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FOOD FORWARD: DESIGN FUTURES TO SUPPORT ALTERNATIVE FOOD SYSTEMS IN URBAN AREAS.

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ABSTRACT | Environmental crises, social and economic challenges, and technological uncertainties highlight the urgent need for more sustainable food systems. While food affects climate change and inequality, these issues also influence food security. In this context, Alternative Food Networks (AFNs) offer promising ways to renew our relationship with food from production to consumption. This paper offers a speculative and design-led perspective on emerging practices within AFNs, proposing scenarios for Milan’s food system in 2035. Two main uncertainties create these scenarios: Governance, which looks at power and decision-making dynamics, and Approaches, which examine how institutions and societies respond to environmental and social issues, emphasising either adaptation or mitigation strategies. Using the design-orienting scenario theory, we outline four possible futures in 2035, considering innovations at the actor level, their relationships with actors at the system level, and broader societal changes. This paper concludes by proposing the concept of “regeneration” as essential for shaping future food scenarios. “Regeneration” refers to the process of reclaiming, maintaining, and restoring the health of ecosystems to enhance resilience. This approach goes beyond ecological health to foster positive outcomes for and with urban ecosystems, suggesting the renewal of societal relationships and structures. It emphasises the crucial role of engaging diverse actors—AFNs, citizens, and mainstream stakeholders—in different ways to create food futures that are not only environmentally sustainable but also socially equitable.

1. Background: Food System Challenges and the Promise of Alternative Food Networks

As we face an environmental crisis, growing social and economic vulnerabilities, and technological uncertainty, it becomes clear that we need to move to more sustainable and resilient food systems (Serraj & Pingali, 2018). From production to consumption, food significantly impacts climate change and social inequality. At the same time, climate change disrupts food security, water security, and agricultural productivity, making it difficult to achieve Sustainable Development Goals (IPCC, 2023). In other words, food affects climate change and inequality, while these issues also put our food supply at risk.

The COVID-19 pandemic and the conflict in Ukraine have made it more evident that the current food system cannot provide food access to all (FAO, 2023). This has increased interest in alternative food networks (AFNs) as a potential solution, as more research focuses on how AFNs and shorter supply chains can drive sustainable change on a small, local, and connected scale (Gori & Castellini, 2023).

AFNs introduce different ways of producing, distributing, buying, and consuming food (Barbera & Dagnes, 2016). Since they work to minimise environmental and social damage, they adopt cleaner and fairer practices, which have a positive impact on the sustainability of the entire supply chain (Bush et al., 2015). A look at Milan, Italy, illustrates how AFNs create new supply chains and leverage the infrastructure of conventional ones (Food Policy di Milano, 2021). After the 2015 Expo 'Feeding the Planet, Energy for Life,' AFNs in the city began using the resources of traditional players to create new solutions for food access. This practical approach shows how AFNs can collaborate with the mainstream food system to develop alternatives.

In this context, we recognize the opportunity for systemic rethinking within Milan. The city, already transforming its food practices since the 2015 Expo, has developed multiple initiatives aimed at varied aspects of the Milanese food system. Although the AFNs in urban and peri-urban Milan have shown promise in creating more sustainable and equitable food practices, the broader context calls for a deeper transformation. How can we extend the impact of these networks? To this end, this paper presents an in-progress work of envisioning scenarios for peri-urban and urban areas of Milan to introduce a speculative perspective on existing trajectories of development driven by design.

These scenarios act as an envisioning tool, an "interaction platform," and a springboard for generating "design-driven conversations" with different food system actors through co-design workshops. They will help identify contexts that improve food access in the city and become a catalyst for creating pre-prototyping and design activism actions, highlighting potential evolutions of the Milanese food system. This research is a part of the ongoing project named OnFoods, a research programme dedicated to the Sustainable Development of Food and Nutrition, supported by funding from the National Recovery and Resilience Plan (PNRR). More specifically, this paper focuses on a series of research activities and design actions conducted by the Polimi Desis Lab of Politecnico di Milano within the OnFood project and focused on enhancing the efficiency of food value chains to ensure food access for the most vulnerable sections of society.

Following this introduction, the paper presents current trends and emerging practices in the agri-food industry in Europe. Section 3 then outlines the methodology for scenario building. Section 4 presents four scenarios for the Milanese Food System and their application in three co-design workshops with food system stakeholders. Section 5 reflects on the workshops' outcomes and suggests that the current scenario-building strategies, which focus on adapting to and reducing negative impacts, should shift towards the concept of regeneration. This approach considers both social and ecological aspects to envision food futures that are not only carbon-neutral but also socially equitable.

