

Understanding the role of diverse cities for sustainable food security: a socio-ecological governance framework

Ana Moragues Faus*, Alessandra Manganelli*, Tanya Zerbian**

Affiliation: Universitat de Barcelona*; IEGD-CSIC**

Email: ana.moragues@ub.edu; ale.manganelli@ub.edu; tanya.zerbian@cchs.csic.es

Abstract

Amid urgent socio-ecological challenges – including persistent food insecurity and planetary health crises – cities are confronted with the mounting challenge of guaranteeing access to healthy and sustainable food for all (HLPE, 2024). Thousands of urban food initiatives, policies, and strategies have emerged in the last decade to incorporate food related concerns into urban agendas. Yet, despite growing calls for integrated and de-siloed approaches, existing conceptual frameworks and practical approaches do not adequately account for the diversity of urbanisation processes and related socio-ecological dynamics. Focusing on urban infrastructures and form, networked resource flows, socio-ecological dynamics, and governance dynamics as interconnected ‘layers’, this paper proposes a socio-ecological approach to urban food system governance which takes the complexity and diversity of urban contexts into serious account.

Keywords: Urban food systems; urban food governance; socio-ecological dynamics; diverse cities

Introduction

Urban food system action is undergoing a critical phase. As currently discussed in scientific and policy circles, the necessity to bring the food system at the center stage of urban sustainability and equity agendas has never been so pressing (Hawkes, 2023). In fact, in an increasingly urbanized world, cities constitute important loci of food consumption, and also active drivers of food system transformations (HLPE, 2024). Urban areas, in particular, account for the highest proportion of global food insecurity, with about 1.7 billion over 2.2 billion of moderate to severe food insecure people living in urban and peri-urban environments (FAO, 2023a; HLPE 2024). As cities are fed by long food supply chains, problems of obesity and bad nutrition are further aggravated by the availability of highly processed food at low costs, often at the expenses of people in precarious socio-economic conditions. In diverse cities, urban food environments are permeated by heterogeneous food infrastructures, where public markets and regional food hubs coexist, compete, or hybridize with conventional food retail and supermarket stores (HLPE, 2024). At the urban margins, the rural-urban interface is continuously negotiated due to dynamics of urban expansion causing land encroachment and undermining prime agricultural areas (López-García et al., 2024). These and other factors hint at the relevance of urbanization processes in both, generating key food systems’ problems, but also providing levers to address critical challenges related to sustainable and equitable food production and provisioning.

Recognising the linkages and tensions between urban dynamics and food systems, the urban food literature has underscored the need for policy integration and for adopting systemic approaches to address food systems and urban sustainability problems (Sonnino, 2023). In particular, some authors have set the stage by proposing analytical frameworks tailored to define food systems and describe the interaction among their components, activities, and drivers (Erickson, 2008; Tefft et al., 2021). Other scholars have focused on how municipal governments attempt to implement a systemic approach, by integrating food system work in the organisational and institutional functioning of the city (Mendes, 2008). More recently, frameworks such as the city-region’s food systems have provided further perspectives for an integrated and systemic action (Blay-Palmer et al., 2018). Rather than considering the city as a confined entity, this framework observes how food systems’ processes, activities, and flows, dynamically interact with specific urban and peri-urban realities, and rural hinterlands (Krähmer et al., 2024). Additionally, informed by a place-based and socio-ecological perspective, recent contributions in the

debate have argued for an inclusive 'framework for food system transformation that integrates ideas of sustainability co-benefits, spatial linkages, social inclusion and sectoral connectivities' (Sonnino and Milbourne, 2022 p. 915).

While the above contributions offer valuable analytical advancements and propose integrative action-oriented frameworks, very often real-world practices do not align with established principles, or with desirable end-states. In fact, experiments of policy integration are still at their infancy. Local authorities still face challenges to legitimize their action and to exercise a systemic approach, given the precarious status of food governance and policy-making in cities (Doernberg et al., 2019). Furthermore, innovative food governance spaces, such as urban food strategies or food policy councils, that have quickly spread around the globe, face hard times to navigate complex urban dynamics and to deal with the political economy and ecology of cities at different governing scales (Moragues-Faus, 2021). These problems are further aggravated by the current situation of crisis, economic downturn, and geopolitical instability. As a result of these processes, even pioneer cities engaged in urban food system action have been experiencing critical times, as the cases of Toronto in Canada, or Ghent in Europe testify (Manganelli, 2025). Taking this reality into account, we argue that a reflexive step is needed in urban food system action. This reflexive account should take stock of the progress made so far, but also re-evaluate how urban food governance and policy spaces can better deal with contemporary challenges posed by diverse urbanization dynamics. More specifically, we argue that many of the challenges faced by urban food governance and policy actors arise from a persistent neglect of the diverse processes of urbanization - both in the way urban food systems are conceptualized and in the design of city-led responses to food security. By proposing a socio-ecological approach to urban food system governance, this paper aims to take an initial step toward a more integrative analysis that better reflects the complexity and diversity of urban contexts.

