

Article

Social Innovation Ecosystems in Times of Crisis: Rethinking Innovation Policy Through the COVID-19 Pandemic

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Abstract

The COVID-19 pandemic exposed structural weaknesses in health systems, economies, and governance frameworks, while simultaneously stimulating diverse forms of social innovation. This article examines the emergence and operation of Social Innovation Ecosystems (SIEs) during the crisis, drawing on a qualitative review of experiences from 34 countries. The objective is to analyze how these ecosystems were configured, the mechanisms that enabled their continuity, and the implications for the design of innovation policies. The findings highlight three main dimensions through which SIEs were mobilized: governance arrangements, digital platforms, and community resilience. These ecosystems brought together civil society, academia, government, and, in a more limited role, private-sector organizations, providing adaptive responses to urgent needs while also revealing challenges to their institutional consolidation. Conceptually, the article advances understanding of SIEs as experimental arrangements with potential to contribute to socio-technical transitions when embedded in inclusive policy frameworks. From a policy perspective, the study underlines the importance of flexible funding instruments, adaptive governance mechanisms, and collaborative infrastructures that integrate social innovation as a central component of regional and sustainable development.

Keywords: governance; STI policy; institutional resilience; sustainability; SARS-CoV-2; regional–social innovation systems; SDGs



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1. Introduction

1.1. Research Problem, Gap and Guiding Questions

The COVID-19 pandemic served as a large-scale stress test for contemporary policy frameworks, revealing not only institutional fragilities and coordination failures but also the limitations of conventional innovation policies, which are often focused on technological and biomedical solutions. In parallel, a wave of decentralized, socially rooted innovation efforts emerged across countries, usually led by civil society, universities, and local governments. These efforts are characterized by collaborative, bottom-up, and adaptive strategies that address urgent societal needs.

Periods of systemic disruption often illuminate the vulnerabilities of existing socio-technical regimes and spur novel configurations that challenge dominant logics. The COVID-19 pandemic, as a global landscape shock, created conditions for diverse bottom-up responses that materialized as social innovation ecosystems (SIEs): decentralized,

adaptive, and purpose-driven arrangements led by civic, academic, and public actors. These responses filled critical governance gaps and offered alternative imaginings for organizing care, provision, and knowledge-sharing during a crisis. While such initiatives have been widely acknowledged for their immediate social value, less attention has been given to their potential role as niches—protected spaces where radical practices can evolve and potentially influence socio-technical transitions. Understanding these configurations through the lens of the Multi-Level Perspective (MLP) provides a framework for exploring how they interact with destabilized regimes and whether they carry elements of transformative potential, particularly in relation to sustainability [1,2].

Rather than being peripheral, these emergent responses became central to how many communities coped with the pandemic. They highlight the need to rethink policy instruments and institutional arrangements that can enable resilience, inclusion, and experimentation. International bodies have also begun to recognize the critical role of social innovation in addressing such challenges. For instance, the OECD's Recommendation on the Social and Solidarity Economy and Social Innovation explicitly calls for harnessing the potential of these initiatives at national and local levels [3]. While scholarly attention has focused extensively on technological innovation, less attention has been paid to how SIEs can reconfigure the policy landscape during emergencies, serving as informal yet effective governance infrastructures. Thus, it is necessary to find new ways to respond to complex challenges that require higher coordination between governments, companies, and civil society [4,5]. The pandemic accelerated a wave of collective responses driven by communities, civil society organizations, and public institutions. While much has been written about technological and biomedical innovation during the crisis, far less has addressed SIEs—decentralized, multisectoral, and knowledge-driven entities that have emerged as critical territories of adaptive governance. The effects of the pandemic have been globally widespread, including a 4.4% reduction in global Gross Domestic Product [6,7] and increases in poverty and inequality [8]. Conversely, innovation has also generated opportunities for companies and organizations [9].

The COVID-19 pandemic represented an unprecedented health crisis and profoundly altered how societies organize themselves to confront emergencies. Beyond the collapse of health systems and the ensuing economic disruption, communities were compelled to forge new forms of collaboration and solidarity. These responses reveal that innovation is not limited to technological or market-driven solutions but also emerges from social practices, institutional arrangements, and collective action.

Existing studies on the pandemic have largely emphasized biomedical and economic strategies, while the institutional and social dimensions of innovation remain comparatively underexplored. There is limited knowledge about how social innovation ecosystems were mobilized in the Global South, where formal infrastructures are often fragile but where strong traditions of community action persist. This absence constitutes a significant research gap, as it prevents a comprehensive understanding of how societies adapt to crisis conditions and redesign their innovation systems.

Although the literature on social innovation and innovation systems has grown in recent years, significant gaps remain, particularly in understanding how these systems were configured and articulated in response to the COVID-19 pandemic. Accordingly, this work's main contributions are to analyze the knowledge-based collaboration networks among involved actors and to identify the mechanisms that enabled knowledge-driven social innovations to be sustainable and have a prolonged impact. Thus, this study addresses the following research questions: (1) How were SIEs related to the COVID-19 pandemic configured and articulated? (2) What mechanisms enabled knowledge-driven activities

and the use of technologies to ensure the sustainability and success of these ecosystems, and how can innovation policy frameworks support these mechanisms?

Accordingly, the objective of this study is to analyze the global emergence and configuration of Social Innovation Ecosystems (SIEs) during the COVID-19 crisis, identifying the mechanisms that enabled their continuity and exploring how these insights can inform future innovation policies.

1.2. Literature Review

Although innovation has traditionally been linked to economic progress through new ways of producing—centered on knowledge use and wealth generation [10,11]—its paradigm has shifted from a market-oriented approach to the introduction of new products, processes, or methods [12]. Moreover, the study of innovation now encompasses activities that apply knowledge to generate social, environmental, and/or institutional value [13].

Broader and more integrative concepts of innovation reinforce the idea of its direct association with knowledge creation [14]. This has led to a paradigm shift toward a broader concept linked to market [15], as outlined in the latest edition of the Oslo Manual [16]. This concept encompasses new or improved products or processes that differ from previous ones and are made available to users, emphasizing that value extends beyond the economic sphere.

