling, fragile access to funding, bureaucratic opacity, and limited technical expertise. Indicators included sustainable agricultural practices, low-impact technological adoption, and access to multi-level funding/policies. Compared with the other two dimensions, this dimension revealed structural fragilities in the local innovation ecosystem, showing that while cultural and social resources are abundant, techno-economic infrastructures remain precarious. As one interviewee explained, "We can't access public funds. Innovation remains marginal; everything is self-financed" (Interview 9). Another observed, "There's a lot of energy and creativity, but no structure. Everything remains at the voluntary level" (Interview 12). This gap highlights a structural fragility in the local innovation ecosystem: while rich in cultural and social resources, it remains under-supported by institutional and techno-economic infrastructures.

When compared with the bibliometric clusters, the Officina Keller findings both confirm and complicate mainstream narratives. Themes such as community participation, grassroots innovation, and cultural regeneration, which appeared as secondary or niche in the thematic mapping, emerge here as central and richly elaborated. Conversely, clusters emphasizing policy frameworks, energy transitions, or technological infrastructures resonate only partially with local practice, where resource constraints and institutional neglect limit their realization. This reveals a clear tension between theoretical frameworks and empirical realities: while the literature highlights techno-economic innovation and governance mechanisms, the case study underscores the primacy of social trust, cultural continuity, and symbolic re-signification as drivers of entrepreneurial practice. Table 2 presents a comparative synthesis of how the five bibliometric clusters align with the three Lazarsfeld dimensions derived from fieldwork.

Overall, the Officina Keller case demonstrates how community-led entrepreneurship mobilizes intangible assets such as trust, memory, and identity to generate new forms of value. It also highlights the asymmetry between academic discourse and empirical reality: while the literature increasingly acknowledges social and cultural sustainability, practice remains constrained by fragile institutional support and limited technological capacity. In this way, the qualitative analysis both complements and deepens the quantitative results: it confirms the centrality of community cohesion and territorial regeneration, while exposing the fragility of techno-economic innovation. This creates a seamless transition between macro-level trends and micro-level mechanisms. By embedding qualitative insight within the upside-down pyramid, this final level not only validates but also reframes the broader patterns identified earlier, underscoring the importance of culturally grounded and community-driven forms of entrepreneurship in sustainability transitions. These additions make explicit how the bibliometric mapping informed the qualitative stage, and how the case study operationalizes and tests the patterns surfaced in the earlier levels.

Cross-level synthesis of findings

Our integrated analysis reveals a layered understanding of how entrepreneurship is framed and practiced within socially and culturally sustainable paradigms. This section brings together the findings of the upside-down pyramidal design, combining

Table 2 Comparative cluster–dimension matrix

Cluster	Lazarsfeld → / Cluster Topic ↓	Community Cohesion	Territorial Regeneration	Techno-Economic Innovation
0	Sustainable Tourism and Cultural Heritage in Rural Contexts	**High**: cultural participation, stakeholder engagement, local memory	**High**: adaptive reuse of rural/village spaces, symbolic revitalization	**Low**: economic models often traditional, less digital/innovative
1	Energy Transitions and Low-Carbon Policy Innovation	**Medium**: policy focus with some community-driven energy initiatives	**Medium**: infrastructure-focused, environmental upgrades	**High**: strong presence of technological solutions, policy instruments, funding frameworks
2	Grassroots and Inclusive Innovation Ecosystems	**High**: emphasis on collective agency, inclusivity, local participation	**Medium**: symbolic and social innovation often without physical transformation	**Low**: limited technological tools, reliant on volunteer efforts
	Sustainability and Environmental Governance	**Medium**: large-scale governance and policy instruments, often top-down	**Medium**: institutional regeneration, not place-specific	**Medium**: strong in regulatory tools, less in community-based innovation
4	Smart and Inclusive Urban Sustainability Planning	**Medium**: participatory urban governance, social inclusion strategies	**High**: infrastructure, renewal, smart cities, space transformation	**High**: focus on smart technologies, data, and urban systems

Source: Authors' own elaboration

bibliometric mapping (Level 1), thematic clustering (Level 2), and a field-based case study (Level 3). Together, these levels provide a multi-scalar reading of how entrepreneurship, when rooted in social and cultural sustainability, is conceptualized in scholarship and enacted in practice.