To address these issues, the paper is structured as follows. Section 2, after the introduction will provide a socio-ecologically oriented definition of urban food systems' governance, stemming from an understanding of urban food systems as socio-ecological systems that necessarily hybridize with key urban dynamics (the political economy and ecology of the city). This approach allows to identify key layers, or markers, which stand at the intersection of food and urban systems, and can be regarded as strategic points of intervention for an urban food system action. In section 3 these layers will be further broken down into key monitoring indicators, as examples of elements that urban food actors can assess in order to calibrate adapted food security policies, able to tap into key urban dynamics. Some of these dynamics go beyond the food system itself and yet significantly affect food system processes and outcomes in cities. Based on the above insights, section 4 discusses how urban food security governance and policy-making can address key trends characterizing diverse urbanization processes, by prioritizing some of these layers and indicators, or addressing their intersection. Section 5 concludes on how research and action can move ahead towards a better (re)consideration of urban dynamics and trends in urban food system action.

2. Towards a socio-ecological approach to urban food systems' governance

Drawing from a variety of disciplines - including geography, sociology, economics, political science, environmental science, health and community studies, and urban planning, among others -, the food systems' literature has engaged with conceptualizing and analysing the complex interactions among actors, activities, processes, and outputs, that characterize the food system (for a synthesis see, for instance, Battersby and Watson, 2019; Moragues-Faus et al., 2023). At their core, food systems have been defined as including 'the range of activities in the production, processing, distribution, marketing, preparation, consumption and disposal of goods that originate from agriculture, forestry or fisheries, including the inputs needed and the outputs generated' (Tefft et al., 2021, p. 4). In characterizing how the food system works, studies have started to incorporate socio-ecological systems' approaches, which typically look at the ecological and at the social components as interconnected and co-evolving dimensions (Folke et al., 2003; Frank et al., 2017; Hebnick et al., 2021). In particular, focus has been on

delineating the interaction among components (or sub-systems), their activities, inputs and outputs, but also on situating food systems within a broader array of agents, institutions, environmental and social interactions (Ericksen 2008). As Tefft et al. (2021) suggest, such interactions involve 'the people and institutions that initiate or inhibit change in the systems as well as the sociopolitical, economic and technological environments in which these activities take place. (...) Urban food systems, specifically, hone in on activities that occur in and/or impact urban and periurban areas' (Tefft et al., 2021, p. 4). As this definition by Tefft et al. (2021) indicates, most (urban) food systems' characterizations treat key socio-ecological dynamics – including socio-economic conditions, socio-cultural dynamics, and biophysical processes –, as external elements affecting or impacting on food systems. On its side, the urban dimension is mostly regarded in locational or spatial terms rather than properly integrated in a socio-ecological account of food system governance (Moragues-Faus and Battersby, 2021, HLPE, 2024). As a result of these tendencies, there is lack of clarity concerning how to properly connect key socio-ecological dynamics and related socio-material flows, to the specificity of urban food systems and their governance constellations.

Recognizing these gaps, the urban food debate has provided further perspectives to embed the characterization of urban food systems within a broader socio-ecological and place-specific approach. Some of these scholarly contributions also address governance or, as highlighted below, suggest useful directions for a socio-ecological governance perspective (Sonnino and Milbourne, 2022). Analyses of urban food flows, for instance, connect food system activities with the metabolism of cities, assessing the potential environmental or social impact of the urban circulation of food production, import-export, processing, distribution, consumption and disposal (Guibrune et al., 2024). A further perspective is the City Region Food System (CRFS) approach, introduced about a decade ago by the FAO and the RUAF Foundation (REF) (Blay-Palmer et al., 2018; Forster et al., 2015). Specifically, CRFS' frameworks shed particular light on morphological and geographical aspects of the urban, by stressing the need to address specific urban and peri-urban patterns characterizing large or medium-size cities, looking at the interrelation of urban, peri-urban, and rural food system flows (Blay-Palmer et al., 2018). At the same time, the framework suggests going beyond a bounded conception of the city-region, looking at how flows of resources, material, human activities, and non-human elements, connect with wider institutional scales and spatial processes (Krähmer et al., 2024). Underlining the need for a 'more thorough and deeper engagement with the spatial complexity of food systems' (Sonnino and Milbourne, 2022, p.916; see also Vincent and Feola, 2020), further studies have mobilized the notion of place to 'conceptualize and tackle the interwoven socio-ecological issues that affect the food system' (ibid. 2022., p. 915). According to these and other perspectives, adopting a place-based approach would not only allow for a better comprehension of how broader social and ecological dynamics (e.g. socio-economic, cultural, biophysical processes), intersect with food system activities and their material and infrastructural dimensions, in specific urban realities (HLPE, 2024). It would also allow for a better contextual understanding of power dynamics and institutional processes driving urban food systems' governance (Sonnino and Milbourne, 2022). In fact, while socio-ecological system approaches tend to consider governance in normative and abstract terms, as an exogenous force steering food systems, other perspectives such as place-based governance and political ecology, show how governance, power, and institutional dynamics are deeply embedded in metabolic resource flows and in hybrid socio-ecological dynamics characterizing the urban sphere (Moragues Faus and Mardsen, 2017; Heynen et al., 2006).