2. Design-Orienting Scenarios

Scenarios facilitate open conversations around visions and solutions between the actors shaping the food system. Exploring scenarios encourages actors to share their different positions, concerns, and future goals, activating new discussions and even shared visions (Manzini & Jégou, 2004). The importance of participatory approaches lies in the fact they can help create visions with a plurality of perspectives and a better understanding of preferences (Heidingsfelder et al., 2015).

The goal of the research project is to use these scenarios as triggers to develop pre-prototypes. In this context, pre-prototypes become design activism actions meant to showcase new Alternative Food Networks (AFNs) and cross-sector partnerships in the city, involving different levels of society and opening the discussion for policymakers and local actors. Working with scenarios also presents an opportunity to invite actors from the food system to sit at the same table and share provocations that could eventually spark changes at the food policy level. Given that scenarios will provoke participatory ideation, the method used during this first phase was the one of design-oriented scenarios (Manzini & Jégou, 2000).

Unlike policy-oriented scenarios (POS), design-oriented scenarios (DOS) are "design-oriented" because they are motivated, illustrated, and visualised with specific solutions, representing a range of perspectives to be discussed. They address specific actors, showing how their decisions affect a focused system to help them orient their future (Manzini & Jégou, 2000). DOS can have different goals depending on the project's focus and the moment of the process in which they are used. Teams can apply them in a phase of exploration or focalization focusing on actors or results. Setting these conditions allows teams to define if scenarios help explore opportunities and possibilities or individuate a product system or solution (Manzini & Jégou, 2004). Through the DOS framework, teams can also determine the motivation and practicality of their scenarios, understanding their aim and the steps to facilitate their implementation (UNEP, 2009). Scenarios are here geared towards exploration and results. They are Function-based DOS since they focus on the food system, sharing macro and emerging trends and how several actors and their behaviours could affect the evolution of the entire system and the actors themselves (Manzini & Jégou, 2000).

The actors within the designed scenarios address are the food system nodes. A 'node' is a pivotal point (digital, physical, or both) where significant activities and interactions related to food production, transformation, distribution, and consumption occur (Aucoin & Fry, 2015). The nodes in the scenarios presented in this paper are part of AFNs: actors that interact and share resources and infrastructure with AFNs, and actors that could play a role in developing and supporting current or new AFNs. As an example, in the Milanese context, these main nodes are the wholesale market, indoor and outdoor markets, the farmers' markets, the food waste hubs¹, and public canteens. Although characteristic of Milan, these nodes constitute an interconnected network in other European urban areas.

3. Developing Scenarios for the Milanese Food System of 2035

The scenario-building process comprised three main phases, each with different steps. The first phase involved case study research and analysis to identify promising practices and food system nodes to engage, including desk and field research, interviews, and internal problem-framing workshops. The second phase focused on research around trends, drivers, and policies related to the challenges and critical topics recognized in the previous phase and about urban and food matters in general. The scenario-building phase developed future visions using the 2x2 matrix technique and the design-oriented scenarios approach. Finally, a workshop tested the scenarios with researchers from OnFoods and from the departments of Politecnico di Milano.

¹ Milan food waste hubs have "the aim of reducing food waste and innovating the ways of recovering food for the people in need, designing and experimenting a model of collection and redistribution of food surplus, based on local neighborhood networks" (Milano Food Policy, n.d.).

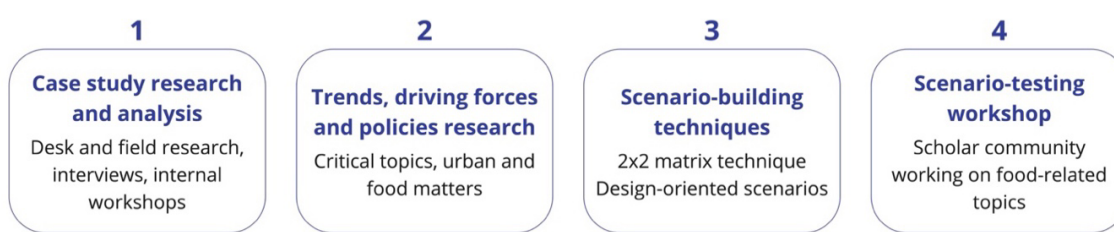


Figure 1. The scenario-building process.

3.1 Research Baseline

The process for creating scenarios began with case study research and analysis to create a detailed image of the Milanese Food System, its nodes and actors, and how these interconnect. This initial research helped identify active, inactive, and new nodes, their purposes, and barriers, which ones are enabling and part of AFNs, and which ones play or could play a role in supporting current and prospective AFNs. Interviews helped better define activities and barriers and understand their vision for the future. Finally, a workshop within the Polimi Desis Lab transformed barriers and opportunities into challenges to tackle, which the authors clustered into seven topics future visions should address: diet and sustainability, good and fair food, collaborations as integration of services, service model logistics, optimization, escalation and replication, and urban production.