With regard to RQ1, the bibliometric analysis demonstrates a significant shift in the scholarly treatment of entrepreneurship and sustainability over the past three decades. Themes that were once peripheral—such as grassroots innovation, collective agency, cultural regeneration, and territorial cohesion—have become increasingly prominent, pointing to a more pluralistic understanding of entrepreneurial

practice (Welter et al., 2016; Zahra et al., 2014). Nevertheless, the literature still privileges environmental and economic framings, leaving the social and cultural pillars comparatively underdeveloped.

Turning to RQ2, the clustering analysis revealed five dominant thematic streams: sustainable tourism and cultural heritage (C0), energy transitions and low-carbon innovation (C1), grassroots and inclusive innovation (C2), environmental governance (C3), and smart and inclusive urban sustainability (C4). The distribution of publications is highly unbalanced, with C3 alone accounting for nearly 70 percent of the corpus. This confirms the prevalence of policy-driven and institutional approaches, despite the growing presence of more community-centric topics. The temporal analysis shows that output accelerated rapidly after 2013, while geographical patterns reveal national specializations: Italy in tourism and energy, the United Kingdom in governance and urban planning, and China in environmental policy. These dynamics suggest that institutional and policy frameworks strongly shape the evolution of the field.

As for RQ3, methodological mapping shows an almost even split between qualitative and quantitative approaches (31 percent each), with mixed-methods still rare. Case studies are concentrated in the clusters most closely associated with community engagement (C0 and C2) and are more often supported by public funding, whereas quantitative approaches dominate governance and policy evaluation clusters. Citation analysis reinforces this imbalance, as six of the ten most cited papers belong to C3, reflecting the discursive dominance of environmental governance, although influential contributions also appear in grassroots innovation and cultural regeneration.

Finally, in relation to RQ4, the Officina Keller case provides a situated lens through which to test and extend these patterns. Fieldwork identified three key dimensions of community-led innovation: community cohesion, territorial regeneration, and techno-economic innovation. While the first two dimensions were consistently strong, the third proved fragile, highlighting a gap between cultural-social vibrancy and institutional-technological support. These findings are further explored in the next section, where we compare the Lazarsfeld dimensions with the bibliometric clusters to assess points of convergence and divergence.

Bridging scholarly themes with situated entrepreneurial realities

This section explicitly integrates the bibliometric and qualitative levels of analysis, showing how the five clusters identified in Levels 1 and 2 converge and diverge with the three dimensions derived from the Lazarsfeld coding of interviews.

The integrated design of this study allows for a synthetic reading across levels. Bibliometrics (Level 1) captures the general landscape of academic production; clustering (Level 2) organizes dominant themes and methodologies; and fieldwork (Level 3) adds depth and situated insight, revealing how academic concepts materialize, or fail to, within specific territories. Together, the three levels link discursive patterns with experiential knowledge. This triangulated approach shows that sustainable entrepreneurship is not only a matter of institutional design or environmental metrics, but also of community cohesion, symbolic regeneration, and relational infrastructures. While the academic literature has begun to reflect this plurality, its thematic and

methodological structure still lags behind the complexity of entrepreneurial realities observed on the ground.

The insights from the Officina Keller case serve to validate, complicate, and extend the thematic patterns revealed in the bibliometric analysis. This layered comparison underscores the asymmetry between discourse and practice (Osmanovic, 2025). While scholarship increasingly embraces the social and cultural dimensions of sustainability, empirical realities in marginalised contexts remain under-supported (Sauermann, 2023). The integration of bibliometric and qualitative approaches thus does more than provide triangulation (Correggi, 2024): it reveals a conceptual tension between aspiration and implementation, between how community-led entrepreneurship is theorized and how it is lived (Maldonado-Mariscal & Alijew, 2023).

To bridge the clusters identified in Sect. "Cross-level synthesis of findings" with the Lazarsfeld dimensions derived from fieldwork, Table 2 presents a comparative synthesis. It shows how the five bibliometric clusters align unevenly with the three dimensions of Community Cohesion, Territorial Regeneration, and Techno-Economic Innovation. For example, Cluster 0 (sustainable tourism) and Cluster 2 (grassroots innovation) score highly on cohesion but lag in technological integration. Clusters 1 and 4 are stronger in techno-economic infrastructure, yet only moderately embedded in local communities. Cluster 3, which dominates the dataset, offers a more institutional and policy-driven view of sustainability that aligns only partially with field realities.