In this sense, the Young Foundation defines social innovation (SI) as new solutions—including technological innovations—that effectively address a social need, aligning with the OECD's view and aiming to generate social change [17]. Thus, SI can be understood as improvements in social conditions, as well as innovative activities and services that satisfy social needs and contribute to building a better society [18,19].

Social innovation involves the distinctive participation of civil society actors in addressing social needs through changes in social practices, leading to shifts in structures and relationships. This contributes to significant socio-technical change [20], directly associating SI with novelty and intensive use of knowledge. Social innovation addresses social problems and needs—primarily creating social value—thus improving living conditions [13].

Innovation and social innovation can arise from isolated, ephemeral efforts led by one or a few actors in the private, social, academic, or governmental sectors to address a need, create a market, or solve a problem. However, isolated efforts limit continuity in the emergence of innovations—especially social innovations, which require greater efforts for long-term sustainability [21]. They also constrain the development of broader innovation processes that could be achieved through greater cooperation, underscoring the need to articulate and institutionalize initiatives via the formation of innovation systems [22–25].

Research on innovation has traditionally concentrated on technological development, market dynamics, and institutional arrangements that enable scientific and industrial progress. Within this broad field, the concept of social innovation ecosystems (SIEs) has gained increasing attention, as it captures the networks of actors, resources, and institutional frameworks that collectively produce novel solutions to social challenges. SIEs is linked to addressing these limitations, differing from earlier innovation systems by focusing on social needs [26] and empowering societal networks through rootedness, connectivity, and resonance [27]. SIEs integrate actors from civil society, the economic sector, academia, and intermediaries, adopting diverse modes of innovation [28]. They also employ multisectoral perspectives to analyze social change. These ecosystems emphasize not only outcomes but also the processes of collaboration and collective learning that sustain innovation in complex environments [28].

Despite some prior studies [29,30]; there remains a lack of research examining innovation systems at the territorial level through a social innovation lens. This gap calls for

investigating how to design and coordinate such systems to generate both bottom-up and top-down governance processes [31]. Addressing this gap could help solve pandemic-related problems by engaging actors in SIEs that promote social innovations beyond the health sector.

Previous studies have shown how social innovation emerges in response to structural inequalities, environmental challenges, or systemic crises [21,32]. However, the COVID-19 pandemic revealed the urgency of understanding how these processes unfold under sudden and disruptive conditions. There is a lack of knowledge at the global level about the diverse institutional pathways that enable social innovation in crisis contexts [33–37]. This imbalance underscores the need for more comprehensive comparative approaches that integrate theoretical insights with global empirical evidence.

1.3. Contribution

This article contributes to the growing literature on social innovation ecosystems by examining how these ecosystems evolved and adapted during the COVID-19 pandemic. Unlike studies that prioritize technological or market-driven approaches, our analysis emphasizes the social and collective dimensions of innovation, demonstrating how networks of actors, resources, and practices generate solutions under conditions of uncertainty.

Conceptually, we offer a framework that brings together debates on social innovation, crisis response, and innovation systems, advancing a more integrated understanding of how ecosystems behave when confronted with systemic shocks. This approach highlights that innovation is not only a matter of technological capacity but also of social coordination, collaborative practices, and shared values that facilitate collective problem-solving. Empirically, the study draws on global evidence from diverse initiatives implemented during the pandemic, identifying both recurring patterns and contextual differences. By mapping these experiences, we provide comparative insights into the mechanisms that allow social innovation ecosystems to emerge, scale, and sustain themselves in crisis settings.

From a policy perspective, the findings underline the importance of designing innovation policies that explicitly recognize social innovation as a strategic dimension of resilience. By doing so, the study offers lessons that can inform the creation of more inclusive and adaptable policy frameworks, capable of addressing not only health emergencies but also other global challenges, such as climate change and social inequality.

To explore the research questions presented in Section 1.1, we examine how bottom-up initiatives during the COVID-19 pandemic integrate into what we conceptualize as social innovation ecosystems (SIEs), and we analyze their implications for innovation policy design and governance. Drawing on cases from 34 countries, we argue that these ecosystems functioned as experimental infrastructures, through which collaborative governance, institutional learning, and anticipatory innovation were mobilized under conditions of radical uncertainty. Rather than treating these initiatives as isolated or episodic, we position them as reference points for designing innovation systems that are both inclusive and crisis resilient. Our claim of novelty is that we (i) reconceptualize SIEs as policy-relevant infrastructures that operationalize institutional resilience within sustainability transitions, and (ii) assemble comparative, cross-country evidence to show how these infrastructures enable social innovation responses in crisis contexts.

This article advances theory by integrating insights from social innovation and sustainability-transition studies to propose an institution-centered account of resilience, clarifying how SIEs reconfigure roles among public, civic, and knowledge actors. Second, it provides comparative evidence from 34 countries that identifies the mechanisms by which SIEs work—most notably inclusive governance arrangements, rapid knowledge mobilization, and platform-based coordination—thereby explaining why some responses

persisted and informed policy while others faded. Third, it derives actionable implications for science, technology, and innovation policy, outlining the enabling conditions (funding flexibility, regulatory openness, and participatory evaluation) required to institutionalize SIEs beyond emergency settings and to align them with sustainability goals. The remainder of the paper proceeds as follows: Section 2 details the methodology; Section 3 presents the findings; Sections 4 and 5 offer the discussion and conclusions, respectively, highlighting how these results inform the design of resilient innovation systems.

2. Materials and Methods

This study employs a qualitative research design, utilizing content analysis [38,39] to explore the emergence of SIEs during the COVID-19 pandemic. Data were collected from peer-reviewed articles, case studies, and reports published between 2019 and 2025, sourced from Scopus, Web of Science, and Google Scholar. The selection criteria included studies that explicitly addressed social innovation in the context of COVID-19, focusing on multi-stakeholder collaboration for non-profit or public-benefit purposes.

