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Can Crises Become Opportunities? Food Solidarity and Democratic Participation in Turin (Italy)

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Abstract

Food poverty is a growing challenge for European cities, where socio-economic inequalities intersect with disruptions of urban food systems. This paper examines how the COVID-19 pandemic affected food solidarity in Turin (Italy). The study has two aims: to understand how interactions between collective action initiatives (CAIs) and institutional actors evolved throughout the pandemic, and to assess whether, and under which conditions, deliberative practices can strengthen democratic capacities in urban food governance. Drawing on the Multi-Level Perspective, COVID-19 is conceptualised as an external shock and a window of opportunity. Empirically, the paper draws on a deliberative process conducted between December 2025 and June 2026, in which representatives of niche-level CAIs and regime-level institutions co-produced causal loop diagrams, selected leverage points and designed a Theory of Change, followed by a validation session with three external experts. The pandemic accelerated niche–regime cooperation but was followed by a partial niche demobilisation and the consolidation of regime organisational and distributional practices. Through the deliberative process, inter-organisational dialogue, collective learning and the development of shared, concrete proposals were fostered. These provided the basis for identifying potential areas of intervention and future research avenues aimed at renewing food solidarity governance and practices, while also addressing the vulnerabilities emerging in relation to climate change and its impacts on food systems.

Keywords: food poverty; food solidarity; COVID-19; collective action; Multi-Level Perspective; participatory system mapping; urban food policy

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1. Introduction

Climate change, understood as both an environmental phenomenon and a driver of profound social transformations, is increasingly exacerbating existing socio-economic inequalities. Urban settings are particularly vulnerable to environmental disruptions and lay bare economic asymmetries, unequal access to welfare systems and dependence on complex infrastructures.

Food poverty, defined as the inability to afford healthy food and have access to a nutritious diet, has recently emerged as a pressing political challenge and represents one of the most visible expressions of these intertwined environmental and societal crises [1–4]. In Italy, whilst severe material and social deprivation has remained largely stable (4.6 per cent, down from 4.7 per cent in 2023), the proportion of the population unable to

afford a protein-rich meal is on the rise, increasing from 8.4 per cent in 2023 to 9.9 per cent in 2024 [5]. This trend is driven by a combination of interconnected factors, including disruptions to agricultural and production patterns caused by climate-induced unpredictability, the resulting instability of global supply chains, persistent socio-economic inequalities, and rising food prices, as shown by the European Commission [6]. Urban populations are particularly exposed to these dynamics as they are detached from infrastructures of food production and highly dependent on complex systems of distribution [1]. Interestingly, these socio-technical dynamics become starkly visible in moments of crisis [7], such as the COVID-19 pandemic, during which everyday routines and supply chains were suddenly disrupted [8]. This crisis has led to the emergence of new forms of vulnerability in terms of food accessibility and affordability, while also triggering a sudden increase in food waste and food poverty. In response to these challenges, new grassroots practices and more institutionalised forms of action have emerged, while opening up new spaces for political and collective action and for a debate on food as a fundamental human right.

On the one hand, complex and global crises such as climate change expose us to increasingly significant risks and vulnerabilities; on the other, the exceptional nature of these unpredictable events can create the conditions for the emergence of new forms of collective action and social innovation. These can be understood as self-organised groups of citizens who actively collaborate to govern, produce, manage or consume common goods and services (in this case, food), transforming a resource from a purely private or public good into a common good. It is precisely in the interstices between, and through the encounter, and at times the conflict, with more traditional and institutional forms of action that social innovation emerges. Social innovation is understood here as a set of new processes, practices and social relations, encompassing both means and ends, produced and driven by collective action. The pandemic therefore provides an analytical lens through which to examine forms of emergency response, as well as their potential implications in terms of democratic risk and reduced participation. At the same time, it offers a recent, well-documented and bounded episode in which the interplay between grassroots solidarity and institutional responses can be observed ex post. Accordingly, the implications we draw for climate-related crises are formulated as hypotheses concerning the governance of shocks, and their limitations are discussed in Section 6.

A growing body of literature has shown that community initiatives involving food often function as spaces where alternative forms of citizenship, participation and political engagement are practised [9–16]. Through everyday activities, such as surplus food collection and distribution, collective kitchens and fridges, or mutual aid networks, these initiatives simultaneously respond to immediate material needs while also claiming social justice and the right to food.

Turin has long been characterised by innovative food-related policies, as witnessed by its signing of the Milan Urban Food Policy Pact (MUFPP) in 2015 [17–19], and a vibrant network of community-based food solidarity initiatives. While the pandemic undoubtedly intensified food insecurity and exposed the fragility of urban food systems, it also represented a catalyst for new forms of civic participation (facilitated by the greater availability of time during lockdowns), institutionalised intervention (supported by the increased availability of emergency funds), and the establishment of new partnerships between civil society organisations and public institutions.

Collective Action Initiatives (CAIs) [20,21] have progressively developed forms of collaboration that extend beyond food provision, becoming arenas where demands for more equitable access to resources, services, recognition and participation are articulated. Throughout the paper, we refer to these actions as *food solidarity*: a form of civic engagement fostering not only social support but also representing a potential lever for

socio-political transformation. More precisely, we define food solidarity as the set of collective, non-market practices through which citizens and organisations pool resources, time and relationships to secure access to adequate food for those who lack it, combining material support with horizontal relations of reciprocity and advocacy for the right to food [9,10,12] (see Table 1). Food solidarity and the initiatives revolving around it (prior to, during, and after the COVID-19 pandemic) opened spaces of negotiation of alternative visions of urban governance, sometimes resulting in the establishment of a community of practice.

Theoretically, we adopted the Multi-Level Perspective (MLP) [21–23] to conceptualise socio-technical transitions as interactions between niches, regimes and broader landscape dynamics. We approached the COVID-19 pandemic as a landscape-level disruption and a potential 'window of opportunity' through which existing dynamics acquired more visibility, and exchanges between already existing niche-level innovations (represented by Turin's food solidarity initiatives) and the institutional regime embodied by municipal welfare and food policies, as well as by other more institutionalised third-sector initiatives, accelerated.

Building on these premises, the article explores how moments of crisis can both expose the limits of emergency governance and create opportunities for more participatory forms of urban food governance. Furthermore, as part of the CO-SUSTAIN project, which examines how individuals unite in collective organisational structures in response to common climate, political and societal imperatives, and how these collective initiatives act as platforms for political participation, prefigurative innovation and social pressure on the incumbent social order, the paper investigates the interconnections among environmental disruptions, collective action and socio-technical transition, with particular attention to their implications for democratic governance. As climate-related crises become more frequent and governments increasingly rely on emergency-based responses designed to mitigate immediate impacts, it is increasingly necessary to find solutions that address the structural drivers of vulnerability and support the long-term transformations required to tackle climate change. The broader concern motivating this study is to analyse the extent to which civic and political participation can be strengthened when designing responses to systemic crises, particularly those associated with the ecological transition.

By focusing on the city of Turin, we developed a deliberative process through which we investigated the evolving relationships between collective action initiatives and institutional actors. More specifically, we addressed the following research questions: (RQ1) How did interactions between CAIs and institutional actors evolve throughout the COVID-19 pandemic? (RQ2) To what extent can civic participation strengthen or, conversely, hinder democratic capacities within urban food governance?

Answering these questions matters for two reasons. First, transition literature has devoted limited attention to how certain landscape shocks can reshape niche–regime relations in the domain of food provisioning. Second, despite the growing promotion of deliberative arenas in urban food governance, less is known about whether and under which conditions deliberation can inform the design of urban food policies, strengthening democratic capacities [24–26]. The paper develops an integrated framework in which the MLP, systems thinking and deliberative democracy theory operate as mutually corrective lenses for transition studies; at the methodological level, it shows how participatory system mapping can function simultaneously as a research instrument and as a democratic infrastructure. This contribution responds to a specific gap. Existing attempts to politicise the MLP have mostly drawn on arguments about power and regime resistance [24,27] or on social movement theory [28,29], while participatory system mapping and group model building have mostly been used as analytical tools, with

limited reflection on their democratic potential [30–33]. Deliberative systems mapping [25] is the closest existing approach, as it explicitly combines systems mapping and deliberation; however, it does not account for niche–regime relations or how a landscape shock can empower and prefigure new sustainable pathways. In the remainder of the paper, we first explain the theoretical framework employed, including the MLP, systems thinking and the deliberative process itself (Section 2); we then illustrate the methodology and the process implemented throughout the project (Section 3); we present the results (Section 4) and discuss them (Section 5), contributing to current debates on food governance, socio-technical transitions and democratic resilience. To conclude, we argue that food solidarity should be understood as a politically significant arena through which more inclusive and participatory forms of urban governance can emerge (Section 6).

2. Theoretical Framework

2.1. Food, Urban Systems and Collective Action

The study of food and food systems has gained attention in the sociological literature due to its intersection with and amplification of concepts, dynamics and critical issues concerning space and territories, cities and urban transformations, the relationship between the urban centre and the suburbs, and production systems and value chains, which are increasingly global [1,18,34,35]. Food, in this perspective, is more than a commodity: it is simultaneously a material need, a symbolic marker of distinction and belonging, and a relational device that structures everyday practices, spaces and interdependencies. It is important to distinguish between food poverty, food solidarity, and food security, as these concepts refer to different dimensions of food systems and social and collective action. Food poverty refers to the inability of individuals or households to access, in socially acceptable ways, sufficient, adequate and nutritious food [3,4]; it is therefore a relational and distributive condition, generally rooted in income, welfare and housing inequalities. Food security, according to the Food and Agriculture Organization of the United Nations (FAO), exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs; it is typically measured at household or population level, but without specifying who is responsible for guaranteeing it [1,36]. Food solidarity, by contrast, highlights the collective practices and forms of mutual support through which communities address food vulnerabilities, emphasising the right of people and communities to define and govern their own food systems (e.g., concerning food production, distribution and equitable and healthy consumption decisions) [9,10,12,36]. In short, food poverty and food security describe conditions (of deprivation and of adequate access, respectively), whereas food solidarity describes a form of collective action that responds to the former and, in its transformative variants, claims the latter as a right.

Table 1 summarises these concepts, together with the two models of food assistance referred to throughout the paper.

Table 1. Key concepts and terminology used in the paper.

Concept	Definition	Analytical Focus
Food poverty	Inability of individuals or households to access, in socially acceptable ways, sufficient, adequate and nutritious food, mainly due to insufficient economic resources [3,4].	Condition of deprivation (individual/household)
Food security/insecurity	Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food; food insecurity is its absence, measured, for	Condition of access (household/population)

	example, through the Food Insecurity Experience Scale (FIES) [1,5,36].	
Food solidarity	Collective, non-market practices through which citizens and organisations pool resources, time and relationships to secure access to food, combining material support with reciprocity and claims for the right to food [9,10,12].	Form of collective action
Charitable (assistentialist) model	Model of food aid based on the donation and redistribution of surplus food through vertical relations between donors and recipients, who are positioned as passive beneficiaries; we use "charitable" and "assistentialist" as synonyms [2,10,37].	Model of intervention (regime-oriented)
Transformative (post-assistential) model	Model in which food is a vehicle for social empowerment, autonomy and community-building, with active involvement of recipients and a rights-based framing of food poverty [2,12,37].	Model of intervention (niche-oriented)

Analysing urban systems through food, therefore, means observing, at once, the mechanisms that produce exclusion and vulnerability, and the resources through which agency, new social and spatial ties, and collective action can be activated. This section will focus on how food can be transformed from a mere instrument of welfare into a tool that triggers new forms of collective action and political debate, with a view toward a socio-ecological transition that puts justice, democracy and human dignity back at the centre.