The matrix reveals how community-led entrepreneurship unfolds in ways that both reflect and disrupt the dominant scholarly narratives captured in our bibliometric clustering. The three empirical dimensions that emerged from our fieldwork interact unevenly with the five thematic clusters previously identified.

First, community cohesion, as evidenced in Officina Keller through horizontal networks, co-design practices, and intergenerational collaboration, aligns closely with Cluster 2 (Grassroots and Inclusive Innovation Ecosystems) and Cluster 0 (Sustainable Tourism and Cultural Heritage). However, our interviews suggest a richer, more emotionally embedded conception of community than is typically theorized. For example, interviewees emphasized care, mutual support, and symbolic ownership of space, but these words rarely appear in cluster-level abstracts, despite their analytical importance in practice.

Second, territorial regeneration, expressed through spatial reuse, cultural memory, and ecological restoration, resonates partially with Cluster 0 and Cluster 4 (Smart and Inclusive Urban Sustainability Planning). Yet, while Cluster 4 often centers on urban, tech-enabled planning, Officina Keller shows how rural regeneration can be low-tech, culturally driven, and symbolic. This suggests a different ontology of innovation—one grounded in re-signifying place rather than infrastructural overhaul.

Third, techno-economic innovation remains the most tenuous. Although Clusters 1 and 3 focus heavily on energy transitions, policy mechanisms, and low-carbon strategies, these themes are only marginally present in the case. Most actors described technological innovation as emergent, improvised, or inaccessible. As one interviewee put it, “There is a lot of creativity, but no structure—everything is still at the voluntary level.” These divergences are not merely empirical; they reflect deeper epistemological and structural asymmetries between institutional logics of

innovation and the actual capacities of community initiatives to engage with them. While the literature maps innovation through measurable outputs and institutional frameworks, grassroots initiatives like Officina Keller prioritize relational dynamics, symbolic meaning-making, and cultural continuity, which are dimensions largely invisible to large-scale bibliometric tools. This disconnect is particularly apparent in the positional marginality of themes related to community, cohesion, and place in our thematic map (Fig. 2), despite their centrality in lived entrepreneurial practice. In this sense, the Officina Keller case functions as an embedded narrative that reframes what counts as innovation and highlights what bibliometric methods may miss. Importantly, the three field-derived dimensions do not map cleanly onto the five clusters. Instead, they cut across them, offering a new organizing logic that challenges disciplinary silos and expands the scope of sustainable entrepreneurship research.

Pyramidal synthesis

The upside-down pyramid design facilitates this cross-level dialogue. Table 3 synthesizes the methods, outputs, and key findings at each level, showing how broad bibliometric mapping informed clustering, which in turn guided the design of the qualitative case study. The upside-down pyramid design is thus not only methodological but also epistemological: it reverses the usual flow from grounded observation to general theory, and instead moves from structural mapping to embedded understanding, facilitating a dialogue between discursive patterns and experiential knowledge.

To make the layered design of the upside-down pyramid more transparent, Table 3 synthesizes the methods, outputs, and key findings from each level of analysis, while also illustrating how they connect and build upon one another. It also highlights how each stage of the pyramid informs the next, culminating in a multi-scalar perspective that connects bibliometric trends, thematic clusters, and qualitative insights from the analysis of the interviews to stakeholders of Officina Keller.

Discussion and implications

This study advances a more nuanced understanding of sustainable entrepreneurship by connecting macro-level discursive trends with micro-level practices rooted in local culture, community, and territory. Through an integrated framework that combines bibliometric mapping, thematic clustering, and qualitative field inquiry, it exposes a structural tension between the increasing rhetorical emphasis on social and cultural dimensions in academic and policy discourse, and the practical realities experienced by community-based initiatives. While scholarly output reflects a growing interest in inclusivity, grassroots innovation, and cultural regeneration, these dimensions remain largely under-resourced and institutionally marginal. This section discusses the implications of these findings across three domains: theory, practice, and policy. This section discusses the implications of these findings across three domains: theory, practice, and policy.