3.2 Driving Forces, Trends, and Promising Practices

After identifying the nodes for scenario building, the team looked at the macro, emerging, and niche trends, driving forces, and policies at the local, national, and regional levels. This research allowed a deeper understanding of the seven topics and how Milan's food system might evolve. The aim was to identify emerging values and behaviours in AFNs and other players and detect signs of change at the micro, meso, and macro levels to understand how particular trends would react over time in determining the future of food in the city. This exploration considered food-related and food-influencing factors such as urbanisation, mobility, housing, migration, and health, including themes like the city's push towards sustainability, the growth of the elderly population, the immigration of the young population into cities, the increase of technology and digitalisation in all areas of life, European and Milanese mobility regulations for 2023, urban lifestyles, the customers' awareness of climate change, and their changes in health habits and routines.

As a result, the authors identified examples of food practices relevant to more sustainable and fair food systems in European AFNs, e.g.:

- A shift towards avoiding waste and reducing consumption (e.g., food rescue, purchasing "enough," locally sourced food) shows opportunities for more efficient food consumption.
- A shift towards self-sufficiency and including diners in transforming their food (e.g., urban farming; student-run canteens) shows how people move from food consumers to food co-producers.
- A shift from food ownership to food access (e.g., sharing, swapping) shows a different way to consume.

The authors integrated and projected these more virtuous practices to create four desirable scenarios for a fair and sustainable food system in Milan in 2035. Working within a 10-year timeframe allows for open discussions between food system actors that invite new and forward ideas while remaining grounded in what is feasible, viable, and possible today. Later in the research process, these conversations will serve to understand the priority issues for each actor and as the base to kick-start pre-prototyping actions that showcase the food system's evolution and new partnerships.

3.3 Polarity Mapping and Design-Orienting Scenarios

As anticipated, the project employed a specific scenario methodology - design-orienting scenarios (DOS)- to create visions for the Milan food system and specific nodes. We can identify these scenarios as preferable futures (Dune & Raby, 2013), concerned with practices that we, as designers, believe are promising and desirable for the nodes from business, social, and environmental points of view.

The scenario-building phase used the 2x2-matrix technique, crossing two critical uncertainties (highly impactful issues for the future of food) with opposing polarities to generate diverse future scenarios (Rydderch, 2017). Given the focus on DOS, meant to provoke specific actors, ten years was a time frame that allowed us to mix high-impact uncertainties with feasible technologies and consumer behaviours. The team based the selection of critical uncertainties on the idea that the scenarios should:

- Reflect on the topics and promising practices uncovered by the first two research phases,
- Differ from policy-oriented (POS) scenarios, allowing for actor-specific narratives,
- Reflect issues critical in existing research on sustainable food systems and production/consumption patterns.

The first uncertainty is about governance structures, focusing on the distribution of power, decision-making processes, and compliance. This leads to two polarities: Centralised governance, where decision-making is concentrated in a few hands, and Distributed governance, which spreads power across a wider network of participants. The second uncertainty examines the approaches to addressing environmental and social issues, questioning the innovation strategies employed by society and institutions. The polarities here are Adaptation strategies, which battle the effects of phenomena, and Mitigation strategies, aimed at tackling the root causes of phenomena.

Climate change research identifies mitigation options as those strategies that prevent or reduce the emission of greenhouse gases, which cause climate change. Avoiding or reducing emissions requires society to change everything we do—from our lifestyles to how we produce our food, energy, and products—for example, changing to plant-based diets or reducing consumption. On the other hand, adaptation focuses on tackling the effects of climate change and modifying how actors operate to become more resilient. These strategies work on adapting to the climate changes that are already happening or are soon to happen—for example, heat and drought-resilient crops (Wang et al., 2023).

Given that AFNs tend to pursue environmental and social aims, the impact of the climate crisis on the urban population, and the role of social behaviours in shaping future strategies, the social dimension was necessary for strategies in these scenarios. Following the same logic of adaptation and mitigation used in climate change strategies—addressing effects and causes—we also applied these concepts to social phenomena. For instance, when considering unemployment rates among migrant populations, an adaptation strategy might involve enrolling them in a food stamp or donation program to ensure they can access food. On the other hand, a mitigation strategy would address the root cause by including individuals in job insertion programs and integrating them into the workforce.

Mitigation and adaptation strategies are promising for improving environmental and social resilience, and feasible, effective, and low-cost options exist. We can bring significant environmental and well-being benefits by integrating these strategies into social programs, such as promoting consumption reduction practices or lifestyle changes (IPCC, 2023). Design can be crucial in this area, especially in the food system. Design has shaped food systems for a long time, starting from product, communication, and packaging, and moving to services, systems, and strategies. The food value chain offers several design opportunities for problem finding, framing, and solving, which can support the city's adaptation and mitigation strategies.