In synthesis, what we learn from the above analysis is the need for a governance approach that: a) engages with the material, morphological, and infrastructural conditions of cities (space and place, urban infrastructures and form); b) considers the connection of food flows with wider material and immaterial flows (people, ideas, resources); and c) integrates the analysis of key socio-ecological dynamics with the functioning of urban and food systems.

2.1 Depicting key features of a socio-ecological governance approach

Over time, literature on urban food governance has proliferated and a myriad of studies have addressed governance processes or dynamics in a plurality of initiatives, empirical contexts, and types of processes (Doernberg et al., 2019; Haysom, 2015; Moragues-Faus et al., 2022). On a basic level, governance can be defined as ‘all modes of governing encompassing activities carried out by different actors to guide, steer, control, or manage the pursuance of food system outcomes in a specific urban area’ (Moragues-Faus and Battersby, 2021, p. 5). As food governance studies develop, however, we notice a double tendency, or risk. In particular, on the one hand, when governance is applied to the study of specific initiatives or sectors of the food chain – including urban food production (Ferreira et al., 2018), short food supply chains (Manganelli and Moulaert, 2018), public procurement (Sonnino, Torres and Schneider, 2014), or urban food policies (Moragues-Faus and Morgan, 2015), among others – the risk is to adopt a too narrow focus, which misses a comprehensive, socio-political and socio-ecological understanding of food system processes. On the other hand, food governance studies based on socio-ecological system approaches tend to regard governance in terms of mechanisms, or most appropriate modes of governance such as ‘rules, institutions and practices that set limits and govern the behaviour of individuals, CSOs and private sector actors’ (Tefft et al., 2020, p. 4). In this case, governance is treated in an abstract, system-focused, and normative way, with poor connection with socio-ecological, socio-political and power dynamics – including conflicts between urban development agendas and interests – related to specific urbanization processes.

In particular, while most of the urban food governance literature addresses governance from within food initiatives or food systems’ activities, it is also necessary to draw from perspectives that start from the urban, considering the relation to food. Specifically, drawing from place-based and territorial approaches to governance allows to shed light on how governing actors and institutions relate to the materiality of the city (Latham and McCormack, 2004), and specifically, how they deal with urban infrastructure and its form (McFarlane and Rutherford, 2008; Monstadt et al., 2022; Rutherford, 2014; Tozer, 2019). ‘Urban infrastructure and form’ encompasses physical elements such as land, built-up and open spaces, parks and green areas, transport networks, but also public markets, food distribution networks, and other relevant food infrastructures (Marsden et al., 2018; Clark et al., 2021). In mediating the everyday life of citizens, urban infrastructures are equally conditioned by wider socio-ecological dynamics (i.e. dynamics related to population movements, urbanization processes, the provision of services, utilities, and economic activities), but also by the politics of urban planning and design institutions in charge of managing growth, deciding on infrastructural investments, channeling development through zoning designations and urban planning guidelines, or allowing for the opening of food markets in urban space (Cabannes and Marocchino, 2018). Therefore, place-based approaches that examine the spatial dynamics of urban infrastructure provision, as well as the politics and governance of the built and unbuilt urban environment – should be integrated as a layer into the analysis and monitoring of urban food system governance.

Urban infrastructures are not just physical entities in urban space. Rather, infrastructures’ networks articulate and mediate the dynamic circulation of material and immaterial flows, such as people, ideas, technologies, and material resources (Monstadt, 2009). Governance lenses based on urban metabolism and urban political ecology provide useful insights to disentangle the hybrid socio-ecological flows of food and relevant resources, the connection between food and other flows, and their relation of material flows (resources) with immaterial dynamics (power geometries and governance dynamics) (Heynen et al., 2006; Swyngedouw and Kaika, 2014; Moragues-Faus and Carroll, 2018). At a broad level, urban political ecology allows us to grasp how the interplay of ecological, economic, political, cultural, and social processes – here collectively referred to as socio-ecological dynamics – shapes patterns of access to and distribution of resources within urban areas (Heynen et al., 2006). An illustrative example concerns the interaction between socio-ecological dynamics such as migration patterns and ethno-cultural diversity, and global trade mechanisms that govern food imports and exports. These dynamics collectively influence both the types of food available and the characteristics of food environments in specific urban settings. Furthermore, urban political ecology and the politics of urban metabolism allow to grasp the uneven

pattern of distribution and access to key resources – including food –, and how governance institutions relate to the monitoring and provisioning of fair access to resources. Relatedly, while the tendency is to look at flows in a disconnected way, political ecology lenses allow to link food flows with other types of networked resource flows, by for instance observing the relation of public transport provision with food accessibility, or the linkages between energy poverty and food poverty (HLPE, 2024). These considerations allow to integrate a further layer in the socio-ecological governance framework, which can be summarized as ‘networked resource flows’, i.e. the governance of circulation, provision of, and access to material and immaterial flows such as food, water, waste, energy as well as capital, people, and knowledge.