Table 3 Synthesis of themes and findings across the three levels of the upside-down pyramid

Level of analysis	Method	Main outputs	Key themes/findings	Connection to next level
Level 1: Bibliometric mapping	Bibliometrix, descriptive statistics	1,155 articles; growth trends; methodology breakdown	Broad rise of community-led and cultural entrepreneurship; dominance of environmental governance (Cluster 3)	Informs clustering by highlighting recurringkeywords and methodological gaps
Level 2: Thematic clustering	TF–IDF + K-means (K = 5); PCA	5 clusters identified	C0: Tourism & Heritage; C1: Energy & Low-Carbon; C2: Grassroots Innovation; C3: Environmental Governance; C4: Urban Sustainability	Provides thematic anchors for qualitative comparison with Officina Keller
Level 3: Semi-structured interviews	15 semi-structured interviews; Lazarsfeld coding	3 dimensions, 9 indicators; heatmap	High: Community cohesion & Territorial regeneration; Low: Techno-economic innovation	Validates and enriches clusters by showing centrality of social/cultural dynamics underrepresented in literature

Theoretical implications

Theoretically, this study contributes to the repositioning of social and cultural dimensions within the field of sustainable entrepreneurship, long dominated by environmental and economic framings (Biberhofer et al., 2021). We offer here a theoretical reframing of entrepreneurship as an embedded, place-sensitive process, shaped by interlocking dimensions of community, territory, and infrastructure. We hence rein-

force earlier arguments that entrepreneurship is deeply embedded in community structures and local cultures. Peredo and Chrisman (2006) and Welter et al. (2016) emphasized the relational and context-sensitive nature of entrepreneurship, and the high scores for community cohesion and territorial regeneration observed in Officina Keller confirm this embeddedness perspective. At the same time, the weaker performance of the techno-economic dimension echoes the gaps identified by Sica et al. (2024) and Karatas-Özkan et al. (2021), who highlight the persistent underrepresentation of social and cultural pillars in mainstream sustainability research.

Methodologically, the upside-down pyramid contributes to recent calls for pluralism in entrepreneurship research (Contreras Cruz et al., 2022). While bibliometric reviews such as Baier-Fuentes et al. (2019) have mapped the field's intellectual structures, they remain limited in capturing the lived realities of entrepreneurship. By integrating clustering analysis with a qualitative case study, our approach addresses this shortcoming, offering a model that not only identifies macro-level patterns but also explores their articulation, and sometimes dissonance, in situated practices. In this way, our study both confirms existing theoretical insights and expands methodological approaches for investigating socially and culturally embedded entrepreneurship.

By foregrounding grassroots innovation, territorial regeneration, and community participation, it aligns with recent research advocating for a more contextual, embedded, and relational understanding of entrepreneurial processes (Welter et al., 2016; Zahra et al., 2014). Rather than treating entrepreneurship as an individualistic, market-oriented phenomenon, this study affirms its role as a socially situated and culturally mediated practice that mobilizes collective agency, rebuilds local identity, and reactivates symbolic resources.

A key theoretical contribution of this study is the operationalization of a sociological framework initially theoritised by Lazarsfeld (1969), which translates qualitative complexity into structured, comparative indicators. As also argued by Bagnoli and Megali (2011), codifying these dynamics not only enhances the analytical precision of community entrepreneurship research but also allows for comparative generalization across contexts. Drawing on bibliometric evidence and grounded fieldwork, we identify three core dimensions: community cohesion, territorial regeneration, and techno-economic innovation, which together offer a relational lens for understanding sustainable entrepreneurship. These dimensions both intersect with and reconfigure the five thematic clusters identified through K-means clustering of the papers from the literature:

Community Cohesion is most strongly reflected in Cluster 2 (Grassroots and Inclusive Innovation Ecosystems) and Cluster 0 (Sustainable Tourism and Cultural Heritage). These clusters emphasize participation, local agency, and social innovation. However, they remain underrepresented in the mainstream literature, despite their central role in the field-level dynamics observed with the stakeholders interviews by Officina Keller.

Territorial Regeneration aligns with Cluster 0 (Smart and Inclusive Urban Sustainability Planning), but also partially intersects with Cluster 4 (Sustainable Tourism and Cultural Heritage in Rural Contexts). While urban-focused regeneration tends to be institutional and infrastructure-driven, the Officina Keller case shows how

symbolic and cultural reactivation of space can drive innovation even in non-urban, under-resourced settings.