The combination of the two critical uncertainties created four possible future visions, each with specific features of governance and strategies (Figure 2).

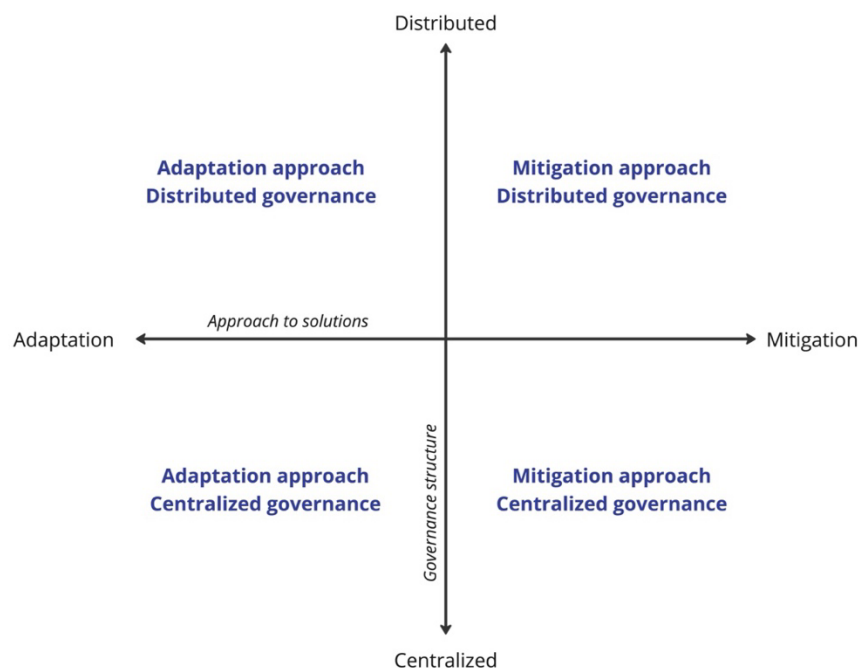


Figure 2. The 2x2 matrix and the resulting critical uncertainties.

3.4 Scenario Components

The drivers and trends coming from previous research informed the storytelling, creating a believable context to place our provocations, or story layer (Lindley & Coulton, 2014). Each scenario consists of five main elements. The story includes a name, a brief description, and a longer one that details three levels: micro (actor), meso (system) and macro (city and beyond). ‘Sustainable qualities’ (Manzini & Tassinari, 2012) — key elements from Alternative Food Networks (AFNs) that we aim to promote in services and interactions —support the story. Finally, technology serves as an enabler for innovation.

The scenarios take shape through the story layers. The first one, the Macro level, defines the overall context holding the food system together. It describes the macro changes in urban areas and frames the food system in an urban, regional, and national setting. Trends, policies, and driving forces were the main stimuli for creating this first layer. The Meso level focuses on the vision of the food system, and it works as a first provocation layer for the actors. It considers the future of nodes and actors’ relationships and how power dynamics work around them. Therefore, governance highly influences this layer. Finally, the Micro level focuses on the vision for specific food system players and works as a second provocation layer. It describes the node-level strategies, practices, solutions, and features that could facilitate changes in that context. Consequently, the approach to strategies primarily influenced this layer.

In addition to the critical uncertainties and their polarities, other key ingredients influence and shape each scenario. These are the sustainable qualities and enablers, common elements that hold different weights depending on the scenario. Manzini and Tassinari (2012) define sustainable qualities as “features that are better than the ones proposed by the mainstream unsustainable production and consumption system” (p.08). Using this definition, we adapted these qualities for our scenarios, influenced by their reflection on Alternative Food Networks (AFNs). The result is four qualities and one enabler, detailed in Table 1 below. Together, the different weights of sustainable qualities and enabler(s) add an extra layer of information to build each scenario’s identity.

Table 1. Sustainable qualities and enablers adapted for this project.

Sustainable quality	Definition
Integration	How integrated are services between each other?
Collaboration	Does the innovation promote collaboration among different actors? Does it promote cross-sector partnerships? Does it include final users in the design and delivery of the service?
Engagement	Does the innovation require a high degree of engagement or self-organisation from actors?
Building capacities	How much does the innovation build competence and capacity across society?
Enabler	Definition
Technology	How much is technology integrated into the solutions?

In our four scenarios, we see technology as an enabler of change, recognizing its potential to reshape food systems dramatically. In the Data-Driven Renewal scenario, we feature AI as the primary technological advancement to understand the readiness of various actors within the food system to adopt and engage with new technologies and to begin dialogues about their use. However, we're also aware of the broader impact of these technologies, from the energy they consume to the materials they require and the social repercussions they might carry, particularly concerning data use and materials sourcing.