As Harvey's [38] political economy of urbanisation and Bourdieu's [39] sociology of symbolic power suggest, urban food systems can reproduce the same logics of capital accumulation, class reproduction, and symbolic distinction that produce urban inequality more broadly. This is increasingly accompanied by the emergence of food deserts and food swamps, which are not simply market failures but can also reflect spatial expressions of racialised disinvestment [40]. Food deserts refer to urban or rural areas where residents have limited physical and economic access to affordable, nutritious and culturally appropriate food due to the absence or scarcity of grocery stores and fresh food retailers. Food swamps, by contrast, are areas where access to unhealthy, energy-dense, and highly processed foods (e.g., fast-food outlets and convenience stores) significantly outweighs the availability of healthy food options, thereby contributing to unhealthy diets and food inequalities [19].

Beyond these spatial inequalities, charitable food assistance systems, despite their longstanding tradition of food solidarity, can reproduce hierarchical relations between donors and recipients that contribute to social stigma [10]. Moreover, framing food poverty as a matter of individual nutritional deficit, rather than structural entitlement, contributes to its depoliticisation, thereby serving the interests of incumbent welfare regimes [2,37]. As Toldo et al. [37] observe, food poverty is often constructed starting from its supposed solutions (i.e., surplus redistribution) rather than from an adequate conceptualisation of the problem. This depoliticisation can be read under the neoliberal frame in which public welfare has progressively been delegated to the charitable and voluntary sector [2,41]. This approach also tends to appropriate the transformative meanings and potentialities of food itself: when alternative food practices are translated into matters of individual consumer choice, their radical claims risk being diluted and co-opted within the very market rationality they seek to contest [15,42]. Rather than adopting a charitable-assistentialist approach, in which recipients are positioned as passive beneficiaries and vulnerability is framed as an individual condition, it is necessary to move towards a transformative approach that, starting precisely from the identification and analysis of these vulnerabilities, can translate into a food and social justice approach,

while building relationships and communities and fostering inclusion and urban transformation.

In reaction to these processes, increasingly diverse forms of collective action are emerging in the food sector, including solidarity purchasing groups (Gruppi di Acquisto Solidale, GAS), community kitchens and groups for the recovery of surplus food, which can be considered processes of "re-commonification" [12]: collective actions capable of transforming both how we conceive food (from commodity to commons) and how we can transform local food systems towards collective practices of community reproduction and greater social justice thanks precisely to the role of CAIs. Important examples are provided by Grasseni [43] and Fonte [15], who show that solidarity-driven collective action around local food systems is not simply an alternative market arrangement, but constitutes a relational space in which new forms of civic subjectivity, trust and political identity are produced through citizens' collective participation. By territorialising food provisioning and reconnecting farmers and consumers, these initiatives can also generate alternative forms of collective agency and provisioning infrastructure [15]. These experiences illustrate what Kerstetter et al. [44] describe as social solidarity operating as a form of social infrastructure, enabling bottom-up responses to crises that differ from charity-based approaches to food poverty and turning food distribution into spaces of political solidarity [10]. From an actor–network perspective, Brunori et al. [45] similarly argue that solidarity purchasing groups in Italy function as socio-technical niches in which capacities for critical citizenship are developed beyond the immediate function of food provisioning.

The COVID-19 pandemic has made it possible to analyse these dynamics in other European contexts as well. In London, Lombardozzi et al. [46] show that the pandemic exposed and exacerbated the pre-existing contradictions of austerity-driven welfare, as well as the dependence of food solidarity action on volunteer labour and short-term funding. In Italy, Zollet et al. [47] document how grassroots initiatives in Rome mobilised territorially embedded networks to guarantee food access during lockdowns, while Tarra et al. [11] highlight the resilience of solidarity purchasing groups. In Kraków, Kopczyńska and Migalska [48] show that collective action around food can challenge the crisis by mobilising relational, organisational and knowledge capitals rather than financial resources. These studies converge on a question that remains largely open: what happens to collective actions that emerge or expand during crises, and how does their relationship with public institutions evolve? This is the question we want to address in this research, through a participatory and systemic approach.

Understanding whether and how such heterogeneous initiatives can move beyond a charitable model requires an analytical framework capable of holding together their conflictual and synergic relations with incumbent institutions. It is to this framework, the Multi-Level Perspective, that the next section turns.

2.2. The Multi-Level Perspective in the Urban System

As Tilly [49] observed, neglected political issues that exacerbate power disparities can create optimal conditions for social movements and collective mobilisation to arise, impacting the established decision-making regime [20]. Although collective actions originate within existing socio-political structures, they can progressively acquire autonomous dynamics while remaining shaped by incumbent actors [50]. These dynamics are conceptualised in this paper through the Multi-Level Perspective (MLP), which provides the theoretical backbone of the CO-SUSTAIN project and the analytical framework for understanding the structural dynamics of the Turin food solidarity system.

The MLP distinguishes three analytically nested levels: the socio-technical landscape (the macro-level characterised by slow-changing trends, such as climate change, economic restructuring or cultural trends); the socio-technical regime (rules, institutions, and the

realm of the incumbent actors); and the niche level (where radical innovations are developed) [28,29]. Applied to urban food systems, the landscape encompasses phenomena such as climate change, practices of value extraction from food supply chains, and economic and social vulnerability characterised by prolonged stagnation or external events and shocks, such as pandemics. The regime encompasses public administrations, institutions and foundations, religious charities and third-sector organisations that fulfil logistical and distributional roles in the field of food assistance (including programmes such as the Fund for European Aid to the Most Deprived (FEAD) and the European Social Fund Plus (ESF+)), together with the regulatory and legislative framework, as well as the cultural norms underpinning these practices. Finally, the niche consists of a broad network of often bottom-up forms of collective action, including associations, solidarity purchasing groups, food recovery initiatives, mutual aid networks, and neighbourhood solidarity hubs.

In Turin, the niche does not refer to a specific collective action initiative but rather to an emerging and dynamic network of heterogeneous practices and collective actors within civil society that work to make the urban food system more sustainable, with particular attention to the nexus between cooperation, mutualism, and active citizenship.

Several of these initiatives, characterised by forms of latent participation [51], emerged both before, during, and after the COVID-19 pandemic in response to new vulnerabilities, and continue to operate today through practices of food surplus redistribution and food solidarity. Their development was also supported by broader processes of urban food policy experimentation, including the influence of the Milan Urban Food Policy Pact [17], which fostered a broader awareness of the need for an integrated urban food policy among actors from academia and the third sector.

Although such a policy remains formally absent in Turin, it has increasingly been shaped from below by collective and third-sector initiatives.

The Turin niche can therefore be interpreted as a socio-political innovation [28,29], in response to the socio-technical regime's inability to adequately address food surplus management and food poverty during acute crises [21,23]. These practices also built upon pre-existing initiatives and collective actions that, even before COVID-19, had experimented with alternative forms of food governance and contributed to constructing post-assistential imaginaries around the right to food [2,37].

The collective action initiatives perform two interconnected functions: they develop practices of mutual aid and social solidarity as a response to the inaction, delays or inadequacies of public institutions and formal welfare systems in addressing food and social emergencies; they develop critical narratives about the structural origins of inequalities and vulnerabilities, while simultaneously implementing concrete alternatives for governing urban and environmental transformations based on principles of justice, inclusion and sustainability.

In Turin, the main limitations of the incumbent regime are the following:

- The absence of a systemic local food policy addressing food surplus reduction, partly due to the limited competencies of local governments;
- The systematic exclusion of unregistered populations, such as migrants and homeless people, from formal food assistance schemes, which are only able to reach officially recognised beneficiaries;
- The persistence of a charitable model that fails to generate meaningful forms of social empowerment [2];
- The absence of a territorial infrastructure capable of supporting local networks of active solidarity and fostering trust and cooperation among diverse social actors through food-based initiatives.

The niche confronts the limitations of the existing regime by advancing a vision of systemic transformation that emerges from below and is rooted in pragmatic action, relational practices, and strong territorial embeddedness.

The COVID-19 pandemic represented a particularly important moment in the relationship between the niche and regime levels. On the one hand, it disrupted everyday practices and food supply chains; on the other, it made existing vulnerabilities more visible and created conditions for experimentation and collaboration. The COVID-19 pandemic therefore provides a window of opportunity through which to examine whether niche practices produced a genuine reconfiguration of the regime, partially transforming incumbent institutions, or merely a temporary accommodation followed by regime restoration [24].

This question also highlights some of the limitations of the MLP. Shove and Walker [52] and Meadowcroft [53] note its tendency toward systemic functionalism and its under-theorisation of political agency and conflict. Stirling [27] argues that transition pathways are not simply functional outcomes of niche–landscape interaction but are shaped by power relations and incumbent actor strategies to defend existing socio-technical configurations. To address these dimensions, we integrate the MLP with Participatory System Mapping and deliberative approaches (described in the next section), which help to shed light on these blind spots and to develop transformative pathways through the active involvement of niche–regime actors.

2.3. Transition Pathways Through Systems Thinking and Deliberative Practices

The challenges posed by the climate imperative increasingly demand tools capable of targeting its intrinsic complexity in a systemic and participatory manner. In this paper, we conceptualise 'transition pathways' as processes through which collective action and institutional actors can be oriented towards socio-ecological transition. Furthermore, we adopt a systems thinking approach to map feedback dynamics of complex socio-technical systems in ways that more conventional narrative frameworks cannot.

Systems thinking (ST) considers systems as inherently dynamic configurations of interdependent components, drawing attention to both the system as a whole and the cascading effects that transformations in one domain may produce across others, including time delays and unintended effects [54].

Applied to Turin's food solidarity system, ST enables a dynamic and relational mapping of the feedback mechanisms that structure niche–regime interaction: the reinforcing loops through which trust, mutualism and collective action accumulate within CAIs; the balancing loops which constrain niche development or regulate reinforcing dynamics that could otherwise destabilise the system; and finally, the leverage points that can produce structural system change.

The participatory dimension of ST is operationalised through Participatory System Mapping (PSM), a structured facilitation methodology that enables diverse groups of stakeholders to collaboratively construct Causal Loop Diagrams (CLDs) by drawing on their expert and situated knowledge of the system [30,31,55]. PSM combines systems modelling with the system representations and practical knowledge of those who inhabit the system. In this way, PSM can represent a form of co-production that constitutes and integrates the political dimension in the analytical process, in order to distribute the capacity to define the system problems and related solutions across the actors. This dimension is complemented by deliberative democracy, understood as a process through which actors engage in public arenas to collectively and horizontally develop a shared understanding of problems and co-create possible solutions [56–59].

Within CO-SUSTAIN, this process was carried out with precise rules and temporalities, through moderation and facilitators able to balance and regulate

deliberative arenas, employed to develop co-production processes and multi-stakeholder dialogue to generate more inclusive policies and strategies, using collective feedback and situated knowledge [60–62].