Techno-Economic Innovation dominates Cluster 1 (Energy Transitions and Low-Carbon Policy Innovation) and Cluster 4, and is central to Cluster 3 (Sustainability and Environmental Governance). These clusters are associated with formal technologies, regulatory instruments, and policy frameworks. Yet, our fieldwork reveals that in grassroots contexts, such innovation is often fragile, informal, or even absent—suggesting a conceptual disconnect between scholarly models and on-the-ground capabilities.

In this way, the three dimensions offer a synthesizing lens: they allow for comparison across literature streams while grounding theory in lived practice. This responds directly to calls in the entrepreneurship field for more pluralistic, relational, and territorially aware models (Karatas-Özkan et al., 2021; Welter et al., 2016; Zahra et al., 2014). This alignment (and misalignment) between thematic clusters and grounded dimensions highlights a critical tension in the literature. While academic discourse increasingly references community participation and place-based development, the conceptual center of gravity remains heavily skewed toward techno-economic framings, particularly in highly cited and policy-aligned publications (e.g., Cluster 3).

Our framework thus addresses a key gap: by relating thematic macro-patterns in the literature to embedded micro-level practices, we expose how entrepreneurial innovation actually unfolds in marginalized contexts. Rather than viewing social and cultural dynamics as ancillary to "real" innovation, we propose that they are foundational—especially where formal infrastructures are weak or exclusionary.

While bibliometric techniques offer breadth and replicability, they are poorly equipped to account for lived experience, relational infrastructure, or informal governance. These limitations are particularly problematic in research on socially embedded forms of entrepreneurship. Our integrated approach demonstrates how qualitative inquiry can surface critical aspects such as symbolic legitimacy, emotional geographies, and improvisational tactics—elements often invisible in large-scale mappings but essential to understanding entrepreneurial processes in marginal territories.

Practical and managerial implications

The findings have important practical implications for actors engaged in community-based and place-sensitive entrepreneurship. Initiatives like Officina Keller often rely on intangible but powerful forms of capital: social trust, cultural memory, and spatial familiarity. These are not passive background conditions, but active enablers of entrepreneurial innovation and long-term resilience. As shown by Vlasov et al. (2018), such embeddedness allows communities to mobilize even in the absence of formal support, crafting new forms of value through symbolic reappropriation of space and collaborative governance. However, the study also reveals a systemic misalignment between these grassroots resources and the infrastructures needed to sustain them over time. Most notably, techno-economic innovation remains a weak dimension in the Officina Keller context, not because of lack of creativity or initiative, but due to fragile funding ecosystems, bureaucratic opacity, and limited access to digital tools or scalable business models. What is celebrated in literature as grassroots innovation

frequently manifests in practice as adaptation under constraint: reliant on bricolage, improvisation, and informal networks. These practices are agile and contextually intelligent but often remain structurally precarious.

This suggests a need for new forms of intermediation—such as local innovation hubs, public–community partnerships, or mission-oriented cooperatives—that can translate community knowledge into models intelligible to funders and institutions (OECD, 2023). For practitioners and local managers, this also implies expanding their skillset beyond facilitation and co-design, toward grant writing, technological engagement, and strategic networking. Framing Officina Keller as a exploratory initiative is instructive in this regard: although deeply situated in its context, it exhibits relational and organizational patterns that could be transferable to other regions facing similar socio-spatial challenges. Its value lies not only in what it achieves locally, but in what it models—its heuristic potential as a site of institutional learning.

Practically, several concrete steps can be recommended for community-based entrepreneurs:

Strategic engagement with funding bodies – Actively seek out local, national, and European funding programs. Framing projects in terms of measurable cultural and social impacts can increase eligibility, while advocacy efforts should push for the inclusion of relational and symbolic value in evaluation frameworks.
Public–private partnerships – Collaborate with municipal governments, universities, and private sponsors to connect grassroots creativity with institutional resources.
Leveraging digital tools – Use low-cost digital platforms to enhance visibility and coordination, for instance by creating online marketplaces for cultural products, adopting collaborative tools, or using social media storytelling to mobilize heritage and attract supporters.
Local innovation hubs and cooperatives – Establish intermediary organizations to translate community knowledge into formats intelligible to policymakers and funders, while also fostering peer-to-peer learning among grassroots initiatives.