It is clear how looking at urban infrastructures and form, and networked resource flows allows to shed light on the political economy and ecology of those actors and institutions that are often beyond food-related agendas, and yet have a considerable impact on food system dynamics and the governance of food in the city. What also emerges from the above analysis is how urban infrastructures and form, and networked resource flows, and related governance dynamics, interact with wider socio-ecological dynamics (i.e. biophysical processes related to climate, environment, land and biodiversity; socio-cultural and social dynamics related to population movements, social composition, cultural diversity; the structure of the economy; the access to basic utilities and services). The challenge is to make the depicted socio-ecological governance approach operational. To sketch some directions on this, Section 3 outlines a brief methodological perspective for translating these various ‘layers’ of the approach into measurable indicators for monitoring urban food systems. Section 4 then discusses how governing actors and institutions can practically apply these indicators in policy and planning processes.

3. Socio-ecological monitoring indicators for food system action

It can be argued that a social ecological characterization of urban food system governance can serve different purposes and can be applied to different contexts. In this paper, we show how the identification of the urban, food system, and governance ‘layers’ outlined in the above section can serve as a cornerstone for developing an urban food system monitoring framework; an ongoing challenge in urban food system governance processes (Zerbian et al., 2024). In this case, the four layers – socio-ecological dynamics, urban infrastructures and form, networked resource flows and (food) governance dynamics – were used as a guiding structure to identify relevant indicators to develop an assessment framework that operationalizes the evaluation of urban food systems from a socio-ecological and urban perspective. Its overarching aim is characterizing urban food systems whilst measuring the progress of different actions or strategies undertaken to improve the local food system and its governance.

The development of this framework followed a modified Delphi method (Fitch et al., 2001), which involves an initial literature review for potential indicator selection, followed by an iterative survey and consultative process to propose a final indicator set. The process of identifying and outlining these indicators was carried out between 2023 and 2024. It included three steps, outlined as follows.

The first step focused on identifying indicators relevant to a socio-ecological perspective through a structured review of both scientific and grey literature. This included peer-reviewed articles, documents and reports that propose, and/or review indicators sets for urban sustainability and urban food systems sustainability. As outlined above, the identified layers were used as guiding objects to analyse literature sources (38 in total) and extract a first set of potential indicators. After removing duplicates and analysing the suitability of indicators, a total of 266 potential indicators were identified as relevant to operationalise the identified ‘layers’, organised in relevant dimensions.

In a second step, the identified indicators were tested in the Spanish context, being this context familiar to most of the authors, in order to determine whether issues of data availability would arise in their application, leading

to a first reduction of the indicator set. This meant identifying potential data sources for each indicator using local, national and European databases. This process was conducted for five Spanish cities showing a considerable dynamism in urban food system action, i.e. Madrid, Valencia, Barcelona, Valladolid, Córdoba. Indicators were retained based on criteria such as ease and cost-effectiveness of measurement, availability of a clearly defined methodology, and the capacity to support consistent and comparable data analysis. Preference was given to standardised indicators, or in cases where this was not possible, indicators were normalised to ensure comparability. Indicators for which no reliable data could be obtained were excluded from the list. This process yielded a final set of 88 indicators used in the following step.

The third methodological step was the application of a slightly modified Delphi survey that consisted of sharing with a group of experts, henceforth referred to as panellists, the list of identified indicators for evaluation (Campbell et al., 2002). The aim of such a process is to form a consensus among selected panellists based on their expertise in the field. A total of 33 potential panellists were contacted, composing a heterogeneous panel in terms of professional sectors, including representatives of the public and civil society sector and expertise across food system areas. Twenty-two expert panellists accepted to participate, of which 50% were women and 50% men. Panellists were invited to rate the preliminary indicators throughout two rounds of reviews, based on online questionnaires, with a final face-to-face panel meeting in which the panellists were supposed to discuss and re-rate each indicator. This process led to a final list of 99 indicators, validated and approved by the panel. Table 1, at the end of Section 4, provides examples of core final indicators for each layer and the related dimensions. While the methodological steps based on the revised Delphi process have been completed, further work is ongoing. This includes testing the indicators in a broader range of European cities, refining the selected indicators, and prioritizing key monitoring elements based on data availability, actionability, and the spatial scale required for observation. Despite the work-in-progress, the following section presents initial insights into the implications for food system action, particularly in relation to governance and policy-making.