In the Turin case, the integration of MLP with systems thinking and deliberative practices served three purposes. First, they provide a structured mechanism for surfacing and negotiating the competing framings through which niche and regime actors construct the problem of food poverty, exposing the differences between a charitable-assistentialist and a transformative approach, which the MLP tends to treat as an exogenous variable. Second, they generate conditions for the development of shared systemic representations that cross institutional boundaries, enabling actors who typically operate in parallel (municipal officials, charitable organisations, grassroots CAIs, researchers) to develop a common analytical language for diagnosing system dynamics and identifying leverage points. Third, and most significantly for the democratic dimension of this paper, they represent sites of potential democratic capacity-building. These are arenas in which the foundations for more inclusive, horizontal and participatory food governance can be collectively constructed and evaluated.

These possibilities, however, cannot be taken for granted. Deliberative processes may reproduce existing inequalities when participation is constrained by differences in resources, institutional recognition, time and discursive power [63–66]. In the Turin case, specific structural features of the food solidarity ecosystem (e.g., the chronic resource scarcity of niche organisations, the time constraints of third sector actors, the differential institutional recognition accorded to regime and niche actors) generate systematic pressures that deliberative design must actively counteract in order to function as a genuinely democratic infrastructure (rather than a legitimation device).

The framework proposed in this paper, therefore, positions MLP, systems thinking and deliberative democracy as mutually corrective perspectives: the MLP provides the structural cartography of niche–regime dynamics; systems thinking adds causal precision and identifies the feedback mechanisms and leverage points that structure those dynamics; and deliberative democracy theory restores the political dimension that the other two frameworks tend to under-theorise: the contested, power-laden and identity-constituting character of the governance processes through which food solidarity is constructed, institutionalised and transformed.

Combined, they allow us to ask not only how niche–regime relations changed after the shock, but also whose causal understanding of that change is represented. In the analysis, deliberative theory is operationalised through four criteria: inclusiveness, i.e., who participates and how participants are selected [61]; discursive equality and the treatment of conflict [56,57,63,64]; consequentiality, i.e., the capacity of deliberation to influence collective decisions [26]; and the degree of power redistribution [66]. These criteria are used to interpret the findings in Section 5.

3. Materials and Methods

3.1. Research Design and Methodology

The MLP, systems thinking and deliberative democracy were therefore employed with the aim of enabling participants to explore systemic challenges and interdependencies, reflect on desired futures and co-create roadmaps and policy strategies for sustainable transition.

From a methodological standpoint, the study is based on a deliberative process structured around Group Model Building (GMB) techniques [67]. This transdisciplinary approach to democratic engagement and sustainability governance aims not only to consult or inform stakeholders but also to activate them as co-creators of change through iterative, reflective, and imaginative processes. In particular, GMB guides groups of

experts in visualising complex challenges, exploring root causes while identifying and prioritising high-leverage areas for action [68].

Consistent with the GMB literature [31,68,69], we structured the process around four stages, adapting GMB to the objectives of the CO-SUSTAIN project and combining it with Participatory System Mapping and deliberative workshops, facilitated by trained moderators who guided dialogue between niche and regime actors and supported the collaborative construction of the CLDs.

As discussed below, the four stages (i.e., defining the problem, conceptualising the system, creating the model, and analysing and validating the model) were developed through a kick-off meeting (December 2025) and three in-person deliberative workshops (February–June 2026), followed by a validation session with external experts (July 2026).

Table 2 summarises the sequence of research stages, the activities carried out, the participants involved and the main outputs of each stage.

Table 2. Research stages, activities, participants and outputs.

Stage	Period	Activities	Participants	Main Outputs
1. Documentary analysis and stakeholder mapping	November 2024–February 2025	Analysis of municipal, regional and national policy documents, organisational reports and media (2019–2025)	Research team	Case context; map of niche and regime actors
2. Semi-structured interviews	January–June 2025	12 interview sessions (60–90 min) with 15 representatives, audio-recorded and transcribed	9 niche and 6 regime representatives	Thematic codes; input for the panels
3. Kick-off meeting	December 2025	Presentation of the project and of the process; informed consent	11 participants	Shared rules of the process
4. Deliberative panel 1 (niche)	February 2026	Life Line; Participatory System Mapping; pre-panel questionnaires	7 representatives of 6 niche organisations	Niche timeline; niche CLD
5. Deliberative panel 2 (regime)	February 2026	Life Line; Participatory System Mapping; pre-panel questionnaires	11 representatives of 10 regime organisations	Regime timeline; regime CLD
6. Integration	Between panels 2 and 3	Merging of the two CLDs; identification of six candidate leverage points	Research team	Merged CLD; six leverage points
7. Deliberative panel 3 (joint)	June 2026	Validation of the merged CLD; shared vision; vote on leverage points; role-play; Theory of Change	2 niche and 7 regime participants	Shared vision; three leverage points; Theory of Change
8. External validation	July 2026	Semi-structured validation session	3 external experts	Refinement and prioritisation of pathways
9. Follow-up	July 2026	Post-panel interviews; post-panel questionnaires	3 participants	Complementary evidence on learning and participation

3.2. Case Study Context: Turin's Food Solidarity System

The food solidarity system in Turin exemplifies the role and the potential of civic engagement. Indeed, Turin can be seen as an ideal laboratory for exploring the complex dynamics of food solidarity and the fight against food poverty. Moreover, the city is characterised by the coexistence of different intervention models, which reflect diverse forms of collective action and institutional responses to food insecurity and food waste: a traditional model, based on the logic of donation, in which the main goal is to address food poverty and food waste by collecting surplus food and redistributing it to charitable organisations, which then deliver it to the final recipients; and a transformative model, in which food is not an end in itself, but rather a vehicle for social reactivation and rebuilding community ties. In the latter case, this transformative (or post-assistential) model is defined by the strong, active involvement of recipients and aims to promote pathways to reintegration and the restoration of individual capabilities.

During the COVID-19 pandemic, Turin experienced lockdowns and restrictions that shut down businesses. This disrupted the normal flow of food distribution and triggered a food supply crisis. In response, civil society self-organised to guarantee access to food and other goods, starting from surplus products. Various organisations, as well as formal and informal networks, were activated for the distribution of food aid, hygiene products, and other essential goods. These initiatives involved a heterogeneity of actors, including students, third-sector associations, religious organisations, and local businesses. Food provision also served to create opportunities for social mediation and neighbourhood-based activities, connecting people to education, social services, and community support.

The case study investigates how this variety of actors, formal and informal networks in the city of Turin, developed, self-organised, evolved, and interacted with local administrations. Some of these initiatives eventually signed a convention with the Municipality of Turin to manage food aid and necessities, social mediation, and proximity actions, in cooperation with associations experienced in social integration. Others maintained an informal nature. They operated across different levels of governance to address food waste, improve food accessibility, and contribute to a more sustainable food system.

At the regime level, food issues are addressed in a fragmented set of official documents rather than in a single policy instrument. The City of Turin's food strategy and the evolution of its food policy are based on a coherent set of resolutions, research tools, official guidelines, and an integrated framework of institutional and operational tools, although the municipality does not have a comprehensive food policy. Based on the pioneering inclusion of the right to food within the Municipal charter and on the City's early adherence to the Milan Urban Food Policy Pact (MUFPP) in 2015 [17,70], the City's food policy has been formally systematised in the recent 'Guide to the City of Turin's Food Policy' [71]. The effectiveness and evolution of this strategy are supported by data-driven monitoring activities, such as the Metropolitan Turin Food Atlas Reports and the Food Metrics Report [72–74].

The absence of a formally adopted urban food policy, confirmed by participants and experts (Section 4.4), is therefore both a feature of the case and a limitation of our documentary analysis, which necessarily relied on sectoral welfare, environmental and waste-reduction documents rather than on a dedicated food strategy.

3.3. Data Collection

Data collection involved three complementary methods. As highlighted in Table 2, the first method consisted of a documentary analysis of municipal, regional and national policy documents, third-sector organisational reports and media sources on food poverty and food solidarity, with a particular focus on the period between 2019 and 2025. This

documentary screening provided the essential background on the institutional and collective action environment in relation to food solidarity. Second, between January and June 2025, the research team conducted twelve semi-structured interview sessions with fifteen representatives (nine niche and six regime actors; some sessions involved more than one representative of the same organisation) of key actors from the food solidarity ecosystem, including representatives of CAIs (community kitchens, solidarity networks, food recovery organisations, and mutual aid groups), municipal and regional officials responsible for social welfare and food policy, representatives of established charitable organisations and third-sector associations with longstanding activities and projects in food solidarity. These two methods informed the selection of participants, the design of the deliberative process and the contextual understanding of the case, but the 2025 interviews are not used as evidence in this article and are not quoted. Third, the empirical material analysed in this article stems from the deliberative process itself (see Section 3.5), which brought collective action initiatives and institutional actors together in structured deliberative spaces: the transcripts of the three deliberative panels and of the validation session, the observers' field notes, the Life Lines, the niche, regime and merged CLDs, and the Theory of Change (ToC). The three post-panel interviews conducted in July 2026 are used only as complementary evidence on learning and participation (Section 5). The way in which this material was analysed is described in Section 3.6.

3.4. Stakeholders Selection and Participation

We invited both niche-level and regime-level actors to take part in the deliberation process, which comprised four meetings: the Kick-off Meeting, the Niche Deliberation panel, the Regime Deliberation panel and a Third Deliberation panel with both niche and regime actors. Organisations were identified through the stakeholder mapping and the interviews and were invited by e-mail and telephone; each organisation was asked to designate one or two representatives. Of the 19 organisations invited, 17 took part in at least one stage of the process; the number of participants per stage is reported in Table 2.

3.4.1. Niche Actors

In selecting organisations belonging to Collective Action Initiatives (CAIs) that address food insecurity in Turin, particular attention was paid to ensuring the organisations reflected the diversity of the local food solidarity network. Specifically, the selection included: (1) organisations engaged in the distribution of fresh food; (2) initiatives operating within neighbourhood-based networks; (3) actors that played coordination roles during the COVID-19 pandemic; and (4) low-threshold initiatives capable of reaching beneficiaries who were not accessing institutional welfare services.

These organisations reflect various organisational trajectories and approaches to food solidarity, such as experimentation in food recovery and redistribution, reciprocal and mutual aid models, neighbourhood coordination mechanisms operating alongside or in collaboration with formal welfare networks (i.e., *Torino Solidale*), varying degrees of professionalisation within the third sector, and interventions targeting hard-to-reach populations.

3.4.2. Regime Actors

To understand the perspectives of the regime, the deliberative process included institutional stakeholders and well-established organisations operating within Turin's food solidarity system. According to the Multi-Level Perspective, these actors represent the institutional arrangements through which food solidarity is governed, coordinated, and implemented at the urban level.

The selection of these actors aimed to reflect the diversity of governance functions characterising the local food system. Specifically, the selection included: (1) large-scale food recovery and distribution organisations; (2) public institutions responsible for policy design and implementation; (3) long-established charitable and welfare organisations; (4) grassroots and third-sector CAIs. These organisations represent various institutional trajectories and governance functions, such as food redistribution and logistics, welfare provision, territorial coordination, policymaking, research activities, and support services for vulnerable populations. The complete list of participating niche and regime organisations is reported in Table 3.