4. Results

The resulting four scenarios are short narratives describing how actors—the food system nodes and their stakeholders—might behave and interact in 2035 Milan (Figure 3).

Food Communities

Food Communities shows a future in which food ceases to be an individual issue and becomes a communal one. Citizens and residents have adopted a shared approach to food and have taken to participate in the changes in the food system nodes. The municipality has taken a proactive step in facilitating this trend by providing regular meeting spaces for various stakeholders in the food system.

While neighbours now meet, co-create, and develop strategies to transform waste, schools teach children how to transform food surplus. Food swap, donation, and distribution are organised by each neighbourhood, with open communication between all. The city is repurposing buildings and revitalising neighbourhoods, and citizens are proud to learn new skills to make the most of what they have.

Farmers share strategies - such as crop rotation, crop adaptation, and water usage optimization - to adapt to the changing climate in the region while those most affected by droughts and floods receive financial support from the government.

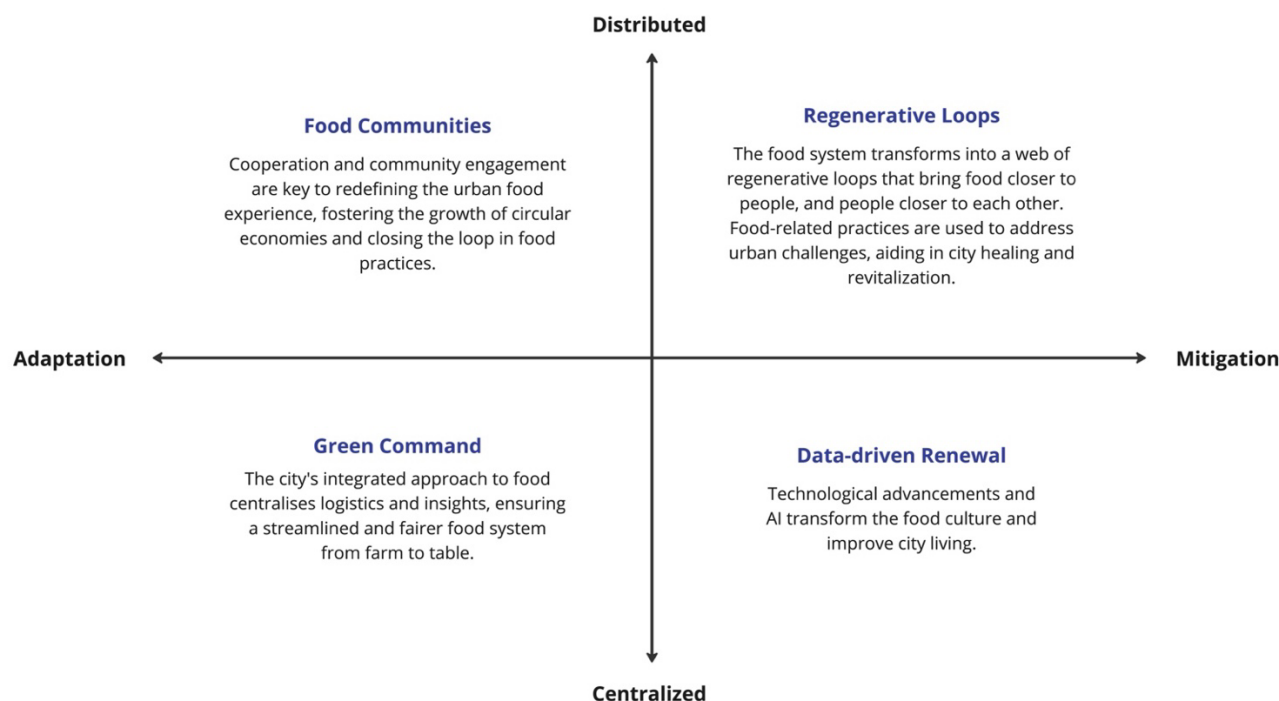


Figure 3. The resulting scenarios and their short descriptions.

Green Command

In Green Command, the municipality collects and integrates information about the food flows and food needs across the city to gain valuable insights. At the same time, they implement strong regulations regarding food production, distribution, and consumption as well as set standards for transportation and storage. These normative initiatives help in establishing markets and food hubs strategically and ensure changes from local producers and food system actors. This effort simplifies the process of donating surplus food and centralises logistics, making the system fairer and more effective.