By adopting these practices, community-based entrepreneurs can strengthen their capacity to secure resources, expand their reach, and ensure the sustainability of their initiatives.

Policy implications

The study's findings also raise significant implications for local, national, and European policy frameworks. While sustainability policies increasingly reference community engagement and cultural vitality, actual support mechanisms remain rigidly structured around techno-economic metrics and standardized outputs (European Environment Agency, 2024). This results in a persistent misalignment between what is promoted discursively and what is funded and institutionalized in practice. The Officina Keller case illustrates this gap with particular clarity. Although it embodies many principles of sustainable innovation (ecological stewardship, participatory governance, cultural regeneration) it struggles to access funding or formal recognition. This is not due to irrelevance or ineffectiveness, but to its incompatibility with existing evaluation criteria. Local actors report fragmented policy instruments, opaque

procedures, and an absence of meaningful engagement with decision-makers. While institutional discourse champions community participation, practical channels for such participation often remain elusive or tokenistic. Addressing this disconnect requires systemic change. Public programmes must broaden eligibility and assessment frameworks to acknowledge relational, symbolic, and cultural value creation. Policies should institutionalize co-design as a standard mechanism, not an exception, and support long-term partnerships between grassroots initiatives and public institutions (Palazzo et al., 2022). Informal, community-driven models of entrepreneurship must be recognized not as "pre-entrepreneurial" but as legitimate forms of innovation in their own right.

At the European level, initiatives such as the New European Bauhaus offer promising opportunities for cultural and territorial innovation (European Commission, 2022). Yet to fully realize their potential, such programmes must evolve to include technical assistance, flexible reporting structures, and multi-tiered funding portfolios (Puerari & Deserti, 2025). Only through this kind of systemic realignment can community-led entrepreneurship be scaled, replicated, and sustained as a pillar of transformative, place-based development.

In summary, policymakers should broaden eligibility frameworks to recognize relational, symbolic, and cultural forms of value creation. This requires institutionalizing co-design as a standard mechanism, supporting long-term partnerships between grassroots initiatives and public institutions, and creating multi-tiered funding structures that combine technical assistance with flexible reporting requirements. At the European level, initiatives such as the New European Bauhaus provide promising models, but they must evolve to include stronger mechanisms for supporting grassroots-led innovation. Only through systemic realignment can community-based entrepreneurship be scaled, replicated, and sustained as a pillar of transformative, place-sensitive development.

Conclusions and future agenda

This study set out to explore the intersections of social innovation, community engagement, and cultural sustainability within the broader domain of sustainable entrepreneurship. Employing an "upside-down pyramid" analytical design, we began by mapping the scholarly field through a large-scale bibliometric analysis of 1,155 peer-reviewed publications. We then narrowed the focus through a thematic clustering of research trends and methodologies, before zooming into the situated practices of Officina Keller: a grassroots initiative for cultural and territorial regeneration in Southern Italy. This multi-scalar approach allowed us to integrate macro-level discursive patterns with micro-level empirical insight, capturing both the structure and substance of socially and culturally sustainable entrepreneurship.Our findings confirm that the academic literature has progressively embraced themes such as grassroots innovation, participatory development, and community-led territorial regeneration. Yet, despite this conceptual evolution, the field remains structurally anchored to environmental governance and techno-economic paradigms. The Officina Keller experience vividly exposes the gap between theoretical ambition and institutional implementation: while the initiative exemplifies high levels of community cohesion and cultural revitalization, it operates in conditions of infrastructural fragility, limited

access to funding, and lack of formal recognition. This disconnect calls into question the coherence of sustainability discourses that celebrate community participation rhetorically, yet fail to support it meaningfully in practice.

Methodologically, the study demonstrates the value of combining quantitative mapping with qualitative depth. The bibliometric analysis offered a panoramic, structural overview of how the field is configured—its dominant clusters, conceptual blind spots, and geographic distribution. In contrast, the field-based inquiry served as a diagnostic lens, illuminating the symbolic, relational, and improvisational dimensions of entrepreneurship that are often invisible to large-scale data. Taken together, these lenses reveal not only how sustainable entrepreneurship is talked about, but how it is actually lived.