Table 3. Niche and regime actors participating in the deliberative process. Numbers in brackets refer to the governance functions listed in Section 3.4.2.

Niche-Level Actors	Regime-Level Actors
(4) Associazione Fa Bene!; (4) Fondazione Porta Palazzo; (4) ARCI Torino; (4) Cecchi Point; (4) Panafricando; (4) Eco dalle Città; (4) Associazione Mosaico—Azione per i Rifugiati	(2) Interdepartmental Group for Food Policies (GIPA); (3) Cascina Roccafranca; (1) Nova Coop; (1) Banco Alimentare; (3) Bagni Pubblici di via Agliè; (3) Rete delle Case del Quartiere; (3) SERMIG; (2) the University of Turin; (3) Unione Pastorale Migranti; (1) Osservatorio delle Povertà e delle Risorse della Caritas Diocesana.

The sampling strategy did not aim to be statistically representative; rather, it aimed to capture the diversity of actors operating within the niche and regime levels of Turin's urban food system. The final composition reflects a variety of governance functions and organisational trajectories, enabling an in-depth qualitative analysis of coordination mechanisms, governance dynamics, and the interactions between regime actors and niche-level initiatives. Importantly, people experiencing food poverty or receiving food assistance were not directly involved as participants: their experiences were only included in the process as mediated by the organisations working with them. This decision was made for ethical and practical reasons, such as the difficulty of guaranteeing a safe, non-instrumental and non-stigmatising participation of highly vulnerable people within the project timeframe. Instead, the research team involved social actors with in-depth knowledge of the urban food system and its policies, including third-sector workers and representatives of migrant associations who could bring the perspectives of these groups into the deliberative process. Nevertheless, this mediated representation remains a substantive limitation for a study concerned with democratic participation, as discussed in Sections 5 and 6.

3.5. The Deliberative Process

Building on the analytical framework presented above, the process asked participants to draw on personal experiences, perspectives, and existing evidence, working with facilitators to create a Causal Loop Diagram (CLD), representing key dynamics, feedback mechanisms, and interdependencies characterising the system.

Following the initial Kick-off Meeting held in December 2025, during which the project and the research process were introduced, the deliberative process consisted of three participatory workshops conducted between February and June 2026: (1) a deliberative panel involving niche actors; (2) a deliberative panel involving regime actors; and (3) a final joint deliberative arena bringing together both groups.

All sessions were audio-recorded, transcribed, and anonymised for analysis. The data were organised through thematic clustering aligned with the Group Model Building outputs (Section 3.6). Recordings were made with the informed consent of participants (Section 3.7). Quotations are identified by panel and participant code (e.g., 2DP-3 = second

deliberative panel, participant 3; 3DP = third, joint deliberative panel), while VAL-E1–E3 identify the three external experts.

In this study, the PSM served two purposes. First, it was used as an analytical tool to reconstruct and understand the main systemic dynamics shaping the food solidarity system in Turin. Secondly, it was used as a deliberative and co-design method, in order to enable participants to collectively identify strategic intervention areas and potential pathways for systemic transformation.

The first two deliberative panels followed the same methodological structure, consisting of two main participatory activities. In the first activity, participants engaged in a participatory timeline exercise (Life Line), which aimed to collectively reconstruct the historical trajectories of the Turin food solidarity system, by drawing on participants' own experiences and memories. In particular, they identified the main events, critical turning points and crises that had shaped the system over time. The exercise aimed to develop a shared understanding of the system's historical trajectory, while making explicit the different perspectives associated with their respective roles and positions within the food solidarity system.

The second activity consisted of a Participatory System Mapping (PSM) exercise, aimed at collectively identifying the key factors that affect the food solidarity system in Turin, including relevant actors, practices, available resources, contextual factors, and governance arrangements. With the support of facilitators, participants explored the causal relationships and interdependencies between these variables through the construction of a Causal Loop Diagram that represented their collective understanding of the system.

The resulting CLDs made explicit the feedback mechanisms, reinforcing and balancing loops, structural barriers and system interdependencies shaping of the Turin's food solidarity system, providing the analytical basis for the subsequent stage of the deliberative process.

After that, participants were invited to a final deliberative arena (DP3). The initial discussion aimed to develop a shared vision of the future food solidarity system and provided the foundation for the subsequent co-design of a Theory of Change, starting from the following guiding question: "How would you like food solidarity in Turin to look in a desirable future?"

The resulting plenary discussion brought to light a detailed and multidimensional vision of the desired change, centred on several recurring themes that gradually defined a shared vision of the system's transformation. Starting from this shared vision, the research team presented six leverage points previously identified through the analysis of the merged CLD (the result of the two CLDs constructed during the niche and regime deliberative panels). The identification of these leverage points was guided by the hierarchical framework proposed by Meadows [69]. Participants collectively discussed the six proposed leverage points and selected the three most relevant leverage points (LPs) according to their vision. All nine participants in the third panel (two niche and seven regime representatives; Table 2) took part in the vote. Each participant could allocate four votes among the six leverage points, with no more than one vote per leverage point, for a total of 36 votes; the three leverage points with the highest number of votes were retained (Table 4).

Table 4. Proposed leverage points and results of the vote in the third deliberative panel.

Proposed Leverage Point	Level in Meadows' Hierarchy	Votes (*n*)	Selected
Stabilisation of resources and time for CAIs (LP1)	Parameters/buffers	9	Yes

Permanent spaces for dialogue, co-design and collective learning (LP2)	Self-organisation/mental models	9	Yes
Information flows and data integration (LP3)	Information flows	7	Yes
Reducing fund volatility and simplifying access (LP4)	Parameters/buffer	5	No
Institutionalisation of support practices (LP5)	Rules of the system	3	No
Stabilisation and institutional recognition of niche networks (LP6)	Rules of the system	3	No

The second part of the workshop consisted of a serious game (role-play). Participants were divided into three mixed groups, each working on one of the selected leverage points, assuming roles different from their own in real life, encouraging perspective-taking and reducing the influence of pre-existing organisational positions. During this session, each group identified three concrete activities necessary to reach the desired systemic transformation.

Following the role-play, participants presented their proposals during a plenary discussion. The collective reflection focused on refining and validating the proposed pathways for change, identifying the expected outputs and potential outcomes, as well as the key inputs and enabling conditions required for implementation. The ToC was therefore progressively co-constructed and visualised in real time using a collaborative digital whiteboard, enabling participants to discuss, revise and validate the emerging intervention pathways collectively.

In addition to the facilitation process, two other members of the research team documented the discussions through detailed field notes. These observations supported transcription and subsequent analysis, and were also used to monitor participation patterns, interaction dynamics, and the accessibility of the deliberative process. Attention was paid to verbal, non-verbal, and emotional aspects of participants' engagement.

Finally, the deliberative process was supplemented with additional qualitative methods, including semi-structured post-panel interviews with selected participants (the interview guide is reported in Appendix A), a validation process involving external experts and additional stakeholders, and institutional ethnographic observations conducted throughout the workshops. These methods strengthened the robustness of the research through methodological triangulation, while providing additional insights into both the deliberative process and the collective creation of system representations and pathways for change.

3.6. Construction of the CLDs and Analysis of the Workshop Material

The CLDs were developed in accordance with the conventions of system dynamics [75] and the Group Model Building [67] scripts, which have also been applied to participatory analyses of food security [33]. In each of the first two panels, the construction proceeded in four steps. First, participants wrote the factors they considered most influential on food solidarity in Turin on cards, drawing on the turning points identified in the Life Line. The facilitators then clustered similar cards and agreed with the participants on a shared label for each variable (e.g., "availability of time and resources"). Second, starting from the most central variables, participants proposed causal connections between pairs of variables and discussed their polarity (whether they would change in the same or in the opposite direction). A connection was only drawn when the group agreed on its existence and direction, while contested links were recorded as such. Third,

the facilitators helped the participants to close the feedback loops and to identify their nature (reinforcing or balancing). Finally, the resulting diagram was read back to the group for a final check and subsequently digitised in Kumu (web-based version; https://kumu.io).

Following the two panels, the research team merged the niche and regime CLDs using a three-step process. (i) Harmonisation of variables: variables with equivalent meaning but different labels were unified (e.g., "monetary funds" and "financial funds availability" were unified under the label "access to funds"), while those expressing different perspectives were kept distinct. (ii) Union of causal links: all links from both diagrams, and their polarities, were checked for consistency. Where the two diagrams attributed different polarities or meanings to the same relationship, as in the case of the effects of institutional recognition and data integration, both readings were kept as distinct pathways (e.g., loops R8 'Public–private integration' and R11 'Cooptation') rather than being resolved by the research team. (iii) Identification and labelling of the feedback loops of the merged diagram. The resulting merged CLD was presented at the beginning of the third panel, where participants were invited to assess whether it adequately represented their views and to discuss its structure and causal relationships. The discussion led to further refinements to the diagram (e.g., the addition of loop B12 'Data appropriation risk', which was not included in the preliminary merge conducted by the research team). The final CLD thus incorporated the researchers' integration of the niche and regime diagrams, as well as the contributions that emerged from the third deliberative panel. It was subsequently discussed with three external experts (see Section 4.4). The six candidate leverage points were identified by the research team on the merged CLD, by looking for highly connected variables and for loops whose modification could alter system behaviour, and were classified according to Meadows' hierarchy [69].

The workshop material was analysed as follows. The material consisted of the audio transcripts of the three deliberative panels and of the validation session, the field notes of the two observers, the Life Line exercise, the three CLDs produced in Kumu and the ToC. The thematic clustering did not involve formal line-by-line coding. Rather, the research team grouped transcript segments and field notes deductively around the outputs of the Group Model Building process and inductively around recurring themes not captured by the diagrams (e.g., the distinction between reducing food waste and reducing hunger, or the critique of tonnage-based indicators). Each cluster was compared with the diagrams to check whether the causal links and loops discussed in Section 4.2 were supported by participants' accounts, and discrepancies were discussed within the research team. The six candidate leverage points were identified on the merged CLD as described above: LP1 targets 'Availability of time/resources', which connects the reinforcing solidarity core to the balancing loops B7 and B11; LP2 targets the coordination and recognition variables involved in loops R8, R10 and R11; LP3 targets 'Information on food solidarity' and 'Data integration' (loops R2, R8 and B12); LP4 targets the volatility of funds and the rules for accessing them (loop B1); LP5 targets the institutionalisation of support practices (loops R1 and R6); and LP6 targets the recognition and autonomy of niche networks (loops R9 and R10).

3.7. Ethical Considerations and Researchers' Positionality

The research was conducted in accordance with the ethics procedures of the CO-SUSTAIN project. All participants received an information sheet describing the aims of the study, the voluntary nature of participation, the recording of sessions and the use of data, and gave written informed consent before taking part in interviews and workshops. Recordings were transcribed, pseudonymised and stored on institutional servers, and only pseudonymised or aggregated data are reported. Moreover, the members of the

research team acted at the same time as designers, facilitators, analysts and evaluators of the deliberative process. This multiple position, typical of transdisciplinary and action-oriented research [76], may have influenced both the dynamics of the process (e.g., through the formulation of the guiding questions and the presentation of the six leverage points) and the interpretation of results. To mitigate this risk, facilitation and observation roles were separated during the workshops, the merged CLD and the leverage points were submitted to participants for validation, and an external validation with independent experts was carried out; nevertheless, this positionality is acknowledged as a limitation of the study (Section 6).