4. Dynamizing urban food systems' governance: monitoring indicators as levers for action

Based on the socio-ecological layers delineated above, urban and food system indicators can help to generate knowledge and to indicate pathways for action in different ways, opening up different spaces for reshaping urban food governance. On a first level, each layer of indicators can be analysed independently, as a source of knowledge, and a basis for action on food and urban systems. For instance, the socio-ecological dynamics' indicators are 'more-than-food' indicators that help to understand key dynamics and trends characterizing the city, thus suggesting how food governance and policy-making can leverage them (see also table 1 for a synthetic overview). Within this sub-set, for instance, indicators related to the dimension "economy" are tailored to assess the economic and employment basis of a city; the key sub-sectors, industries, services, driving the urban economy; whether certain sectors or economic trends such as tourism, knowledge economy, financialization, are prevailing over others with potential repercussions on urban food environments, or on import-export relations (HLPE, 2024). Furthermore, the dimensions of "social justice", "demographics", or "health and diet" provide complementary knowledge about issues such as the level of food insecurity, and data about related determinants of socio-economic inequalities, including gender, level of income, housing insecurity, demographic composition, socio-spatial segregation, and the prevalence of obesity and diabetes across the urban population. This sub-set of socio-ecological indicators are of great importance to both, tailor food security actions, but also bring food action well beyond food and the urban level (Moragues-Faus and Battersby, 2021; Haysom, 2022). In fact, showing the incidence of indicators deriving from those dimensions can allow to build arguments for connecting food with other urban programs and policies, including social welfare programs, public policies and expenditures around health, and so on.

Similarly, indicators related to the layer urban infrastructures and form help to assess the qualities of food and non-food infrastructures (land, green and biodiversity spaces, design and planning, etc.). Specifically, indicators

deriving from the sub-dimension 'design and planning' address issues such as the rate of land consumption over the years (and how this affects urban, peri-urban and regional environments), but also the different uses of land, including for instance what land in the city is scheduled for urban development over the available land. The knowledge generated can allow for establishing dialogue with planning authorities concerning pathways for urban densification, or modes of acting on the urban form to integrate food infrastructures such as community gardens, fruit trees, or urban orchards. It can also suggest pathways for building synergetic action between urban greening and climate adaptation (e.g. through urban greening, nature-based solutions and biodiversity enhancement) and urban agriculture strategies. Moreover, indicators related to the dimension of 'food infrastructure' – including the (lack of) availability and distribution of public markets, food coops, food hubs, food processing and distribution facilities –, shed light on the material basis for calibrating food policy action.

As anticipated in section 2.1, the layer networked resource flows provides further knowledge on the socio-metabolic dimension of food and urban systems. Data on energy consumption for instance can shed light on the carbon footprint of food production, transportation, consumption, and disposal activities, thus helping to identify high-impact areas for decarbonization (IPES-Food, 2023). Indicators on waste – especially those focusing on organic and food waste – can reveal inefficiencies at the consumption level. This can potentially help to link these data to circular policies or programs activated in the city. Data about water flows, such as the amount of water used by (urban) agriculture or other food chain activities, can inform circular and climate adaptation policies, especially in a drought-prone city. Finally, the layer governance dynamics invites to focus on the different actors and agencies shaping urban food governance dynamics, highlighting gaps or missing links concerning existing food governance structures, financing sources, and important issues related to institutionalization and the integration of food in other policies (see table 1).

Yet, as the above analysis suggests, besides working in a standalone manner, the four types of socio-ecological layers, their dimensions, and the related indicators, are more productively analysed in their interrelations. Indeed, functioning like a matrix, key sources of knowledge and levers of action lie at the intersection of various layers and indicators, especially considering their implications for food governance and policy-making, and thus posing particular attention to the connection with governance dynamics (see table 1). Specifically, connecting the layer urban infrastructures and form to the layer governance dynamics raises questions concerning what actors at different levels are driving changes in key urban infrastructures and form and how this is impacting food system outcomes in a specific city. Concretely, indicators such as the distribution of public food markets in the city, the presence of active school food programs per number of inhabitants, or the distribution of producers-consumers networks, could be revelatory of values, actors, modes of community engagement that lie behind the presence and distribution those infrastructures. This source of knowledge allows to calibrate the type of intervention needed in terms of, for instance, public support for food markets or retail stores providing fresh food, sensitization actions, or incentives in terms of distributional patterns. Analogously, actors promoting urban agriculture and greening strategies could consider the availability and quality of the land-infrastructure and the presence of urban planning directions concerning urban expansion or land preservation, in order to propose integrated strategies for the scaling out of food production and greening in the city. Potential synergies between the areas of food and greening could be found especially in a city where greening or climate adaptation strategies are particularly high on the agenda, as recent studies on greening strategies in European cities show (Mahmoud et al., 2025).