However, the study has limitations. It draws on a single exploratory case study in a specific geographic and cultural context. While the Officina Keller case offers rich empirical insights into community-led entrepreneurship and culturally embedded innovation, its contextual specificity inevitably limits generalizability. The initiative is deeply rooted in a particular socio-cultural and territorial configuration (Southern Italy's post-industrial landscape and civic traditions) making it difficult to extrapolate findings without careful adaptation. Moreover, while our coding strategy was designed to ensure transparency and reliability, the qualitative component is based on a relatively small and exploratory sample of 15 interviews. The results should therefore be interpreted as indicative rather than statistically generalizable, serving primarily to illustrate patterns, surface relational dynamics, and generate theoretical insights. At the same time, this localized focus should not be seen as a constraint but as a methodological and epistemological strength, aligning with grounded theory approaches that prioritize situated meaning-making and inductive theory-building (Glaser & Strauss, 1967; Creswell & Plano Clark, 2011). Our exploratory case study focussing on 15 interviews of stakeholders in the ecosystem of Officina Keller serves a heuristic function, revealing latent dynamics and tensions that may also be present, but differently articulated, in other contexts. In this sense, the case functions less as a standalone model than as a generative lens. This resonates with calls in the literature to adopt more interpretive, relational, and context-sensitive approaches to entrepreneurship research, especially when investigating informal, place-bound forms of innovation (Karatas-Özkan et al., 2021; Vlasov et al., 2018). Future comparative studies could explore how the analytical dimensions proposed here (community cohesion, territorial regeneration, and techno-economic innovation) manifest across different cultural and institutional terrains, potentially building toward a more flexible yet grounded typology of community-based entrepreneurship.

Future research should build on three main trajectories. First, there is a need for comparative and longitudinal studies that track how community-driven entrepreneurship evolves across different institutional, territorial, and cultural environments. Such studies could assess the replicability and resilience of grassroots innovation models over time. Second, the field would benefit from methodological pluralism, including more mixed-methods designs that bridge the richness of ethnographic insight with the generalizability of statistical patterns. In particular, frameworks that evaluate the social and cultural impact of entrepreneurial initiatives, beyond market metrics, are crucial for developing more inclusive evaluation tools. Third, more attention should

be given to institutional intermediation mechanisms: how grassroots actors engage with, adapt to, or resist public policy frameworks, innovation systems, and financial infrastructures. Research in this area could inform policy design, improve funding instruments, and support the creation of enabling environments that recognize and legitimize informal or symbolic forms of entrepreneurship.

In conclusion, this study argues that sustainable entrepreneurship cannot be fully understood nor effectively supported, without acknowledging its social and cultural dimensions. These are not peripheral to innovation, but foundational to its emergence, legitimacy, and long-term viability. Recognizing entrepreneurship as a place-based, relational, and culturally mediated process shifts the focus away from extraction and scalability toward regeneration, cohesion, and embeddedness. It calls for a redefinition of entrepreneurship, not only as a driver of economic growth, but as a collective, transformative practice capable of sustaining communities, reactivating territories, and renewing cultural meaning in the face of systemic uncertainty.

Appendix

This appendix explain the three dimentions on which the Lazersfeld model is based: Community Cohesion, Territorial Regeneration and Techno-Economic Innovation.

The first dimension, concerns the capacity of local actors to build and maintain strong social ties through participatory and inclusive practices. Participation, in this context, goes beyond formal mechanisms and becomes a vehicle for fostering trust, belonging, and shared responsibility. This is reflected in the first indicator, community participation, which captures the degree to which individuals engage in collective initiatives, both formally and informally, and contribute to the governance of local projects.

The second dimension, refers instead to the collective capacity to revalue and reactivate spaces, landscapes, and local heritage through cultural, environmental, and symbolic practices. Rather than a nostalgic return to the past, these practices represent a critical re-engagement with embedded histories, skills, and values. Through the three indicators space restoration, landscape regeneration and connection to traditions, territorial regeneration emerges as a process of re-narrating place, where space, memory, and identity are woven together to reconstitute the territory as a shared and living resource. A particularly illustrative example of this emerged from one interview, in which a small rural initiative described how the transformation of a monoculture olive grove into a biodiverse, multifunctional landscape—including endemic plants, ecological restoration, and artist residencies—not only improved local ecosystems, but also gave new cultural meaning to the land, attracting both residents and returnees in a process of ongoing place-making.