4. Results

The deliberative process produced a collective representation of Turin's food solidarity system, emphasising the key factors, dynamics, relationships and feedback mechanisms that have influenced its development over time.

The results presented in this section summarise the results produced throughout the three deliberative workshops, integrating the perspectives of niche and regime actors, as well as the subsequent validation process. The section is organised in four subsections: the historical trajectories and turning points identified by participants during the Life Line exercise; the main systemic dynamics between niche and regime that emerged from the merged CLD; the leverage points and ToC co-developed with participants during the third deliberative arena; and the external validation. The analysis focuses on systemic dynamics emerging from co-produced causal loop diagrams (CLDs), and pays particular attention to mechanisms influencing the capacity of the local food solidarity system to adapt, stabilise, and transform. Sections 4.1 and 4.2 mainly address RQ1, while Sections 4.3 and 4.4 provide the empirical basis for RQ2. The answers to both questions are summarised at the end of Section 4.4.

4.1. Life Line Exercise: The Historical Trajectories of Food Solidarity in Turin

The first exercise focused on the construction of a historical timeline, providing a collective and shared reconstruction of the trajectories that have shaped the evolution of Turin's food solidarity system. Even though niche and regime actors emphasised distinct events and interpreted some turning points differently, participants highlighted a non-linear evolutionary trajectory, characterised by phases of emergence, partial institutionalisation or emergency acceleration. The participants traced the origins of the current system back to the establishment of the Food Bank in 1989 and the gradual consolidation of distribution practices by charitable organisations such as SERMIG. During this period, food aid largely followed a traditional charitable model centred on the redistribution of surplus dry food through vertical welfare structures.

A second turning point emerged in the aftermath of the 2008–2009 economic crisis with the rise of so-called new poverties, which broadened the profile of food aid beneficiaries to include middle-class households and families. Between 2010 and 2013, food solidarity practices progressively expanded towards the recovery of fresh food and stronger collaborations with local markets and large-scale retailers. The establishment of *Fa Bene!* in 2013 marked a shift towards combining food redistribution with community-building and social inclusion, addressing both material deprivation, the erosion of social capital, and loneliness.

Between 2016 and 2018, the system underwent a further phase of diversification. The creation of the *Atlante del Cibo di Torino Metropolitana* was seen by participants as a milestone in connecting research, public policies, and the territorial food system. Meanwhile, the emergence of organisations such as *Eco dalle Città* saw environmental sustainability and food waste reduction introduced as additional rationales for food

recovery. Food redistribution initiatives were increasingly recognised as both social welfare and environmental practices. The most significant turning point in the collective reconstruction process was the onset of the global pandemic. Participants consistently described the period from 2020 to 2021 as an unprecedented phase of mobilisation, coordination, and visibility. The creation of *Torino Solidale* formalised city-wide collaboration among civil society organisations, informal groups, volunteers, local businesses, and public institutions, substantially expanding the scale of food solidarity interventions through the creation of a dedicated hub-based distribution model (called *Snodi*). Participants differed in their interpretations of the pandemic's transformative role. Some viewed the emergency as a genuine window of opportunity, accelerating institutionalisation, strengthening partnerships with local authorities, and embedding food solidarity more firmly within urban policies; others argued that the pandemic primarily revealed and amplified collaborative dynamics that had already been developing.

Participants also emphasised the cyclical nature of public attention towards food solidarity. The extraordinary mobilisation observed during the health emergency rapidly declined once the immediate crisis subsided, alongside seasonal fluctuations in donations, volunteer engagement, and food surplus availability. The panel interpreted this evolution as signalling a gradual transition from an emergency-based and charitable approach towards a more integrated and person-centred model of food solidarity, despite continuing uncertainty regarding not only resources and food supplies, but also political priorities.

From 2022 onwards, the Life Lines revealed a divergence between niche and regime perspectives: while niche actors described a process of demobilisation and partial institutional retrenchment, regime actors emphasised consolidation, professionalisation, and stabilisation of the *Torino Solidale* network and data integration. This divergence points to a central post-pandemic tension between the autonomy of grassroots solidarity and its absorption into institutional welfare circuits.

Figure 1 summarises the configuration of the food solidarity system before, during and after the pandemic, as reconstructed by participants in the Life Line exercise.

4.2. The Merged CLD: Main Systemic Dynamics

The two CLDs produced by the niche and regime deliberative panels were merged by the research team (Section 3.6) and validated with participants at the opening of the third deliberative panel. As shown in Figure 2, the merged CLD comprises 55 variables, 95 causal links and 27 feedback loops (14 reinforcing (R) and 13 balancing (B)), offering a systemic representation of the food solidarity system in Turin. Here, we highlight three systemic dynamics that address our research questions. The complete list of variables and loops, with their descriptions, is provided in Appendix B, while an interactive version of the diagram is provided as Supplementary Figure S1.

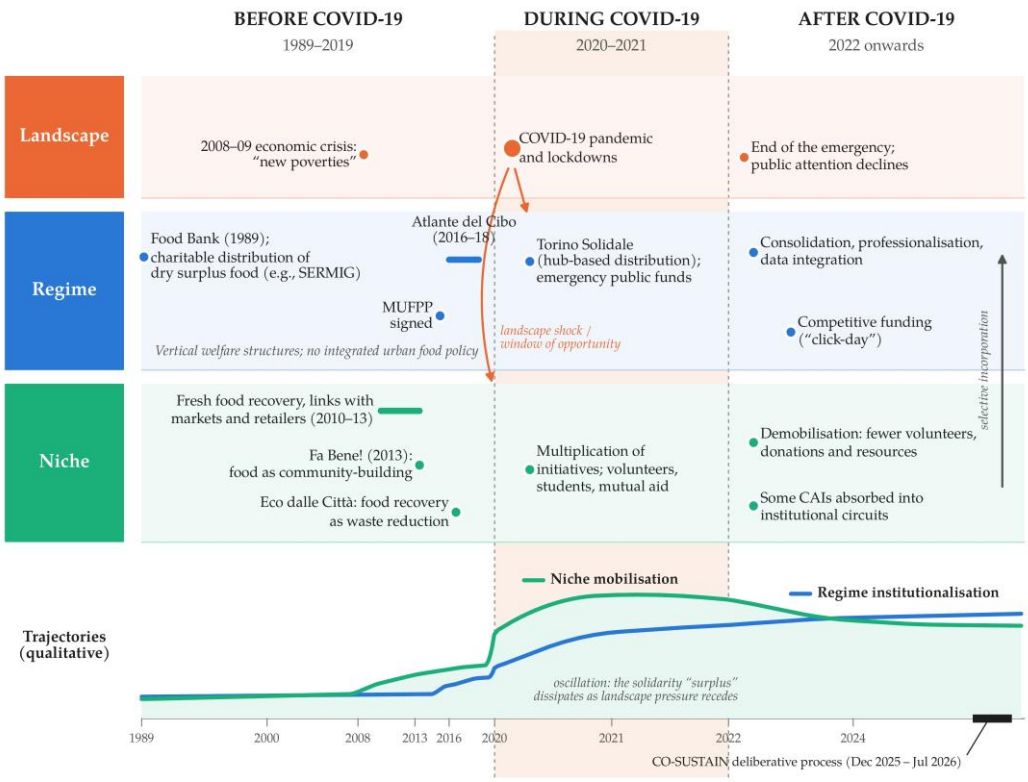


Figure 1. The food solidarity system in Turin before, during and after COVID-19. Source: authors' elaboration.

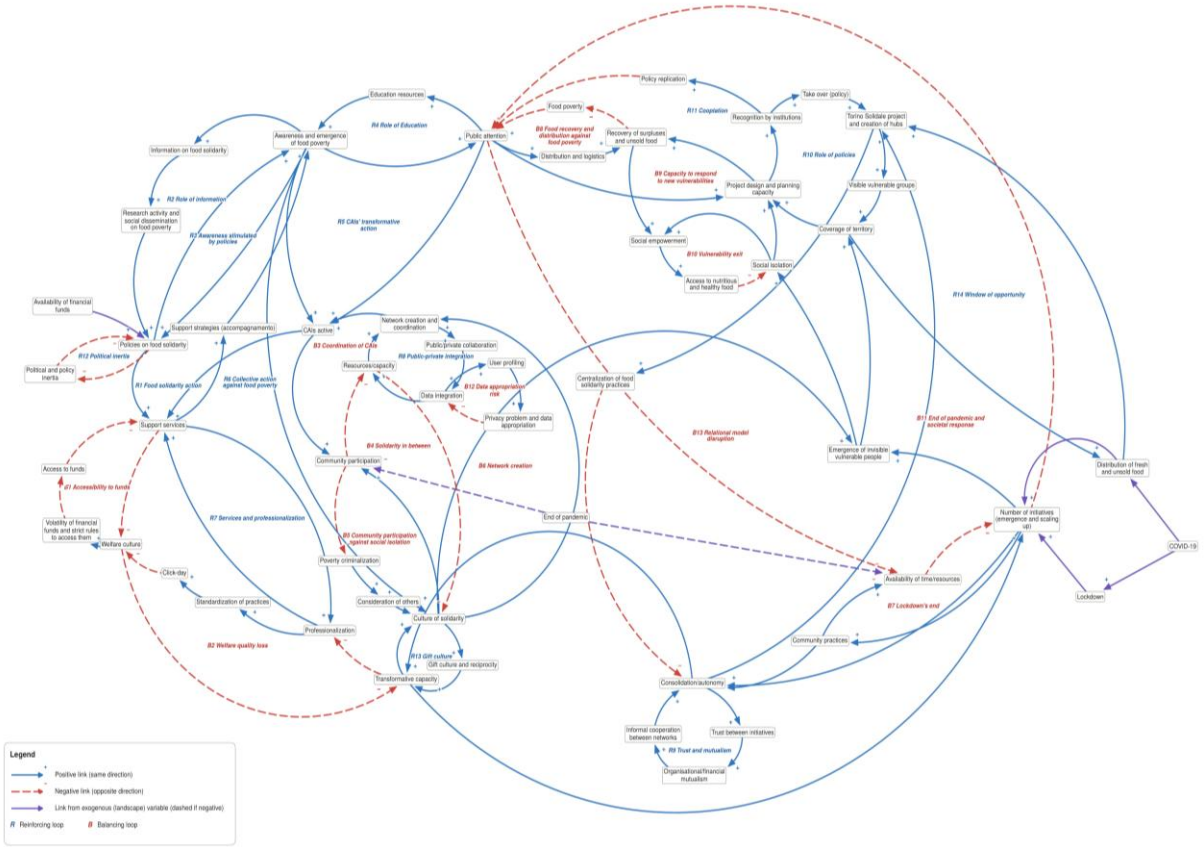


Figure 2. Merged causal loop diagram of Turin's food solidarity system. Blue solid arrows indicate positive links (+); red dashed arrows indicate negative links (−); purple arrows indicate links originating from exogenous landscape variables (COVID-19, Lockdown, End of pandemic). Loop

labels in blue identify reinforcing loops (R), labels in red balancing loops (B). Source: authors' elaboration in Kumu (web-based version) (interactive version in Supplementary Figure S1).