There is a solid push to invest more in locally grown produce and to provide support programs, including skills training and subsidies, for farmers, especially those in peri-urban areas, enabling them to become more prominent players. New technologies around food are becoming widespread and accepted by the public as laboratory meat enters the market, dehydrated food, and similar technologies to prolong food life become widespread and government funds are dedicated to researching crops that are heat and drought resistant.

Citizens receive constant reports about the food they eat and are notified about existing more sustainable and healthy food alternatives. Motivation and awareness are rewarded and drive changes in everyday consumption.

Regenerative Loops

Regenerative Loops envisions a future in which the city's food system is more capillary, with urban and peri-urban farming flourishing. Parco Agricolo Sud Milano sets a precedent in regenerative agriculture and resilience against climate change, showcasing permaculture and agroforestry practices. Food production happens within and around the city, with an emphasis on high-quality food, accessible to all in the present and for future generations. While farmers gain more access to public incentives when they join cooperatives and networks, public institutions receive incentives to buy from urban and peri-urban farming.

These changes are supported by local policies that foster collaborations and strengthen emerging small-scale initiatives, encouraging the formation of localised food loops across neighbourhoods. Green areas are taking the space of cars and neighbourhoods have access to spaces for food production or transformation,

such as the neighbourhood food hubs, supporting the city's growing focus on self-sufficiency. These changes have generated new jobs in this field, and since everything develops in small areas, people can easily access all the services they need within a 15-minute radius.

People's perception of food transforms, embracing 'ugly' but delicious produce, leading to policies that reduce aesthetic standards for fresh food and promote hands-on school food lessons, helping youth learn practical skills. Household food waste significantly drops as residents adopt more responsible purchasing and consumption habits. They use apps to monitor expiration dates and to cook with whatever is at hand. Local policies encourage networks and technologies to minimise home food waste, to advocate for plant-based diets, to use unpackaged products, and to promote returning distribution packaging to suppliers.

Data-Driven Renewal

In this future, the municipality aims for high-quality food for all in present and future generations, through the support of technology.

The municipality uses AI and real-time data to predict challenges, react immediately by adjusting micro-policies and actions, and improve their impact. This focus on data, AI, and blockchain helps to optimise the system, minimise waste, increase the efficiency and transparency of the food system, and allow for continuous prototyping of incremental innovative solutions.

As the local government raises awareness and implements policies to support vegetarian and vegan diets to lower carbon emissions, people's shopping and eating habits gradually shift by having access to personalised and optimised menu options. Supermarkets, local markets, and canteens use this technology to offer a variety of fresh produce and vegan options, ensuring access to high-quality, affordable food all over the city.

Energy policies have transitioned from fossil fuels to renewable sources, encouraging food industry players to adopt renewables in transportation and logistics and to decrease transportation distances and displacements by optimising them.

Table 2. Summary of scenarios and their defining characteristics.

Scenario name	Food communities	Regenerative loops	Green command	Data-driven renewal
Quadrant	Adaptation approach + Distributed governance	Mitigation approach + Distributed governance	Adaptation approach + Centralised governance	Mitigation approach + Centralised governance
Short description	Cooperation and community engagement are key for redefining the urban food experience, fostering the growth of circular economies, and closing the loop in food practices.	The food system transforms into a web of regenerative loops that bring food closer to people, and people closer to each other. Food-related practices are used to address urban challenges, aiding in city healing and revitalization.	The city's integrated approach to food centralises logistics and insights, ensuring a streamlined and fairer food system from farm to table.	Technological advancements and AI transform the food culture and improve city living.
Scenario keywords	bottom-up initiatives, neighbourhood scale, engaged citizens, low technology, sharing	production, care, capillary and connected, specialization, future generations, 15-minute city	technocratic, normative, monitoring and tracking, optimization	high-tech, predictions, anticipation, rapid response
Integration	High	High	High	High
Building capacities	Medium	High	High	Medium
Collaboration	Medium	High	Low	High
Engagement	High	High	Low	Medium
Technology	Low	Low	High	High
Relevant nodes	Farmers market, Food hubs, Covered markets	Farmers market, Covered markets, Food hubs	Wholesale market, Farmers	Wholesale market, Farmers, Food hubs

4.1 The Co-Design Workshops

The project aims to use participatory approaches in specific contexts of experimentation to improve fairness, efficiency, and awareness around food systems. Here, scenario building is crucial. Therefore, three workshops tested the scenarios to initiate conversations around the key projects and actors that influence these future visions.

The first workshop involved researchers from different areas, including management engineering, architecture engineering, and design, currently working on OnFoods in Politecnico di Milano and on food-related topics. After an initial presentation of the four scenarios with the proposed visions of the Milanese Food System nodes, participants worked in groups around the nodes they felt more knowledgeable about. The nodes participants worked with were the wholesale market, covered markets, street markets, food redistribution hubs, farmers' markets, and canteens. Each group imagined how their node would change in each scenario, which node-related activities were the key for each context, and their node's relationship with other players in the system—a moment of reflection on the current situation followed this exercise. Then, participants identified existing projects or actors working on similar practices to the ones the scenarios presented or with enough influence to impact them. The workshop concluded with a shared space where the participants and facilitators shared and built upon each other's ideas, some of which were collaborations the scenarios did not consider.