The third dimension, addresses the integration of appropriate technologies, sustainable agricultural practices, and resilient economic strategies oriented toward long-term local development. The first indicator, technological innovation, refers to the adoption of digital tools, low-impact technologies, and context-sensitive solutions that enhance productivity while maintaining ecological balance. The second indicator, sustainable agriculture, identifies practices—such as agroecology or syntropic farming—that seek to combine environmental sustainability with economic viability,

promoting circularity, biodiversity, and resilience. The third indicator, funding and policy access, points to the capacity of local initiatives to secure financial resources and effectively engage with relevant policy instruments. This dimension thus highlights the strategic alignment of ecological awareness, technological advancement, and institutional connectivity. While many initiatives expressed skepticism toward burdensome bureaucratic processes, some interviewees reported successful engagement with EU funding mechanisms for example, through cultural residencies or programs such as the New European Bauhaus demonstrating the potential for coupling local autonomy with institutional support (European Commission, 2022).

Each dimension is then operationalised through three specific indicators, which allow for the empirical observation of complex social processes and provide analytical depth across different cases.

Once the three analytical dimensions and their respective observable indicators were defined, a qualitative parameterization table was developed to codify each indicator on a three-level ordinal scale (Appendix Table 4): Low = 0, Medium = 1, and High = 2, corresponding to increasing levels of intensity and systemic integration. Crucially, the assignment of these levels was not the result of mechanical counting, but emerged from an interpretive reading of the interview narratives, with close attention to the embeddedness, continuity, and transformative capacity of each practice.

Table 4 Qualitative parameterization table (Low – Medium – High)

Dimensions	Indicators	*Low = 0*	*Medium = 1*	*High = 2*
1. Community cohesion	Community Participation	Passive or sporadic involvement	Participates in activities when invited	Actively co-designs and shapes activities and goals
	Diversity of actors	Few local actors, mostly homogeneous	Some diversity but limited engagement	High diversity (youth, migrants, cooperatives) with active roles
	Knowledge transfer	Symbolic or one-time events	Occasional training sessions	Structured, ongoing learning programs
2. Territorial Regeneration	Space restoration	Only plans or minimal action	Partial restoration or under development	Full restoration and active reuse of the space
	Landscape regeneration	No visible action	Isolated or pilot interventions	Systemic interventions (e.g., reforestation, ecological restoration)
	Connection with local traditions	Symbolic references only	Some cultural events or references	Deep integration of traditions into practices and narratives
3. Techno-Economic Innovation	Sustainable agricultural practices	Not present or only discussed	Pilot or small-scale projects	Fully integrated (e.g., syntropic farming, permaculture)
	Technological innovation	Absent or minimal	Some tools adopted (e.g., sensors, apps)	Broad and strategic use of digital or emerging technologies
	Funding and policies access	No funding or only local small grants	Some regional/national funding accessed	EU/PNRR-level funding and institutional recognition

Source: Authors own elaboration

For instance, low levels of participation were identified in cases where local actors were described as passive attendees of sporadic activities led by external agents, without meaningful involvement in planning or decision-making. In contrast, high levels were attributed to contexts in which the community actively shaped project objectives, engaged in co-design, and demonstrated agency in steering the initiative.

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Data Availability The data that support the findings of this study are available from the corresponding author, GS, upon reasonable request.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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Authors and Affiliations

Giusy Sica[1] · Chiara Spiniello[2] · Maria Palazzo[1] · Giovanna Lusini[3] · Alessandra Micozzi[1]

✉ Giusy Sica
giusy.sica@unimercatorum.it

Chiara Spiniello
chiara.spiniello@physics.ox.ac.uk

Maria Palazzo
maria.palazzo@unimercatorum.it

Giovanna Lusini
lusinigiovanna@gmail.com

Alessandra Micozzi
Alessandra.micozzi@unimercatorum.it

[1] Universitas Mercatorum, Piazza Mattei 10, 00186 Rome, Italy

[2] University of Oxford, Parks Rd, Oxford OX1 3PU, UK

[3] University of Naples Federico II, Corso Umberto I 40, 80138 Naples, Italy