This approach enabled a systematic literature review (presented in Section 2) and facilitated the identification of key themes and patterns across different countries and sectors. We categorized and analyzed content using established social innovation criteria [13,18,19] to ensure consistency in determining what qualifies as SIEs. The initial search string combined the categories “social innovation system” or “social innovation ecosystem” with “COVID-19” or “SARS-CoV-2,” yielding 115 documents (via Google Scholar due to the few results in Scopus—only 2). To broaden the search, a second query combined “social innovation” with “COVID-19” or “SARS-CoV-2,” identifying 252 documents. Searches were carried out in English, Spanish, French, and Portuguese; however, no additional relevant indexed results were found in Scopus or Web of Science beyond those captured in English. While this multilingual search strategy was applied, the final body of literature analyzed is predominantly in English. This constitutes a limitation, as it may exclude valuable non-indexed or locally published work. To address this, Google Scholar was utilized to expand coverage, with a focus on prioritizing peer-reviewed sources to ensure quality and consistency. Accordingly, our findings should be interpreted with awareness of this language bias, which remains an inherent constraint in many systematic reviews with a global scope.

To enhance methodological transparency, all documents retrieved were systematically screened and coded using an iterative process. Each paper was initially reviewed to determine its relevance according to predefined social innovation criteria [13,18,19]. Content was then coded thematically, focusing on actor configurations, governance mechanisms, and innovation outcomes. Coding was conducted, followed by joint discussions to refine categories and ensure consistency. This inter-coder validation helped to reduce individual bias and strengthen the reliability of our thematic analysis.

To address potential limitations, several mitigation strategies were implemented. First, to reduce language bias, searches were conducted in multiple languages; however, the results were mainly in English, as previously noted. Second, to minimize selection bias, only peer-reviewed articles and book chapters were included, ensuring academic quality and comparability across cases. While gray literature and non-indexed sources may contain relevant insights, they were excluded to preserve replicability and to avoid unverified or anecdotal information. However, we acknowledge this as a limitation, since local innovations may not be fully captured. Third, themes were developed through an inductive process, iteratively refined as more evidence was coded, which increased the robustness of pattern identification across cases.

As a third step, using Atlas.ti 8 and Foxit Reader software 2025.2.0.33046, we removed duplicates. We excluded articles focusing on innovations led solely by for-profit companies without collaboration (e.g., some studies on open innovation, medical device development, or corporate social responsibility initiatives driven mainly by economic motives rather than social value creation). We also excluded studies that, although conducted during the pandemic, did not address problems arising from it. This filtering yielded a final sample of 29 publications that analyzed experiences across 34 countries.

While this sample is not statistically representative of all documented cases (including gray literature), it offers regional, institutional, and functional diversity. Our objective was to capture a wide range of organizational configurations and action contexts to identify recurrent patterns, relevant contrasts, and transferable lessons. We recognize the inherent limitations of this qualitative-comparative analysis—informal or unrecorded community initiatives may have been missed, and we did not quantify impacts. Yet, we consider that triangulating multiple sources and focusing on documented cases provides a solid basis for understanding emerging dynamics with transformative potential in public policy, particularly innovation policy. By reflecting on these limitations, we acknowledge that our approach prioritizes depth and pattern recognition over generalizability, underscoring the need for future research (e.g., longitudinal studies) to build on these insights.

Finally, to enhance the clarity of the findings, some figures in Section 3 were created using Napkin (<https://www.napkin.ai/>). This tool was used to translate thematic categories into accessible visual schemes, ensuring consistency between the analytical dimensions and their graphical representation. The visualizations aim to synthesize complex relationships across cases, highlighting comparative patterns in governance, digital platforms, and community resilience.

3. Results

Our review of 29 studies, covering experiences in 34 countries, confirms that social innovations played a crucial role during the pandemic, linking this global crisis to the emergence of diverse local and national initiatives. The thematic analysis of these contributions reveals three broad and interrelated dimensions through which Social Innovation Ecosystems (SIEs) were mobilized: governance arrangements, digital platforms and technology tools, and community resilience practices. These categories not only capture the diversity of initiatives but also provide a comparative framework for identifying shared patterns and distinctive features across regions.

3.1. Governance Arrangements

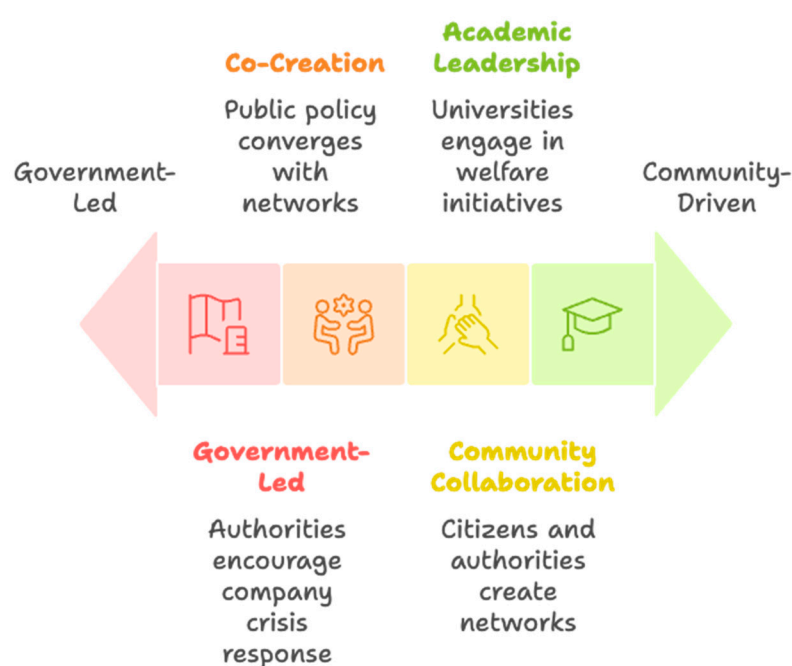
Governance arrangements were one of the most visible areas where innovation occurred. In several countries—including Canada, China, Spain, the United States, France, Hungary, Ireland, Italy, the Netherlands, the United Kingdom, Singapore, Syria, South Africa, and Turkey—social innovation responses reinforced existing partnerships and gave rise to new collaborations that were vital in moments of uncertainty. These governance mechanisms involved forms of government participation, the development of proactive mindsets, and the adoption of novel methods of communication. They also required the recombination of available resources and the mobilization of emotional motivations that helped sustain collective action in education, health, and welfare [40].