The first dynamic is a *crisis-driven solidarity core*. A cluster of reinforcing loops—R1 'Food solidarity action', R6 'Collective action against food poverty', R9 'Trust and mutualism', R13 'Gift culture'—connects the emergence of food poverty, public attention and awareness with the multiplication of CAIs and the strengthening of a culture of solidarity. 'Culture of solidarity' is one of the most connected nodes in the CLD: it is reinforced by information flows (R2 'Role of information'), by education (R4 'Role of Education') and by the visibility of collective action itself, and in turn it sustains participation, trust between initiatives and organisational and financial mutualism. The COVID-19 pandemic, represented as a landscape-level exogenous variable, activated these dynamics through both increased need (the emergence of new vulnerable groups) and increased opportunities (the availability of time and resources during the lockdown).

The second dynamic concerns *niche–regime hybridisation and its ambivalence*. Loops R7 'Services and professionalization' and R8 'Public-private integration' capture how institutional recognition, the creation of *Torino Solidale*, data integration, and professionalisation can strengthen the capacity of grassroots initiatives to respond to new vulnerabilities and the coverage of the territory. Yet these connections generate counter-dynamics that participants explicitly thematised: loop R11 'Cooptation' traces how institutional take-over and the centralisation of food solidarity practices can reabsorb niche logics into standard welfare procedures; the integration of beneficiary data raises risks of privacy violation and data appropriation (B12); competitive funding mechanisms, epitomised by the 'click-day' variable, select organisations on administrative speed rather than territorial rootedness; and political and policy inertia (R12) slows the translation of awareness into structural policies. The 'click-day' refers to competitive funding schemes in which applications are submitted online within a limited time window and partly evaluated according to the speed of submission. This mechanism may disadvantage smaller, grassroots organisations with fewer administrative resources. Hybridisation, in other words, appears in the diagram as simultaneously enabling and threatening for the transformative capacity of the niche.

The third dynamic concerns *oscillation and demobilisation*. Balancing loops tied to the end of the emergency (B7 'Lockdown's end' and B11 'End of pandemic and societal response') reduce the availability of time and resources, the number of initiatives and, downstream, the culture of solidarity itself. Other balancing loops moderate the system from within: B5 'Community participation against social isolation', B9 'Capacity to respond to new vulnerabilities', and B10 'Vulnerability exit' link community participation to the re-absorption of social isolation and to pathways out of vulnerability. Meanwhile, B2 'Welfare quality loss' warns that standardisation may erode the relational quality that distinguishes solidarity from service delivery. Taken together, these loops explain the post-pandemic decline recorded in the Life Lines: without dedicated feedback mechanisms to stabilise resources and relationships, the surplus of solidarity generated by the crisis dissipates as landscape pressure recedes. This was clearly stated by one of the participants during the Regime Deliberative Panel: "after the COVID-19 emergency, all the emotion collapsed: people went back to work, to school, university, etc." (2DP-3).

4.3. Leverage Points, Vision and Theory of Change

Building on the merged CLD, participants selected three of the six proposed leverage points (see Table 4) considered particularly relevant for achieving the desired transformation. They operated at different levels of Meadows' hierarchy, ranging from

interventions aimed at stabilising system functioning, to deeper changes in information flows, collective learning and system paradigms.

The first LP concerns the stabilisation of resources and the availability of time for CAIs. The CLD identified 'Availability of Time and Resources' as a key variable influencing the emergence and scaling up of initiatives, as well as the culture of solidarity and organisational and financial mutualism. Participants highlighted the need to reduce the system's dependency on temporary mobilisation and emergency responses through structural multi-year funding, stabilisation mechanisms, and support for existing forms of organisational mutualism.

The second LP concerns permanent spaces for dialogue, co-design and collective learning. Participants expressed the need for institutionalised spaces in which niche and regime actors can exchange knowledge, negotiate priorities, and develop a shared understanding of systemic challenges. These spaces are considered important for strengthening collective learning and transforming the mental models underlying food solidarity governance. In this regard, a regime participant in the third deliberative panel highlighted the need for greater inclusion and education, stating that: "even within the Municipality, there are officials who lack awareness of these topics. They don't even know that food poverty is already at the heart of some of the Municipality's policies!" (3DP-5).

The third LP concerns information flows and data integration. Participants emphasised the importance of investing in shared monitoring systems and infrastructures for knowledge production, such as the *Atlante del Cibo*, in order to strengthen knowledge-based governance. At the same time, participants recognised the risks of co-optation, dependency, professionalisation and reduced niche autonomy associated with greater institutional integration, highlighting the need to balance coordination with organisational flexibility.

The identification of these leverage points provided the basis for collective reflection on the type of transformation participants imagined for Turin's food solidarity system in the future, guided by the question introduced in Section 3.5.

The shared vision was formulated as follows:

An integrated, participatory, and transformative food solidarity system, in which food becomes a tool for strengthening social bonds, promoting people's autonomy, and enhancing the community, by building collaborative governance between the public and private sectors capable of responding to the needs of the local area in a coordinated, inclusive, and sustainable manner. A system based on the co-design and co-creation of data and knowledge, which enables policies to be guided through shared decision-making and invests in the active participation of communities, recognising users not only as recipients of services but as agents with agency, while promoting a culture of solidarity, giving, conscious consumption, and collective responsibility.

Although the vision was developed prior to the selection of leverage points during the deliberative process, we present it here as the normative horizon guiding the interpretation of possible transition pathways, with the leverage points identifying areas where interventions may be most effective. The Theory of Change was then developed collectively through the serious game, translating the shared vision into concrete pathways of change. For each leverage point, participants identified actions, expected outputs, inputs and long-term outcomes. The resulting pathways reveal how different actor groups envisioned concrete ways of addressing the identified leverage points: territorial facilitation and redistribution of responsibilities and resources (LP1); new spaces for learning, networking and co-design, including territorial deliberative arenas and the proposed figure of a food manager (LP2); and consolidating information infrastructures, including the implementation of SolidApp, regular exchanges with the third sector, and improved data monitoring (LP3).

Two critical shifts emerged transversally in the plenary discussion. The first is the explicit distinction between reducing food waste and reducing hunger: participants observed that an efficient redistribution of surplus can diminish waste without ever reaching the most invisible vulnerable populations, and traced a normative trajectory 'from waste, through charity, to justice'. The second is a critique of the adequacy of prevailing indicators: tonnes of food recovered and meals distributed capture quantities but fail to describe the quality of relations, the dignity associated with food distribution mechanisms and support services, or pathways towards autonomy and recognition. Participants also questioned the current structure of fiscal incentives, which rewards large companies for the management and disposal of food surplus, and called instead for a culture based on gift-giving, community- and relationship-building through food. This shift was summarised by a regime participant in the third deliberative panel, who stated: "Each of us owns a fridge, each of us has a cupboard, and each of us eats every day. We need to educate and sensitise people [...] food poverty starts in the fields but reaches our homes" (3DP-2).

4.4. Validation

The validation workshop, held in July 2026, presented the preliminary results to three external experts (VAL-E1–E3) in the fields of food solidarity and food poverty alleviation. Selected for their expertise and practical experience, they provided feedback on the representativeness of the CLD, the relevance of the identified dynamics and the feasibility of the proposed pathways for change. The session combined elements of a semi-structured interview and a guided discussion and formally concluded the deliberation process.

The discussion broadly confirmed the CLD dynamics and the relevance of the leverage points, while suggesting several refinements. Experts emphasised the reciprocal dimension of the culture of giving, the ambivalence of user profiling and associated data-governance risks, and the role of political and policy inertia in limiting transformative capacity. They also characterised COVID-19 as a double-edged dynamic: while creating opportunities for institutional change, it could simultaneously reinforce a return to conventional food-distribution practices at the niche level.

The validation further highlighted the absence of a coherent food policy in Turin and the persistent overlap between food policy and welfare functions, while questioning the use of tonnage-based key performance indicators (KPIs) as indicators of impact: such measures do not capture the transformative effects of community-based initiatives, but primarily reflect upstream inefficiencies. This reinforced the need to move beyond charity-based food assistance towards a right-to-food and social justice perspective, including greater involvement of community-based initiatives in policy design and planning.

Finally, the validation helped refine and prioritise the pathways for change. 'Resource and time stabilization' (LP1) emerged as the most immediate priority, a point also reflected in the limited participation of third-sector actors in the final deliberative panel and interpreted as an indication of resource constraints. 'Co-design spaces' (LP2) were also considered potentially high-impact, but experts favoured strengthening existing structures, such as GIPA and *Atlante del Cibo*, rather than creating new institutional bodies. 'Information flows' (LP3) were confirmed as relevant, provided that appropriate data-governance safeguards are established, while the proposed food manager role was endorsed as a system-level connector. Finally, experts recommended incorporating rights-fulfilment indicators as an explicit output of the ToC, linking the proposed pathways more directly to a rights-based understanding of food policy.

In summary, with respect to RQ1, the results show a non-linear trajectory in which the pandemic accelerated pre-existing niche–regime collaborations, produced a new institutional infrastructure (*Torino Solidale*) and was followed by a post-pandemic phase

of demobilisation of the niche and consolidation of the regime (Sections 4.1 and 4.2; Figure 1). With respect to RQ2, the results show that participants converged on a shared vision and on three leverage points that concern precisely the conditions of participation (resources and time, permanent spaces of co-design, shared information), while the validation highlighted that these conditions are currently unevenly distributed (Sections 4.3 and 4.4). Whether the process strengthened democratic capacities beyond the deliberative arena, or produced durable institutional change, could not be observed within the study period. These results are interpreted in the next section.

5. Discussion

With the conclusion of the deliberative process, several dynamics emerged that offer insights into the relationships between food governance, participatory processes, and civic activism, as well as into possible pathways for the renewal of democratic systems. Hereafter, we focus on two dynamics that are particularly relevant to broader debates on democratic participation within socio-technical and sustainable transitions.

The first concerns a gradual shift in the framing of food solidarity, from charitable responses to situations of need towards a broader understanding of food as a matter of rights and social inclusion. Participants highlighted the limitations of an approach that, both in the past and, in some respects, during the COVID-19 pandemic, was characterised by an emergency-driven logic and adopted a reductionist focus on food waste and sustainability objectives. Rather, it was highlighted how food can become a means through which CAIs (and, to some extent, regime actors as well) actively contribute to reshaping forms of governance through food. Food, therefore, operates not only as an object of assistance but also as a medium through which claims, responsibilities and forms of practised citizenship are negotiated [77,78]. This dynamic is particularly significant because it suggests that innovations in food governance can contribute to broader processes of democratic revitalisation, creating opportunities for participation that extend beyond the simple "management" of food poverty and can lead towards the collective redefinition of rights, responsibilities and knowledge in food systems.

The second dynamic concerns the transformative potential of deliberative processes themselves, together with the conditions and limitations that shape their democratic capacity [25]. While the deliberative arena per se did not produce any institutional change during the project time-span, it offered opportunities for new forms of collaboration among niche and regime stakeholders, as well as for learning and collective reflection among actors, as reported by some participants in the post-panel interviews; whether these collaborations will last could not be assessed within the project time-span. In this sense, the process itself can be read as a form of social innovation, not only because of the solutions that were co-created and proposed, but because it generated new spaces for interaction and collective participation.