Connecting the layer networked resource flows with governance dynamics opens up questions concerning what actors, values, and institutions, at various scales and in different sectors, influence the circulation of capital, human, discursive, and material flows in a specific city, and the implication of this for food governance and policy-making (see table 1). Analysing these aspects means understanding more thoroughly the connections between, for instance, the flow of people in a city (tourists, visitors, temporary workers, minorities, ethnic groups)

and the diffusion of particular food flows and practices such as food away from home, or the creation of particular food environments shaping the city (HLPE, 2024). Furthermore, looking at critical material resources and infrastructures in the city allows to establish connections between apparently unconnected flows and sectors, and their implication for governance (see section 2.1). One illustrative example is the analysis of food system actors and activities that contribute to food waste generation in the city, along with strategies for engaging diverse stakeholders across sectors. In fact, addressing food waste prevention, recovery, and reuse offers a valuable opportunity to connect with multiple actors, infrastructures, and resource flows. For instance, discarded, unsold, or surplus food can be repurposed through community-based initiatives, such as community kitchens. These spaces not only support food redistribution and social assistance, but also foster community building, public awareness, temporary employment opportunities, and intercultural exchange (Gennari and Tornaghi, 2020). Furthermore, composted organic waste can be re-used in urban-peri-urban agriculture activities as soil fertilizer; or it can be recovered for energy generation through anaerobic digestion facilities, producing biogas that contribute to power the built environment.

Finally, highly relevant questions emerge from the connections between socio-ecological dynamics and governance dynamics. In fact, looking at socio-ecological dynamics raises questions concerning what actors and processes (operating in different sectors, spaces and scales) are shaping the socio-ecological dynamics of the city, from its economic basis, to demographics or social justice factors, and how these factors can be leveraged in food governance and policy-making (see table 1). In fact, elements such as food environments, food retail, as well as the price, accessibility, and availability of fresh food options can be highly affected by factors such as demographic composition, population movements, or touristification dynamics, among others (HLPE, 2024). At the same time, tourism can be also a driver of employment, specifically in the food and catering sectors, and a potential lever for sustainable practices involving food (see for instance Bottiglieri et al., 2016, on the example of Turin). Thus, there is space for public actions tailored to understand how touristic facilities (restaurants, canteens etc.) can engage in fair trade and sustainable food practices, including adapting food catering and service facilities to quality labelling standards (see the example of Brussels-Capital Region's GoodFood label). Further examples are interventions in the sphere of tourism and culture that can target the refurbishment and re-valorisation of local farms or food infrastructure facilities for eco-tourism practices. These considerations are particularly relevant for cities and regions that are heavily dependent on tourism, as is the case for many urban areas across Europe (Aguilera et al., 2021). Moreover, socio-ecological dynamics related to social justice factors (food insecurity, socio-economic inequalities) and health factors (prevalence of obesity and diabetes), can provide strong hooks for linking food with other structural programs and policies. Comparative urban analyses revealing a significant prevalence of obesity or diabetes in specific cities can offer robust evidence for positioning food as a strategic entry point in the design of social and public health prevention strategies. Such findings have the potential to mobilize higher levels of governance and institutional support around targeted interventions. Examples are health-related food environment policies at the national or EU level discouraging unhealthy food options and stimulating fresh food environments as a health prevention measure (Schneider et al. 2023).

Table 1. Synthetic overview of key layers, dimensions, and indicators, with resulting priorities and questions for urban food governance and policy-making.

Layer (and dimensions)	Examples of indicators connected to dimensions	Emerging priority areas for food governance and policy-making	Key overarching questions
Socio-ecological dynamics (social justice; demographics; economy; land, environment and biodiversity; health and diet)	<i>Social justice:</i> -Population rate at risk of poverty -Percentage of population that are food insecure or hungry -Beneficiaries of food assistance in cash or kind <i>Demographics:</i> -Immigration rate; -Demographic composition <i>Health and diet:</i> -Prevalence of obesity and overweight in children and adults; -Prevalence of Type 2 diabetes <i>Land, environment and biodiversity:</i> -Total GHG emissions per capita (including the food sector) -Areas dedicated to the preservation of agro-ecological diversity <i>Economy:</i> -Distribution of Employment by Sector in the Municipality -Employment in the agri-food chain -Relative contribution of tourism to the municipality's economy (...)	- Understanding how demographic, health, and social justice dynamics intersect with food, and how food can serve as a pivotal element in shaping socio-economic measures and public health prevention policies; -Connecting food with environmental actions especially qualifying cities affected by environmental dynamics and/or engaged in greening / climate adaptation strategies; -Understanding how key economic sectors or dynamics of economic restructuring affect urban food environments, drive food demands and import-export relations, but also provide hooks for creating job opportunities in the food sector and incentivizing food sustainability actions	-What actors and processes (in different sectors, spaces and scales) are shaping the socio-ecological dynamics of the city, from its economic base to demographics or social justice factors and what are the possible implications and hooks for food action?