According to [41], the pandemic in Iran highlighted the interdependence of various factors that drive change in times of crisis. Community collaboration, government leadership, and the adoption of new technologies collectively enabled solutions based on social innovation, including the creation of support networks through the social economy and new forms of social participation. This underlines the role of social innovation in facing

global problems in a more resilient and organized manner in Iran. These authors found that community participation was crucial in addressing the pandemic through key actions such as information sharing, public consultation, collaboration, health education, empowerment, and advocacy—tailored to different community needs. Such responses improved health-care access, strengthened social capital, enhanced resilience, and even contributed to the institutionalization of new practices [37]. Similar evidence is presented by [42], reinforcing these findings.

Other cases underscored the interdependence of community participation and state leadership. In Iran, for example, collaboration between citizens and public authorities created support networks rooted in the social economy. These efforts were reinforced by public consultation, information sharing, health education, empowerment, and advocacy, which not only addressed immediate needs but also strengthened social capital and contributed to the institutionalization of new practices [37,41,42]. Similar lessons were drawn from Austria, where the crisis spurred the development of more resilient ecosystems through co-creation and rapid institutional adaptation. In that context, entrepreneurship, accessible financing, and long-term public policies converged with collaborative networks to promote a culture of sustainable entrepreneurship [26]. In China, ref. [35] identified a government-led social innovation model, illustrating how authorities encouraged companies to respond to the crisis through the mass production of medical supplies, such as masks and test kits.

Through strategies of social bricolage, based on the creative use of local resources and organizational agility, companies were able to repurpose existing knowledge and respond quickly to societal demands [35]. Academic actors also assumed an active leadership role. In Poland, the pandemic created opportunities for higher education institutions to engage more directly in welfare and sustainability initiatives through transdisciplinary and quadruple-helix collaborations with business, civil society, and government [43]. Likewise, in Egypt, universities developed social innovation strategies as a source of competitive advantage, linking education, research, and outreach programs to generate long-term social impacts [44]. The governance arrangements promote social innovation from government-led to community-driven initiatives (Figure 1).



Made with Napkin

Figure 1. Social innovation governance ranges from government-led to community-driven.

3.2. Digital Platforms and Technology Tools

A second dimension that emerged strongly was the role of digital platforms and technological tools. These infrastructures became indispensable to sustain social innovation ecosystems when physical interaction was restricted. In Italy, social innovation catalyzed change in health ecosystems by developing digital platforms that facilitated interaction among hospitals, authorities, and citizens. One example is “He-Net,” a digital cooperation platform that supported diagnosis, knowledge sharing, and service provision through digitization [33]. Similarly, in Japan, the Iwaki Health Promotion Project in Aomori integrated government, academic, business, and community sectors, leveraging more than 15 years of citizen health data. This long-term collaboration led to the development of a digital platform that promotes healthy habits and enhances longevity [45].

The potential for creating ecosystems that integrate social innovation and technology to address global challenges was also evident [46] notes that in countries such as the United States, China, India, Brazil, France, and South Korea, public and non-profit institutions played essential roles in developing technologies like vaccines, medical and diagnostic equipment, and treatments. These technological innovations, in turn, spurred social innovation in health crises by providing communities with new tools and knowledge.

In Peru, Malawi, and the Philippines, social innovation proved crucial in mitigating the negative impacts of the health crisis through community-driven solutions. Examples include a maternal health program in remote communities, a free medical care hotline, and health risk management initiatives that also ensured food security. All were achieved through intersectoral collaboration and were triggered by community resilience during the pandemic [36].

In 13 countries—including Argentina, Australia, Austria, Canada, France, Hungary, Italy, Japan, Luxembourg, Norway, South Korea, Spain, and the UK—new networks combined citizen participation with digital tools to strengthen alternative food systems [47]. These experiences demonstrate how digital infrastructures acted not only as technical tools but as enablers of collective coordination, knowledge mobilization, and sustainability. They found that social innovation supported alternative food networks by forming new multi-stakeholder cooperation networks with greater citizen participation and by leveraging digital strategies, thereby enhancing sustainability and resilience. In Naples, Italy, collaboration between local communities and voluntary organizations led to the creation of support networks aimed at improving food access in both urban and rural areas [34].

For example, in China, the pandemic spurred the adoption of innovative production processes and sustainable materials in industry. This led to digital design of bamboo products to reduce waste and improve efficiency, alongside collaborative production models with local impact efforts that contributed to the construction of SIEs in manufacturing and design sectors [48].

In Ecuador, a teleconsultation platform, coordinated by public health centers, foundations, and academic institutions, provided remote medical services and psychological support during the crisis [49]. In Mexico, universities and civil society organizations collaborated to close the digital divide in indigenous communities, expanding existing educational and technological projects to address the new conditions imposed by the pandemic [50,51]. Beyond healthcare, digital platforms also played a central role in sustaining food systems. All these are summarized in Figure 2.

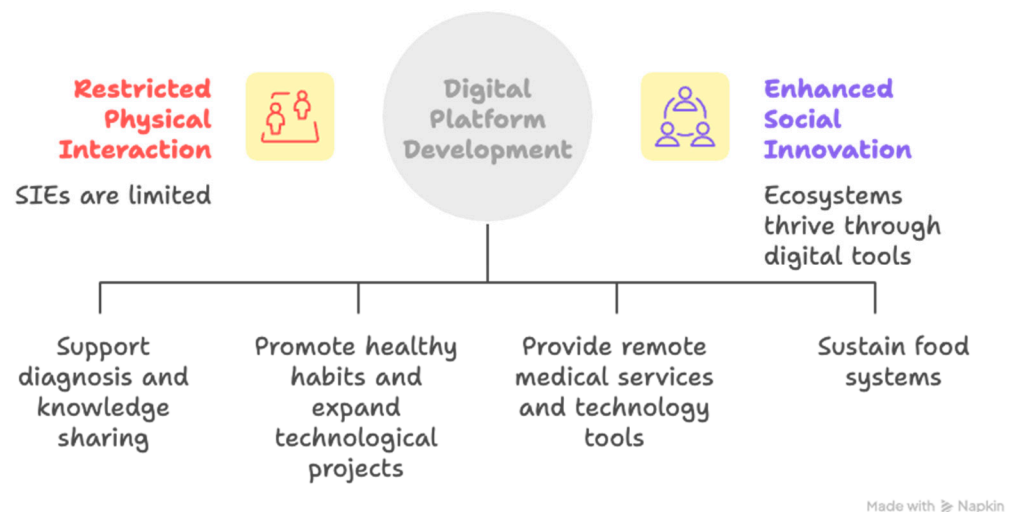


Figure 2. Digital platforms enhancing SIEs.