A key contribution of the deliberative process was the adoption of a systems perspective. Through the collective construction and discussion of causal dynamics, participants (guided by the research team) were able to identify counter-intuitive, complex and unintended dynamics that often remain invisible or are taken for granted in everyday governance practices. This systems-oriented approach encouraged participants to move beyond a linear understanding of food poverty and to build a shared understanding of the challenges at stake. We therefore underline the added value represented by the use of CLDs as a reflexive tool bringing to light counter-intuitive, complex and unintended dynamics, while returning to participants a valuable representation of the system of which they are part.

The proposals emerging from the third deliberation panel further illustrate this potential. Participants called for a stable and long-term space of coordination, including

co-design tables and participatory forums connecting public institutions, civil society organisations and CAIs beyond emergency contexts. In the Turin case, food may thus act as a catalyst for broader forms of democratic engagement, and as a laboratory to foster new forms of participation and collective action. Food, in that sense, may function as a boundary object: its multiple meanings (nutrition, care, culture, economy, ecology) allow actors who rarely engage with one another to connect across policy domains, creating new relationships and, potentially, new forms of social innovation.

Yet the findings also invite caution. Participants and external validators pointed out that transformative ambitions associated with participatory governance can be limited by existing power asymmetries (especially between institutionalised actors and third sector operators and volunteers), and "institutional inertia". Similarly, the language of participation and co-design can be incorporated into existing governance arrangements without substantially redistributing decision-making power. The democratic value of participatory processes therefore depends not simply on the creation of collective spaces, but on their capacity to become consequential: to influence policies, resource allocation, and institutional practices over time. Participation may generate collective learning and create enduring synergies among actors without necessarily producing a redistribution of power.

With regard to RQ2, these limits can be explained more precisely by mobilising the deliberative theories introduced in Section 2.3. At first, funding dependence: as the click-day mechanism and loop R11 show, niche organisations depend on resources allocated by the same institutions they are asked to deliberate with. In terms of Fung's "democracy cube" [61], the arena had communicative but not decisional authority, while resource allocation is generally confined to competitive procedures outside of it. Similarly, in Arnstein's ladder [66], the process can be situated around consultation and, at best, placation, rather than partnership, as no formal commitment linked its outputs to policy or funding decisions.

Moreover, the Habermasian ideal of consensus oriented by the better argument [56,57] tends to privilege the language of efficiency and coordination familiar to regime actors, whereas niche claims for the right to food and for horizontal decision-making were more conflictual. From Mouffe's [63,64] perspective, the convergence achieved in the joint arena on a shared vision may have partially neutralised this agonistic dimension: the vision is inclusive precisely because it does not specify who should give up power or resources. Finally, from a deliberative systems perspective [26,58,79], the democratic value of the Turin arena depends less on the quality of its internal deliberation than on its consequentiality; that is to say, on the existence of transmission mechanisms that connect it to the spaces where empowered decision-making on food and welfare policies takes place. The main reason why deliberation generated learning and recognition without redistributing power is the absence of such mechanisms, rather than a lack of willingness among participants.

Reading through the MLP, these dynamics allow us to answer our first research question (RQ1) on how niche–regime interactions evolved throughout the pandemic. The trajectory reconstructed can be understood as a partial and negotiated reconfiguration [23]. The regime incorporated specific niche elements, including the hub-based distribution model, the legitimacy and relational know-how of CAIs as welfare partners, while filtering out their more political content, namely the framing of food as a right and the request for more horizontal decision-making and resource allocation. Following Geels [24], this selective incorporation can be interpreted as an expression of regime power: accommodation at the instrumental level, combined with inertia at the paradigmatic level. The window of opportunity that was presented by the pandemic was therefore only

partially seized: it was wide enough to institutionalise cooperation, but too narrow to institutionalise participation.

However, neither Participatory System Mapping nor deliberative processes are neutral or without limits. First, power imbalances among participants can persist throughout the mapping process, meaning that the resulting diagrams crystallise the perspective of the most vocal or most resourced actors, unless the facilitator actively counteracts this tendency. Second, the knowledge generated does not translate automatically into policy or practice and it can lead to an underestimation of the effectiveness of the process [32]. Third, the accessibility of system dynamics tools themselves shapes who can meaningfully participate [67]. Fourth, with regard to deliberative processes, critics point to the difficulty of assembling groups that are heterogeneous yet workable, informed yet spontaneous, and that deliberative quality degrades beyond a rather small scale [80].

A further limitation concerns the actors represented in the CLD. Because the diagram was built by a purposive group of organisational representatives, some actors and feedback loops are likely to be under-represented or missing. In particular, people directly experiencing food poverty, including the undocumented migrants and homeless people whom participants themselves identified as excluded from formal assistance, did not take part in the process, and private actors such as food retailers other than Nova Coop, farmers and local markets were represented only indirectly. Loops related to the lived experience of stigma, to household coping strategies or to informal economies of food access are therefore absent from the diagram, and the participation analysed in this paper is organisationally mediated. This reflected practical constraints, issues of trust and accessibility, and the difficulty of involving people facing precarious living conditions in a multi-session deliberative process.

Our research design incorporated several counter-measures to mitigate these limitations, without claiming to eliminate them. The facilitation and observation roles were separated during the process, to reduce the risk of researcher influence. The access survey on potential barriers and participation constraints, the field notes taken by two observers attentive to verbal, non-verbal and emotional dimensions of participation, and the individual pre–post questionnaires were used to monitor the conditions of participation (however, their systematic analysis is reported in the project deliverables and is not discussed here). The role-playing exercise redistributed speaking positions by design, assigning new roles to each organisation, which are quite different from their current ones and the validation process with external experts, together with post-panel interviews, addressed the question of external legitimacy.

6. Conclusions

Understanding how democratic systems respond to shocks such as the COVID-19 pandemic is increasingly important, also in view of the disruptions that climate change may generate. It is equally important to highlight the crucial role of collective and grassroots forms of action in reshaping democratic practices and forms of activism. Against this background, the paper has addressed two research questions, concerning the evolution of niche–regime interactions throughout the pandemic (RQ1) and the democratic potential of civic participation in urban food governance (RQ2).

On the one hand, the deliberative process highlighted how the pandemic represented an ambivalent window of opportunity. While it accelerated an ongoing process of interaction between niche and regime actors, it also led to the creation of a new institutional infrastructure (*Torino Solidale*) and conferred a new degree of public recognition on grassroots solidarity initiatives, although this recognition did not translate into formal institutional change during the project period. On the other hand, it also

initiated dynamics of centralisation and the progressive standardisation of the niche's food solidarity practices.

The current configuration can therefore best be described as liminal: a system in-between, in which social innovation and organisational reconfiguration on both niche–regime sides coexist with unresolved tensions. These include the continued exclusion of some CAIs from project design and planning processes, their partial exclusion from institutional funding circuits and the resulting limited capacity to reach low-threshold and particularly vulnerable populations. In this way, the food solidarity system remains suspended between assistance and transformation.

On the second question, the deliberative process produced several dynamics of collective learning, mutual recognition and general support for more co-designed strategies; yet its democratic value proved contingent on conditions (availability of time and resources, trust, guarantees, etc.) that are unevenly distributed and institutionally fragile. In the Turin case, participation fostered learning and mutual recognition when it was supported by available time and resources, stable infrastructures and logistical support; durable effects on democratic capacities and on institutional arrangements were not observed during the study, and the views of people directly experiencing food poverty were not collected directly. The theoretical contribution of the paper lies in the integrated framework through which these answers were produced. The MLP provided the architecture for reading crisis-driven change, but only its combination with systems thinking and with deliberative theory allowed us to capture the double-edged character of niche–regime hybridisation. Turin's food solidarity system has been investigated as a socio-ecological and socio-technical practice through which food governance and food practices are shaped and negotiated between CAIs and regime actors. It is not the simple sum of two subsystems, but an interconnected and evolving result of their interaction.

Rather than findings directly tested by this research, the Turin case suggests three insights that may be explored in other urban and institutional contexts. (P1) Landscape shocks may open windows of opportunity that regimes tend to seize selectively, incorporating the operational and relational components of niche innovations (while filtering out their political claims). (P2) Without stabilised resources, crisis-driven solidarity tends to follow an oscillating trajectory, so that the solidarity surplus generated by the shock dissipates as landscape pressure recedes. (P3) Participatory system mapping can serve as a useful tool for enabling participants within the system to learn about one another, thereby fostering opportunities for dialogue, collaboration and the co-production of new knowledge. At the same time, it should be emphasised that the decision to allocate the necessary resources and tools to translate these inputs into policy remains a political choice.

Some features of the Turin case are likely to be shared by other European cities with a strong third sector and an urban food policy still in development, such as the coexistence of charitable and transformative models, the hub-based coordination model inherited from the pandemic, and the reliance of grassroots initiatives on competitive, project-based funding. Other features, such as the specific institutional history of *Torino Solidale*, the role of the *Atlante del Cibo* and the density of neighbourhood-based networks, are context-specific. Building on the leverage points and the Theory of Change co-produced by participants, we derive four recommendations for local policymakers: (i) replacing click-day and short-term calls with multi-year agreements for organisations working with hard-to-reach populations (LP1); (ii) giving existing coordination bodies, such as GIPA, a formal mandate to periodically convene niche and regime actors, in order to respond publicly to their proposals (LP2); (iii) developing shared monitoring systems with explicit data-governance safeguards, based on qualitative indicators (rights fulfilment and relational quality alongside tonnage-based indicators) (LP3); and (iv) creating protected

fora through which people experiencing food poverty can participate directly in the design and evaluation of food policies.

As for the broader horizon of the ecological transition, the Turin case points to a hypothesis for future research rather than to a tested finding: if climate-related disruptions were governed through the same emergency-based logic observed during COVID-19, they might reproduce a similar oscillation between mobilisation and demobilisation. Building permanent and consequential participatory infrastructures may therefore be an important condition for more democratic responses to future shocks.

The study has clear limitations, which constrain its conclusions. First, it rests on a single case in which participants were purposively selected; the insights above are therefore analytical rather than statistical generalisations. Second, the merged CLD and the ToC reflect the perspectives of organisational representatives and do not include the voices of people directly experiencing food poverty, so our conclusions on democratic participation concern organisationally mediated participation only. Third, the research team acted as designer, facilitator, analyst and evaluator of the same process (Section 3.7), which may have shaped both the process and its interpretation despite the mitigation measures adopted. Finally, the time horizon of the project does not allow us to observe whether the co-produced ToC will lead to the expected outcomes, whether the window of opportunity will close further or reopen, or whether the deliberative process will leave lasting organisational traces. What can be documented is that the process generated concrete proposals designed for durability and that some participants signalled, during the role-play and in the final questionnaire, their intention to pursue the contacts established beyond the project.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su182312141/s1, Figure S1: Merged causal loop diagram of Turin's food solidarity system (interactive version available online: https://embed.kumu.io/8aa4f16cf0f2023a654ea5deb7da252b#cld3, accessed on 30 September 2026).