This initial workshop was an opportunity to validate the scenarios and their use in a co-design session with an academic community. It also provided new knowledge about the Milanese food context and existing

projects working towards these future scenarios. This session's list of actors and projects helped define which stakeholders to involve in the second and third workshops.

The second workshop focused on the wholesale market, bringing together its market director, the institutional and external relations manager, and the project and property manager. This workshop explored potential developments in the wholesale market's main role—for instance, as an enabler of urban production or a facilitator of food logistics in the city. These roles translated into specific services that would link the market with various nodes throughout the city. The session aimed to pinpoint areas of interest and determine their priority.

The third workshop involved actors from the Milanese food redistribution hubs (the Milan Food Waste Hubs). By March 2024, the city had five hubs donating food to citizens in conditions of vulnerability, with three more planned. The workshop involved nine people working directly in the hubs or third-sector organizations connected to them. The hub system has several tasks: food collection, distribution, assembly, and delivery. The actors attending the session were involved in one or more of these tasks. The session followed the same agenda as the previous workshop. First, participants learned about the four scenarios and the evolution of the hub's role in them. Then, the facilitators presented six service ideas related to those scenarios, and finally, there was time to debate about those ideas. As a result, the session shed light on the importance of implementing optimised logistics systems and communication channels, as well as learning spaces for beneficiaries of the service. On the other hand, it highlighted the need to involve the public administration in the conversation to open the debate around food policy updates and regulations.

Further workshops will involve stakeholders representing the covered and street markets, public canteens, and the consumers and beneficiaries of the services impacted by the four scenarios. The final goal is to envision the priority work areas for each node and the food system, their drivers, barriers, and possibilities for collaboration. Having these issues apparent will help the team develop pre-prototypes of new possible services and collaborations in 2035 that the system could work towards today.