3.3. Community Resilience

The third central theme identified was community resilience and grassroots practices, which proved to be the most decisive in mitigating the pandemic's negative consequences. In Peru, Malawi, and the Philippines, maternal health programs, hotlines for free medical care, and risk management initiatives, combined with food security strategies, emerged directly from community action and intersectoral collaboration [33].

In Indonesia, sanitation infrastructure in informal settlements was developed through collaborations between community actors and local authorities. Although these efforts revealed limitations in resources and coordination, they also illustrated the potential of hybrid models that combine bottom-up initiative with top-down support [52].

In addition to academic literature, numerous grassroots experiences in Latin America have been documented. For instance, in Brazil, communities have organized to produce masks and medical equipment, implement sanitary controls, and distribute food. Grassroots groups created isolation spaces and provided medical care. These efforts involved organized communities, social leaders, samba schools, residents' associations, local governments, and NGOs [53]. Chile: "Micro-zones" for virus containment were established through coordinated efforts between the productive and government sectors, aiming to control the virus's spread without stifling the local economy. This approach also sought to prevent the collapse of healthcare infrastructure [49].

Across these cases, the pandemic highlighted that resilience depends on solidarity-based practices that emerge from within communities and that, when combined with supportive institutions, can become lasting sources of adaptive capacity, in summary, community resilience mitigates pandemic consequences, as shown in Figure 3.

3.4. Cross-Cutting Patterns

The comparative analysis across 34 countries reveals recurring mechanisms that enabled SIEs during the pandemic: Inclusive governance arrangements, coordinating civic, academic, public, and, in some cases, private actors; Digital platforms and technology tools, which provided infrastructures for coordination, knowledge exchange, and scaling of responses and Community resilience practices, ensuring solidarity-based provision and adaptive capacities.

As illustrated in Table 1, these mechanisms varied in form but were widely present. Figure 4 maps their global distribution, with a concentration in the Americas and Europe, and underlines the crucial role of the social sector in generating social and regional innova-

tion responses to the pandemic's adverse effects, not only in health but also in food security, education, and other domains.



Figure 3. Community resilience.

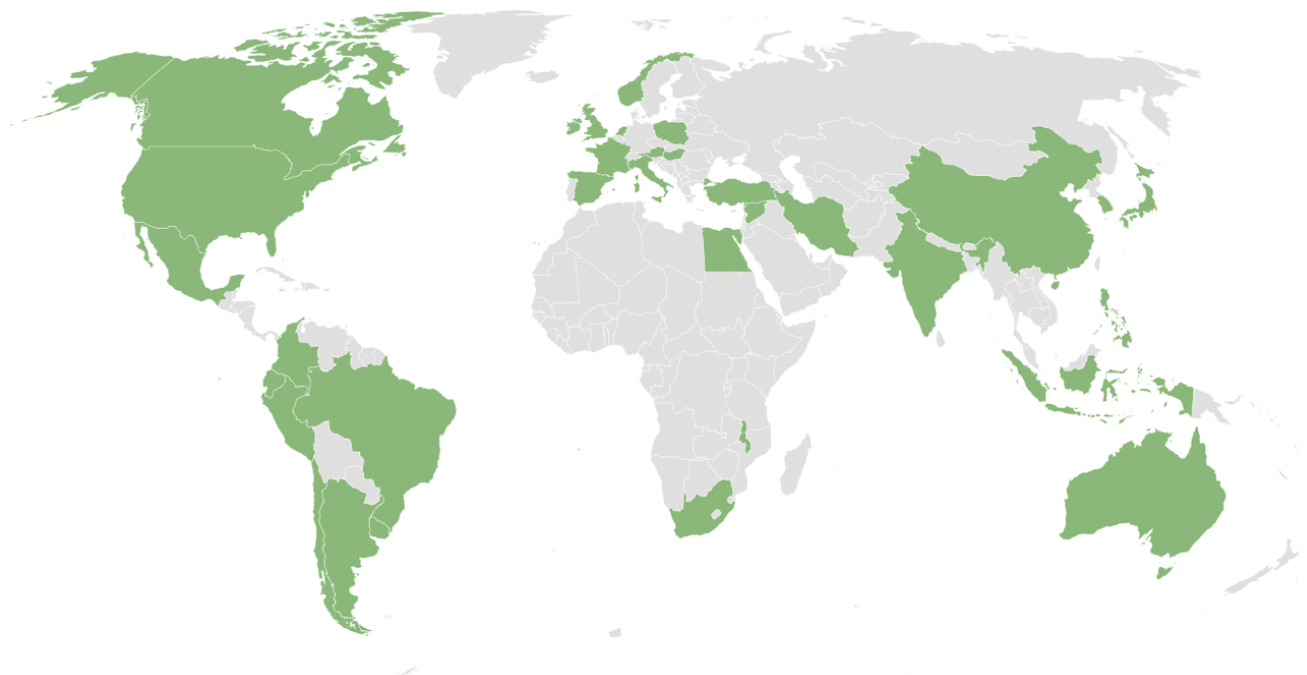
Table 1. Experiences in the formation of SIEs motivated by COVID-19.