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Abbreviations: The following abbreviations are used in this manuscript:

CAI	Collective action initiative
CLD	Causal loop diagram
DP	Deliberative panel
ESF+	European Social Fund Plus
FAO	Food and Agriculture Organization of the United Nations
FEAD	Fund for European Aid to the Most Deprived
FIES	Food Insecurity Experience Scale
GAS	Gruppi di Acquisto Solidale (solidarity purchasing groups)
GIPA	Interdepartmental Group for Food Policies
GMB	Group Model Building
KPI	Key performance indicator
LP	Leverage point
MLP	Multi-Level Perspective
MUFPP	Milan Urban Food Policy Pact
PSM	Participatory System Mapping
RQ	Research question
ST	Systems thinking
ToC	Theory of Change

Appendix A. Post-Panel Semi-Structured Interview Guide

Introduction. Participants were thanked for taking part in the deliberative panels and in the earlier pre-panel interview. They were asked for consent to audio-record the interview and informed that data would be used anonymously, only for analysis within the CO-SUSTAIN project.

A. Civic and political engagement

1. There are different ways to be socially and politically active. How would you describe your role as a citizen?
2. Have your experiences during the panels influenced your thinking about how to be politically active? (2a. If so, how?)
3. Which forms of activism do you consider the most effective, useful or democratic? (3a. Why? 3b. Has participating in the panels changed your view on this? 3c. How?)

B. Barriers and motivations to participation

4. What are the biggest barriers for you to engage politically?
5. What would motivate you to engage more in things that matter to you?
6. What would you need to be more active in these processes?
7. What do you think stops other people from engaging politically? (7a. Why do you think so?)
8. Has participating in the panels changed your view on these reasons? (8a. If so, can you give some examples?)

C. Views on political change

9. Do you think politics needs to change, and if so, in what ways?
10. Has your participation in the panels influenced how you think about the need for political change? (10a. If so, how?)

D. Experience of the deliberative process

11. In our previous interview we discussed your expectations about the deliberative process. Was the process what you expected? (11a. What was different?)

E. Problem framing, causes, desired future and pathways

12. In your view, what problem did the panels come together to solve? (12a. Did this become clearer during the panels? 12b. When and how?)
13. What do you consider to be the main causes of this problem? (13a. Has this understanding changed during the panels? 13b. If so, in what way and how did this happen?)
14. What future would you currently desire for food solidarity in Turin? (14a. Has this vision changed during the panels, and if so, how?)
15. Please describe the pathways you can currently imagine for achieving this future. (15a. Has this understanding changed during the panels, and if so, how?)

F. Deliberative and systemic tools

16. What was your experience more generally with the deliberative practices and systems thinking? (16a. Did you find the approaches helpful or unhelpful, and in what way?)
17. What did you think of the system mapping and causal loop diagrams? (17a. Were they helpful or unhelpful in understanding the problem and its solutions? In what way?)
18. What about the games (role-play) used during the panels? (18a. Were they helpful or unhelpful in understanding the problem and its solutions? In what way?)

G. Implications for collective action initiatives (for participants from CAIs or other institutions)

19. Which approaches have you found most useful for CAIs in achieving sustainable change? (19a. Which approaches have not been useful or have made things more difficult?)
20. Have the panels helped or hindered your ability to involve more people or to cooperate with other institutions? (20a. In what way?)
21. Might you incorporate some of the activities and approaches from the panels into your organisation's future work? (21a. If yes, which ones and how? 21b. If not, what are the main reasons?)

Appendix B. Feedback Loops of the Merged Causal Loop Diagram of Turin's Food Solidarity System (55 Variables, 95 Causal Links; 14 Reinforcing and 13 Balancing Loops)

Loop	Name	Causal Chain	Description
		Reinforcing loops (R)	
R1	Food solidarity action	Policies on food solidarity → (+) Support services → (+) Support strategies (accompagnamento) → (+) Awareness and emergence of food poverty → (+) Policies on food solidarity	A higher number of policy interventions, laws and resolutions sustains the creation of new support services; through accompaniment strategies, services bring further needs to the surface, feeding back into the awareness, emergence and recognition

			of food poverty and, potentially, into its reduction.
R2	Role of information	Awareness and emergence of food poverty → (+) Information on food solidarity → (+) Research activity and social dissemination on food poverty → (+) Policies on food solidarity → (+) Awareness and emergence of food poverty	The more food poverty is studied and publicly disseminated, the more information and research increase awareness of it, reinforcing the policy agenda and awareness itself.
R3	Awareness stimulated by policies	Awareness and emergence of food poverty → (+) Policies on food solidarity → (+) Awareness and emergence of food poverty	A tight two-variable loop: policies legitimise food poverty and make it visible, while awareness generates pressure for further policy action.
R4	Role of Education	Education resources → (+) Awareness and emergence of food poverty → (+) Public attention → (+) Education resources	Educational resources cultivate awareness, awareness attracts public attention, and higher public attention can lead to new investment in education on food poverty.
R5	CAIs' transformative action	Awareness and emergence of food poverty → (+) CAIs active → (+) Public attention → (+) Education resources → (+) Awareness and emergence of food poverty	CAIs raise the public visibility of food poverty; visibility feeds educational work and awareness, which in turn stimulate and enrich CAIs' operations and projects.
R6	Collective action against food poverty	Awareness and emergence of food poverty → (+) CAIs active → (+) Support services → (+) Support strategies (accompagnamento) → (+) Awareness and emergence of food poverty	A higher presence of CAIs expands the supply of support services and accompaniment, which surface previously invisible needs and reinforce collective action.
R7	Services and professionalization	Support services ⇄(+/+) Professionalization	The expansion of services drives the professionalization of practitioners and organisations, and professionalization increases the capacity to deliver services.
R8	Public–private integration	Network creation and coordination → (+) Public/private collaboration → (+) Data integration → (+) Resources/capacity → (+) Network creation and coordination	Networking enables structured collaboration between public and private actors; collaboration supports data integration (e.g., shared information systems), which increases organisational resources and capacity, further strengthening coordination.
R9	Trust and mutualism	Consolidation/autonomy → (+) Trust between initiatives → (+) Organisational/financial mutualism → (+) Informal cooperation between networks → (+) Consolidation/autonomy	As initiatives consolidate and gain autonomy, mutual trust grows and enables organisational and financial mutualism and informal cooperation, which in turn reinforce consolidation.
R10	Role of policies	Take over (policy) → (+) Torino Solidale project and creation of hubs → (+) Visible vulnerable groups → (+) Coverage of territory → (+) Project design and planning capacity → (+)	The public take-over of food solidarity through Torino Solidale makes vulnerable groups visible and extends territorial coverage; this strengthens design and planning capacity, earns

		Recognition by institutions → (+) Take over (policy)	institutional recognition and consolidates the policy take-over itself.
R11	Cooptation	Policy replication → (+) Public attention → (+) Project design and planning capacity → (+) Recognition by institutions → (+) Policy replication	Successful organisational models and practices of CAIs attract attention, build planning capacity and gain institutional recognition, leading to their replication as policy and to their progressive absorption into the institutional agenda.
R12	Political inertia	Policies on food solidarity → (−) Political and policy inertia → (−) Policies on food solidarity	Two negative links produce a reinforcing dynamic that can lock the system into either of two states: active policy-making erodes inertia, enabling further policies, while prevailing inertia suppresses policy initiative and thereby reproduces itself.
R13	Gift culture	Gift culture and reciprocity → (+) Transformative capacity → (+) Culture of solidarity → (+) Gift culture and reciprocity	Practices of gift and reciprocity nourish the transformative capacity of initiatives, which strengthens the broader culture of solidarity in which gift relations are embedded.
R14	Window of opportunity	Torino Solidale project and creation of hubs → (+) Visible vulnerable groups → (+) Coverage of territory → (+) Distribution of fresh and unsold food → (+) Torino Solidale project and creation of hubs	The pandemic opened a window of opportunity in which the hub infrastructure made vulnerability visible, extended coverage and scaled up the distribution of fresh and unsold food; these results legitimised and expanded the hub system itself.
		Balancing loops (B)	
B1	Accessibility to funds	Support services → (−) Welfare culture → (+) Volatility of financial funds and strict rules to access them → (−) Access to funds → (−) Support services	Support services weaken the assistentialist welfare culture, which is associated with funding volatility and strict access rules; through access to funds the loop stabilises the level of services.
B2	Welfare quality loss	Welfare culture → (−) Transformative capacity → (−) Professionalization → (+) Standardization of practices → (+) Click-day → (−) Welfare culture	An assistentialist welfare culture erodes transformative capacity; this favours professionalisation, standardisation and click-day funding, which feed back on welfare culture.
B3	Coordination of CAIs	Network creation and coordination → (+) CAIs active → (+) Community participation → (−) Resources/capacity → (+) Network creation and coordination	Coordinated CAIs increase community participation, but the resulting pressure on resources limits further networking.
B4	Solidarity in between	Network creation and coordination → (+) Public/private collaboration → (+) Data integration → (+) Resources/capacity → (−) Culture of solidarity → (+) Network creation and coordination	Integration of networks and data increases resources, but reduces the culture of solidarity that sustains networking.

B5	Community participation against social isolation	Community participation → (−) Poverty criminalization → (+) Consideration of others → (+) Culture of solidarity → (+) Community participation	Community participation reduces poverty criminalisation; via consideration of others and the culture of solidarity, the loop limits further growth of participation.
B6	Network creation	Culture of solidarity → (+) Network creation and coordination → (+) CAIs active → (+) Community participation → (−) Poverty criminalization → (+) Consideration of others → (+) Culture of solidarity	Networking among CAIs increases participation, which counteracts poverty criminalisation and feeds back on the culture of solidarity.
B7	Lockdown's end	Number of initiatives (emergence and scaling up) → (+) Community practices → (+) Availability of time/resources → (−) Number of initiatives (emergence and scaling up)	The growth of initiatives fosters community practices and available time/resources, which feed back negatively on the number of initiatives; the end of lockdowns further reduces available time and resources.
B8	Food recovery and distribution against food poverty	Food poverty → (+) Public attention → (+) Distribution and logistics → (+) Recovery of surpluses and unsold food → (−) Food poverty	Public attention to food poverty increases recovery and redistribution of surplus, which reduces food poverty and, in turn, attention.
B9	Capacity to respond to new vulnerabilities	Recovery of surpluses and unsold food → (+) Social empowerment → (+) Access to nutritious and healthy food → (−) Social isolation → (+) Project design and planning capacity → (+) Recovery of surpluses and unsold food	Surplus recovery fosters empowerment and access to healthy food, reducing social isolation and the need for further project design.
B10	Vulnerability exit	Social isolation → (+) Social empowerment → (+) Access to nutritious and healthy food → (−) Social isolation	Social empowerment and access to healthy food reduce social isolation, closing a pathway out of vulnerability.
B11	End of pandemic and societal response	Number of initiatives (emergence and scaling up) → (−) Public attention → (−) Availability of time/resources → (−) Number of initiatives (emergence and scaling up)	The growth of initiatives reduces public attention; through available time and resources the loop limits further growth, as the pandemic "solidarity surplus" dissipates.
B12	Data appropriation risk	Data integration → (+) User profiling → (+) Privacy problem and data appropriation → (−) Data integration	Data integration enables user profiling, raising privacy and data-appropriation concerns that constrain integration.
B13	Relational model disruption	Torino Solidale project and creation of hubs → (+) Centralization of food solidarity practices → (−) Consolidation/autonomy → (+) Torino Solidale project and creation of hubs	The Torino Solidale hub model centralises practices, reducing grassroots autonomy that sustained the model.

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