Urban infrastructure and form (transport network, design and planning, food infrastructure, green spaces and parks)	Transport network: -Access to public transport -Length of the bike network Design and planning: -Population density -Ratio of land consumption rate to population growth rate Food infrastructure: -Total agricultural area per 100,000 inhabitants -Number of community gardens and urban agriculture projects -Number of municipal and collective food processing and distribution infrastructures Green spaces and parks: -Green areas per capita -Proximity to green areas (...)	-Connecting urban agriculture and food interventions to wider urban planning, zoning, and design directions and strategies (including anticipating and influencing those strategies) - Understanding the key actors, values, and factors that affect the availability and expansion of food infrastructures as key to developing targeted types of interventions -Connecting food with the scaling out of greening interventions/foreseen planning measures on green areas and open spaces	-How do different types of actors and values shape what urban infrastructure and form look like, and, particularly urban food infrastructures? -How can this open up opportunities for targeted interventions through food?
Networked resource flows (energy, waste, food, water)	<i>Energy:</i> -Energy consumption -Fuel poverty -GHG emissions in key sectors/activities of the food chain <i>Waste:</i> -Urban solid waste generated; -Municipal waste recycling rate -Number of circular programs and initiatives on food loss and waste <i>Food:</i> -Local production and consumption of basic food -Ratio of food exports-imports <i>Water:</i> -Per capita water consumption -Draught frequency (...)	- Understanding potential connections, synergies, or missing links between food and other metabolic flows -Shaping interventions that provide ground for win-win solutions among different sectors (e.g. food, waste and energy) -Linking food with wider circular economy strategies of the city	-What and how do different actors and processes (operating in different sectors, spaces and scales) influence the circulation of capital, human, discursive, and material flows within cities, including food? -How can this open up opportunities for targeted connecting food to other flows and sectors?

Governance dynamics (actors and networks; policies; participation, transparency, inclusion; finance)	<i>Actors and networks:</i> - Presence of an active multi-stakeholder food planning and policy structure - Presence of an active municipal inter-departmental body for food policy and programming <i>Policies:</i> - Presence of food as a key pillar of: city sustainability strategy; city planning strategy; municipal health and social welfare strategy; integrated urban strategy - Presence of healthy and sustainable food in the sustainable procurement policy <i>Participation:</i> - Representation of specific vulnerable groups in food governance bodies <i>Finance:</i> - Municipal budget dedicated to healthy and sustainable food - Commitment to sustainable public procurement (...)	- Understand the degree and modalities through which an integrated food governance and policy-making approach is institutionalized in cities - Envisioning pathways to integrate food in broader urban policies and sectors based on needs and strategic opportunities - Strengthen public engagement in food through key levers (e.g. public procurement; municipal support to markets and retail serving fresh food)	- What are the different actors and agencies shaping urban food governance dynamics within and beyond food?
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5. Conclusions: re-considering the urban in urban food system action

When dealing with governance, the use of tools and notions such as 'indicators', or 'food system monitoring' or 'progress' may be perceived as uncomfortable or misleading. In fact, dealing with indicators may appear to divert attention away from deeply qualitative dimensions characterizing governance dynamics and policy actions – including actors' relations, conflictive values and ideologies, power dynamics, institutional processes –, towards the measurement of quantitative aspects such as data, progress, or performance. Yet, our idea is that the process of developing and employing indicators is not solely a matter of data generation; besides, it is a knowledge-building and reflexive process that supports collective action toward the achievement of more sustainable and genuinely transformative urban food systems' outcomes.

More generally, what this paper aimed to convey is the necessity to develop a broader socio-ecological approach to the understanding of food, urban systems, and their governance (Moragues-Faus and Zerbán, 2025, in progress). Drawing from place-based, political economy, and socio-ecological governance approaches was pivotal to identify key layers, connected dimensions, and observable indicators, which could help to envision key governance priorities and areas of intervention at the intersection between food and urban systems. Consequently, embedding urban food action within key urban and socio-ecological dynamics characterizing diverse cities can help local authorities to link food with other sustainability agendas and policy areas at the urban and wider spatial-institutional scales. This is a crucial process that enables food system action to become more inclusive, systematic, and, at the same time, strategically oriented and transformative (Moragues-Faus and Battersby, 2021; Moragues-Faus et al., 2023). We believe that the analysis presented in this paper provides pathways for further research and action on food and urban systems. In particular, questions arising at the intersection of multiple layers offer new opportunities to examine how food system governance is embedded within place-specific urban dynamics, the types of conflicts it may encounter, and the ways in which it can become meaningful and relevant to diverse actors, in-

frastructures, and processes. In conclusion, this paper invites further research into how urban food governance spaces can more effectively engage with the key socio-ecological and economic dynamics that shape diverse urban contexts. This is crucial for advancing food system action beyond its current status as a policy niche, towards a genuinely transformative approach.