Experiences	Countries	Actors	Refs.
Crisis response through social innovation	Canada, China, Spain, United States, France, Hungary, Ireland, Italy, Netherlands, United Kingdom, Singapore, Syria, South Africa, Turkey	Government sector, civil associations, citizens	[40]
Digital platforms for health ecosystems	Italy	Governments, companies, communities, academic institutions	[33]
Iwaki Health Promotion Project	Japan	Government sectors, academics, businesses, communities	[45]
Development of technologies and vaccines	United States, China, India, Brazil, France, South Korea	Public institutions, non-profit institutions	[46]
Community health and food solutions	Peru, Malawi, Philippines	Communities, intersectoral collaboration	[36]
Alternative food systems	Argentina, Australia, Austria, Canada, France, Hungary, Italy, Japan, Luxembourg, Norway, South Korea, Spain, United Kingdom	Multi-actor cooperation networks, citizens	[47]
Food support networks	Italy (Naples)	Local communities, voluntary organizations	[34]
Social innovation and government collaboration	Iran	Communities, government, social economy	[37,41,42]
Resilient innovation ecosystems	Austria	Institutions, entrepreneurs, collaboration networks	[26]
Mass production of medical supplies	China	Government, companies	[35]
Active role of universities	Poland	Universities, businesses, civil society, government	[43]
University social innovation	Egypt	Universities	[44]
Sustainable production and digitalization	China	Industry, designers	[48]

Table 1. *Cont.*

Experiences	Countries	Actors	Refs.
Health infrastructure in informal settlements	Indonesia	Community actors, local authorities	[52]
Production of masks and medical equipment	Brazil	Organized communities, social leaders, samba schools, residents' associations, local governments, NGOs	[53]
Micro-zones for virus containment	Chile	Productive sector, government sector	[49]
Medical teleconsultation	Ecuador	Foundations, public health centers, Ecuadorian Corporation for the Development of Research and Academia	[49]
Social innovation and education	Mexico	Universities and social organizations	[50,51]

Source: Own elaboration.

**Figure 4.** The world map indicates the locations of identified SIEs' experiences.

Analyzing the actors involved across these cases reveals notable patterns. The social sector—comprising civil associations, community actors, NGOs, and non-profit institutions—accounts for more than 40% of the initiatives. In contrast, the governmental, academic, and research sectors each are present in roughly one out of every five initiatives, and the productive sector (for-profit companies) has the lowest participation (around 16%) in articulating these ecosystems. This distribution underscores the central role of civil society and community-based actors in driving SIEs during the pandemic.

4. Discussion

The findings of this study confirm that Social Innovation Ecosystems (SIEs) played a crucial role during the COVID-19 pandemic, while also highlighting important theoretical and policy lessons. By examining 29 studies across 34 countries, three recurrent mechanisms were identified—governance arrangements, digital platforms, and community resilience practices—which together provide a conceptual basis for understanding how SIEs emerge, consolidate, and in some cases, fade. To interpret these findings, it is necessary to situate

them within existing scholarship on social innovation and innovation systems, while also engaging with transition theory, particularly the Multi-Level Perspective (MLP).

4.1. *Advancing the Conceptual Debate on SIEs*

The concept of SIEs has evolved from a descriptive to an analytical category. Early works highlighted the capacity of social innovation to meet unmet needs through new forms of collaboration and value creation [13,18,19]. Later contributions extended this approach to emphasize the ecosystemic nature of innovation processes, demonstrating that networks of actors, institutions, and resources can generate durable transformations [28,31,54]. Empirical research in urban contexts, such as those of Manchester, Utrecht, Stockholm, Sofia, and Budapest, demonstrates how ecosystems of innovation emerge through multi-actor interactions and collective learning, often rooted in territorial and institutional infrastructures [55,56]. These insights confirm that SIEs are not peripheral coalitions but rather evolving socio-technical arrangements with the potential to support sustainability transitions [27,57].

Recent scholarship enriches this conceptualization [58] emphasize that ecosystems evolve through quadruple and quintuple helix interactions, where collaboration among academia, business, government, and civil society is crucial for resilience. Similarly, refs. [47,59] examine how urban ecosystems serve as incubators for social innovation, emphasizing the importance of institutional infrastructures for scaling. These authors [60] emphasize adaptability as a key characteristic for ecosystem sustainability, while [61] argues that knowledge-driven innovation integrates social and technological solutions to create long-term public value. These perspectives complement existing evidence linking the formation of SIEs to rootedness, connectivity, and resonance [29,62], while reinforcing the importance of cross-sectoral alliances [30,63]. Our findings confirm and extend this debate by offering comparative evidence of how SIEs emerged globally as experimental infrastructures during a systemic shock.

4.2. *Structural Barriers and Theoretical Interpretation*

Despite their potential, SIEs often faced structural barriers that limited their long-term viability. Many initiatives relied on temporary funding, volunteer energy, or ad hoc regulatory adjustments, which hindered institutionalization. This aligns with observations in transition studies: while landscape shocks, such as the pandemic, create windows of opportunity, the persistence of regime constraints often prevents niches from stabilizing [27,64–66]. Recent MLP analyses [67] suggest that niche innovations must align with broader socio-technical agendas to influence regimes. Our results confirm this: in cases where SIEs connected to sustainability or resilience policies (e.g., food systems in Europe, health governance in Latin America), they exhibited greater durability. Conversely, where state–civil society relations were fragile or antagonistic, ecosystems remained fragmented.

This reinforces prior findings on the need to institutionalize social innovation through supportive frameworks and inclusive governance [21,29,68]. This perspective resonates with [69], who, in their study of Florianópolis, Brazil, show how urban social innovation ecosystems can be closely linked to sustainability agendas, generating collective learning and new forms of governance that reinforce their role as experimental infrastructures. As ref. [70] argues, structural change requires learning-oriented institutions that can integrate. While many of the reviewed initiatives demonstrated impressive adaptability, they also revealed enduring structural barriers. Several relied on temporary funding, volunteer work, or ad hoc regulatory exceptions [44,57,68,71]. Others faced difficulties in maintaining momentum once emergency conditions subsided, a common issue when grassroots initiatives lack institutional embedding [54,72]. These constraints resonate with findings

from innovation system literature, where fragile or isolated innovations often struggle to scale or persist without broader support [21,26].