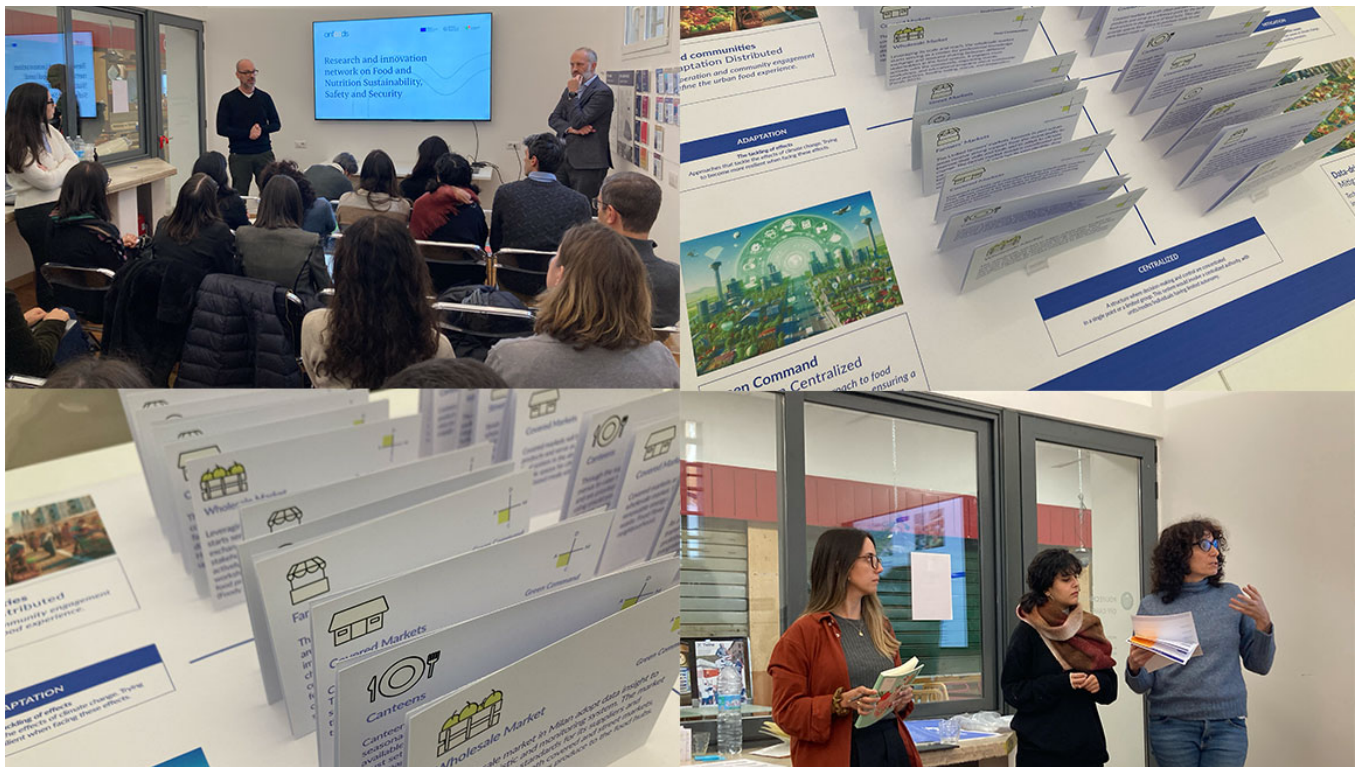


Figure 4. Workshop context, participants, and materials.

5. Discussion

The interconnection between food, climate change, and social inequalities highlights the need to redesign our food system. In this context, Alternative Food Networks (AFNs) suggest new directions for making food systems more sustainable and fairer. They highlight how food system actors and consumers are increasingly aware of the social and environmental issues within the food system and how ready and capable they are to create alternative solutions based on a different paradigm. They also reveal opportunities to renew governance structures for tackling food-related challenges.

This paper adds to the ongoing discussion around food system transformation by introducing a speculative, design-led approach. Drawing from current trends and alternative development paths, design-orienting scenarios (DOS) explore future visions for Milan. The four scenarios share ideas around food that seem more virtuous and promising, showcasing futures where increased well-being is not linked to increased consumption or more intensive use of resources. They also centre around the transparency of information and the active participation of mainstream and alternative food system actors as well as consumers—characteristics AFNs showcase. These are scenarios that aim to activate discussions between food system actors, visualising alternative solutions and collaborations that simultaneously produce environmental and social gains. Not one before the other, but ideally hand in hand.

Carefully looking into the three co-design workshops revealed that the governance axis of the scenarios provided an opportunity to address social interactions as the roots of change (through changes in behaviour, power dynamics, and decision-making processes). However, the approaches axis, which focused on how institutions and society address environmental challenges, fell short to represent the social aims AFNs also have besides the environmental ones. During the discussions based on the four scenarios, the participants aimed to develop ideas that not only focused on environmental care but also embraced a more comprehensive approach to consider social and ecological aspects together. Here is where the real challenge for envisioning more fair and sustainable food systems emerges: integrating these aspects and using them as the background to envision new and more sustainable solutions.

The adaptation and mitigation concepts can be further advanced into the future by considering the concept of “regeneration” as a transformative opportunity not only of practices but also of relationships. Building on the definition provided by the EMF (2015), regeneration involves the process of reclaiming, retaining, and restoring ecosystem health while improving resilience. We aim at expanding this concept as critical in shaping food scenarios, to include the development of positive outcomes with and for the urban ecosystem. This implies revitalising the system of relationships and society at large. This transformation must involve all actors—AFNs, citizens, and mainstream stakeholders—highlighting how to activate people and players in different ways and allowing us to envision food futures that are not only carbon-neutral but also more socially equitable. The concept of regeneration is based on adaptation and mitigation strategies, but it wants to go further and include an aspect of visioning an inclusive, generative, and proactive future, where a predictive approach is in fact linked to a capacity to react to unforeseen aspects. The capacity of actors to act, their agency capacity, is embodied in a collaborative approach that frequently materialises through cross-sector partnerships. This dynamic becomes a crucial element in effectively navigating the intricate contexts of relationships and interdependencies.

Even though the challenges and actors presented in this paper are characteristic of the Milanese context, the insights from the workshops carry general relevance, suggesting ways that similar cities might approach food system sustainability. The situation in Milan reveals the importance of continuously aligning city food policies with on-the-ground realities. The current mismatch between practice and regulation in the city results in food waste, inequalities in access to food, and complicated procedures for those trying to improve food security.

Workshop participants recognized the need for a coordinated effort that aligns different actors and their strategies. While individual efforts have an impact, a collaborative infrastructure can lead to more strategic

and responsive solutions. A systemic approach—one that addresses the entire food chain—is crucial for interventions to be resilient and long-lasting. The critical role of connectivity between different food system nodes, such as the dialogue between covered and wholesale markets or between food hubs, underscores this need.

The four future scenarios and the three workshops implementing them have set the stage to help us envision, alongside Milanese food system actors, new AFNs in the city and rethink different city nodes regarding food. This effort aligns with the Milano Food Policy, the municipality's strategic plan governing the urban food system since 2015 to make it more sustainable from all perspectives.

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