The Multi-Level Perspective (MLP) offers a valuable framework for interpreting these dynamics. The pandemic acted as a landscape shock, destabilizing dominant socio-technical regimes and momentarily opening windows for niche innovations to expand [1,73]. Yet the uneven survival of initiatives shows that SIEs cannot rely solely on landscape pressures. Some ecosystems, such as food networks in Europe or health collaborations in Latin America, have managed to embed themselves within regime-level structures, aligning with public policies and institutional priorities [62,72,74]. Others, however, remained marginal, constrained by weak state–civil society relations or rigid bureaucratic systems. This pattern aligns with [67], who argue that niche innovations require resonance with regime agendas to sustain themselves. Our findings reinforce that institutional learning and adaptive policy frameworks are crucial enablers for translating temporary responses into structural change [70].

4.3. *Explaining Success and Failure Across Contexts*

The comparative evidence allows us to explain why some SIEs succeeded while others failed. Initiatives were most sustainable when three factors converged. First, governance inclusivity: ecosystems that institutionalized participatory arrangements, as in Austria or Brazil, achieved greater legitimacy and resource stability [26,51]. Second, knowledge mobilization: platforms that enabled the circulation of expertise and coordination of actors—such as teleconsultation in Ecuador [49], alternative food networks across 13 countries [47], or educational projects in Mexico [50,51]—proved more adaptable. Third, policy alignment: where initiatives connected with sustainability or resilience strategies, they attracted visibility and institutional support. By contrast, initiatives disconnected from broader agendas tended to fade away once emergency conditions subsided.

These patterns confirm earlier research, which shows that institutional recognition and strategic alignment are crucial for social innovations to mature into ecosystems [28,75]. They are also related to the view that governance cultures that value collaboration and mutual trust enhance resilience [27,41,57,71], whereas adversarial or exclusionary political settings limit long-term viability [62,72,74].

A similar conclusion is reached [76], who, in their case study of urban development in Finland, emphasize that the sustainability of emerging social innovation ecosystems depends on the ability to align local actors with urban policy frameworks.

4.4. *Sustainability, Institutionalization, and Monitoring Mechanisms*

One of the most significant challenges is ensuring that SIEs evolve from emergency logics to enduring infrastructures. While our review provides comparative breadth, it is limited by its focus on immediate crisis responses. Longitudinal evidence remains scarce, and without systematic monitoring, cumulative learning risks are being lost. Scholars have noted the need for institutionalization strategies that extend beyond project cycles, embedding social innovation into formal policy frameworks [28,54,62,67].

To address this gap, we propose the establishment of observatories and monitoring systems at national and regional levels, capable of evaluating SIEs every three to five years. These systems should assess whether ecosystems maintain their adaptive capacity, diversify funding sources, and generate cumulative impacts. Participatory monitoring would also ensure that civic actors remain integral to the decision-making process.

From a policy perspective, three enabling conditions emerge as crucial: (i) funding flexibility, allowing resources to be redirected rapidly during crises; (ii) regulatory openness, encouraging experimentation with hybrid governance; and (iii) participatory evaluation,

incorporating community perspectives into institutional learning. These conditions are consistent with anticipatory and mission-oriented approaches that call for innovation policies centered on resilience, inclusivity, and long-term adaptability [27,74,77,78].

The authors [79] illustrate this point in a different domain, showing how cultural creative hotels in China can serve as spaces of social innovation and value co-creation, suggesting that institutionalization of SIEs may also be supported through cultural and creative industries that combine community value with economic sustainability. By embedding these practices, SIEs can consolidate their role as infrastructures for sustainability transitions, rather than merely serving as temporary crisis responses.

4.5. Adaptive Capacity and Societal Resilience

The comparative evidence shows that resilience was a decisive factor in the performance of Social Innovation Ecosystems (SIEs) during the pandemic. Where networks were flexible, grounded in trust, and supported by local capacities, initiatives were able to reorganize quickly and deliver effective responses. Conversely, ecosystems that relied mainly on ad hoc collaborations or volunteerism struggled to maintain momentum once emergency conditions subsided.

These findings suggest that resilience should be understood not only as the ability to respond in the short term but also as the adaptive capacity to sustain practices beyond crisis conditions. Crises can temporarily activate latent networks, as illustrated by the case of a Spanish water innovation initiative that was repurposed for rapid pandemic response [77]. Still, such mobilizations rarely ensure continuity without deliberate institutional support. Long-term resilience, therefore, requires mechanisms that embed community-driven practices into more stable arrangements, ensuring that solidarity-based innovations do not dissipate when urgency fades.

4.6. Innovation Governance and Policy Implications

The rise in Social Innovation Ecosystems (SIEs) during COVID-19 underscores the need to rethink how innovation policy frameworks are designed and implemented. These ecosystems did more than compensate for institutional gaps; they redefined innovation practices by shifting attention from technology-push models to need-driven, participatory, and context-sensitive approaches.

For policymakers, this means broadening the scope of science, technology, and innovation (STI) policies to explicitly recognize socially grounded initiatives as legitimate components of national and regional innovation systems. Lessons from the crisis can inform more adaptive policies by institutionalizing mechanisms that proved effective—such as flexible funding schemes, rapid regulatory approvals, and participatory evaluation processes. Practical examples include contingency funds for community-led projects, “innovation sandbox” models for experimental solutions, and hybrid hubs that connect civic, academic, and public actors.

A further implication concerns metrics and evaluation. Conventional innovation policies often privilege technological outputs, overlooking social and environmental outcomes. Recognizing SIEs requires adapting criteria and governance logics to capture these broader impacts. Finally, fostering epistemic diversity—by incorporating local knowledge and distributed intelligence—can enhance both effectiveness and legitimacy in innovation governance. SIEs demonstrate that transformative practices often emerge from grass-roots collaboration, highlighting the importance of institutional mechanisms that amplify such voices.

5. Conclusions

5.1. Empirical Findings

This study analyzed 29 documented cases of Social Innovation Ecosystems (SIEs) across 34 countries, directly responding to the research questions posed in the introduction. Regarding the first question on how SIEs were configured and articulated during the COVID-19 pandemic, the findings show that these ecosystems were mobilized through three interrelated mechanisms: inclusive governance arrangements, digital platforms and technological infrastructures, and community resilience practices. These mechanisms enabled actors from civil society, academia, public institutions, and, in some cases, private enterprises to co-create rapid and adaptive responses.

In relation to the second question on what mechanisms enabled knowledge-driven activities and the use of technologies to ensure the sustainability and success of these ecosystems, and how policy frameworks can support these processes, the analysis highlights that ecosystems were most successful when participatory governance was institutionalized, when knowledge circulation was facilitated through digital tools, and when initiatives were aligned with broader public policies. These findings reveal not only the diversity of actor configurations but also recurring patterns of success and failure across contexts.

The emergence of SIEs during the COVID-19 pandemic directly contributed to achieving the Sustainable Development Goals (SDGs) [80], underscoring their role in advancing inclusive and resilient societies. Initiatives such as community-driven food networks in Naples, Italy, and telemedicine platforms in Ecuador align with SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-Being) by enhancing food security and access to healthcare for vulnerable populations. Similarly, the collaborative governance models observed in Iran and Malawi supported SDG 10 (Reduced Inequalities) by fostering inclusive participation and empowering marginalized communities. These efforts are linked with SDG 11 (Sustainable Cities and Communities) through localized solutions that strengthen urban-rural linkages and community resilience. By addressing immediate social needs while promoting equitable and participatory frameworks, SIEs evidence the potential to bridge local innovation with global sustainability objectives, offering valuable lessons for designing innovation policies.

5.2. Theoretical Contribution

This research contributes to the literature on social innovation and innovation systems by advancing the conceptualization of SIEs as experimental infrastructures that emerge in response to systemic shocks. While previous scholarship has identified their role in urban and sectoral contexts, the comparative analysis presented here demonstrates that SIEs can act as temporary niches within the Multi-Level Perspective framework, providing protected spaces for experimentation during periods of crisis. However, their ability to persist depends on whether they achieve resonance with regime structures and sustainability agendas.

The study also underlines the importance of distinguishing between sustainability—the capacity of SIEs to maintain adaptive functions over time—and institutionalization—their formal integration into policy frameworks and organizational structures. Not all sustainable initiatives are institutionalized, and not all institutionalized initiatives guarantee long-term adaptability. This distinction sharpens debates on resilience and transitions, highlighting the dual challenge of maintaining flexibility while securing policy recognition.

The main contribution of this study is to highlight an ongoing rethinking of STI policies by showing how SIEs responded to the COVID-19 crisis through regional collaboration and low-infrastructure solutions. By analyzing a diverse set of international cases, our study reveals that many of these ecosystems emerged not because of formal planning or abundant

resources, but through collective improvisation, trust-based networks, and context-specific problem-solving. Their success in delivering rapid, inclusive responses—despite limited institutional backing—challenges traditional notions of innovation capability and highlights the importance of institutional resilience as a policy-relevant concept, understood here as the capability of institutions (formal or informal) to respond to crises through long-term governance processes. The article advances the debate by arguing that STI policy should not only foster technological advances but also create enabling environments for decentralized, knowledge-driven initiatives rooted in social and environmental values. In doing so, it calls for a more pluralistic and reflexive approach to innovation governance, especially in the face of future crises.

5.3. Policy Recommendations and Future Research

One of the main concerns moving forward is how to sustain these efforts. Many of the initiatives we reviewed were made possible by the energy and commitment of communities, nonprofits, and forward-thinking public institutions during an emergency. However, without long-term support—especially in countries with limited public resources—it is challenging for these systems to remain active and effective. This is where public policy plays a key role. Rather than treating these innovations as isolated or temporary, policymakers should consider integrating them into the broader social fabric through sustained funding, capacity-building, public–private partnerships, and inclusive governance structures. Notably, global policy guidelines echo this approach, emphasizing the importance of establishing favorable legal and financial frameworks to scale the social economy’s impact and sustain social innovations [78]. In line with the OECD’s recommendations, creating an enabling environment can help these community-driven innovations become permanent features of the innovation landscape, rather than ad hoc solutions.

From a policy perspective, three actionable recommendations emerge. Governments should support SIEs through flexible funding mechanisms that enable rapid reallocation of resources in emergencies. For instance, national innovation agencies could establish contingency funds earmarked for community-led projects and put in place simplified procedures during crises. Regulatory frameworks must also encourage experimentation by reducing bureaucratic barriers to collaborative initiatives. Local governments could adopt “innovation sandbox” models, where civic and academic actors co-design pilot programs under temporary exemptions. In addition, participatory evaluation and monitoring systems should be institutionalized, ensuring that citizens, NGOs, and universities contribute to assessing the effectiveness of initiatives over time.

Looking forward, future studies should build longitudinal databases that track the evolution of SIEs at intervals of three to five years. Such efforts would allow researchers and policymakers to observe how ecosystems transition from emergency logics to more durable infrastructures. Complementary quantitative assessments are also needed to measure impacts on inequality reduction, health outcomes, and resilience indicators, thereby strengthening the persuasiveness of the evidence base.

Studying how these systems evolve and what makes them function effectively in various contexts will be essential. Future research should explore mechanisms for institutionalizing the learning derived from SIEs, including how to design environments that facilitate the replication and sustainability of these ecosystems. Comparative studies across regions could identify context-specific variables and inform the development of more effective inclusive innovation policy models tailored to different socio-economic settings. Policymakers should also consider how to integrate such ecosystems into formal STI frameworks without undermining their participatory and grassroots nature.

There are limitations to this work. Our analysis is primarily based on documented cases and literature; however, informal community initiatives may have been overlooked and could remain invisible or unrecorded, especially if they dissolved after the acute phase of the pandemic. Additionally, we did not provide quantitative impact measurements—although some studies have quantified social innovation outcomes, our focus was exploratory and comparative. The long-term consequences and the capacity of these initiatives to maintain momentum or evolve post-crisis remain to be fully evaluated, underscoring the need for longitudinal research.

In summary, combining these empirical insights, theoretical clarifications, and practical recommendations, this study contributes to understanding how SIEs can evolve from crisis-driven initiatives to long-term infrastructures for sustainability transitions. It is fundamentally about social coordination, trust, and the collective capacity to innovate under pressure. By applying these lessons, we can shape policies that respond to crises more effectively, strengthen social ties in the process, and support more sustainable, grounded approaches to innovation that foreground societal and environmental needs.

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