References

- Aguilera, Thomas, Francesca Artioli, and Claire Colomb (2021) Explaining the diversity of policy responses to platform-mediated short-term rentals in European cities: A comparison of Barcelona, Paris and Milan. *Environment and Planning A: Economy and Space* 53.7: 1689-1712.
- Battersby, Jane and Watson, Vanessa (2019) (eds.) *Urban food systems governance and poverty in African cities*, Routledge, Taylor and Francis <https://doi.org/10.4324/9781315191195>
- Blay-Palmer, Alison, et al. (2018). Validating the City Region Food System Approach: Enacting Inclusive, Transformational City Region Food Systems. *Sustainability*, 10, 1680. <https://doi.org/10.3390/su10051680>
- Bottiglieri, Maria, Alessia Toldo, and Giacomo Pettenati, (2016). Toward the Turin Food Policy: Good practices and visions: 1-174, retrieved at: <https://www.torrossa.com/en/resources/an/4925615>
- Cabannes, Yves, and Marocchino, Cecilia, (eds.). (2018). *Integrating food into urban planning*. UCL Press.
- Campbell, Stephen M., et al. (2002). Research methods used in developing and applying quality indicators in primary care. *Quality and Safety in Health Care*, 11(4): 358-364.
- Clark, Jill K., Conley, Brian, and Raja, Samina, (2021). Essential, fragile, and invisible community food infrastructure: The role of urban governments in the United States. *Food Policy* 103: 102014.
- Doernberg, Alexandra, et al., (2019). Urban food policies in German city regions: An overview of key players and policy instruments. *Food Policy*, 89, 101782.
- Ericksen, Polly J. (2008). Conceptualizing food systems for global environmental change research. *Global Environmental Change* 18, 234-245.
- FAO, (2023a). FAOSTAT: Suite of Food Security Indicators. Retrieved at: <https://www.fao.org/faostat/en/#data/FS>
- Ferreira, António J., et al., (2018). Urban agriculture, a tool towards more resilient urban communities?. *Current Opinion in Environmental Science & Health* 5 (2018): 93-97.
- Fitch, Kathryn, et al. (2001). *The RAND/UCLA Appropriateness Method User's Manual*: RAND Corporation. Retrieved at: https://www.rand.org/content/dam/rand/pubs/monograph_reports/2011/MR1269.pdf
- Forster, Thomas, et al. (2015). Strengthening Urban Rural Linkages through City Region Food Systems. *Reg. Dev. Dialogue*, 35. Retrieved at: https://www.fao.org/fileadmin/templates/agphome/documents/horticulture/crfs/Strengthening_Urban_Rural_Linkages_through_CRFS.pdf
- Folke, Carl, Colding, Johan, and Berkes, Fikret (2003). Synthesis: building resilience and adaptive capacity in social-ecological systems. In: Berkes, Fikret, Colding, Johan, and Folke, Carl, (eds.), *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press, Cambridge, UK, pp. 352-387
- Frank, Beatrice, Delano, Dashia, & Caniglia, Beth Schaefer, (2017). Urban systems: socio-ecological system perspective. *Sociology International Journal*, 1(1), 1-8.
- Gennari, Carlotta, and Tornaghi, Chiara, (2020). The transformative potential of community kitchens for an agro-ecological urbanism. Preliminary insights and a research agenda. 9th International Annual Conference of the AESOP Sustainable Food Planning Group. Editorial Universidad de Granada, 2020.

- Guibrunet, Louise, et al., (2024). Data requirements for a systematic analysis of urban food flows and their sustainability outcomes, EPB: Urban Analytics and City Science, Vol. 0(0) 1–20
- Haysom, Gareth, (2015). Food and the city: Urban scale food system governance. *Urban Forum*, 26(3): 263-281. Dordrecht: Springer Netherlands.
- Haysom, Gareth, (2012). Understanding secondary city typologies: A food governance lens. In: Riley, Liam, and Crush, Jonathan (eds.). *Transforming urban food systems in secondary cities in Africa*. Cham: Springer International Publishing, 25-44.
- Hawkes, Corinna, (2023). Leveraging urbanization for food systems transformation. UN Food Systems Summit +2 Stocktaking Moment, Rome. Retrieved at: <https://www.youtube.com/watch?v=L3uDIRakK0w>
- Hebinck, Aniek, et al., (2021). A Sustainability Compass for policy navigation to sustainable food systems. *Global Food Security* 29: 100546.
- Heynen, Nik, Kaika, Maria, and Swyngedouw, Erik (eds.) (2006). *In the Nature of Cities - Urban Political Ecology and the Politics of Urban Metabolism*. Routledge, London and New York
- HLPE, (2024). Strengthening urban and peri-urban food systems to achieve food security and nutrition, in the context of urbanization and rural transformation. publication. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security.
- IPES-Food (2023). *From Plate to Planet*. How local governments are driving actions on climate change through food, retrieved at: <https://ipes-food.org/report/from-plate-to-planet/>
- Vincent, Olga, and Feola, Giuseppe, (2020). A Framework for Recognizing Diversity Beyond Capitalism in Agri-Food Systems. *Journal of Rural Studies* 80: 302–313.
- Krähmer, Karl, et al. (2024). Towards sustainable and sufficient city region food systems: Reflections from the case study of Turin, Italy. *Sustainability*, 16(19): 1-17.
- Latham, Alan, and McCormack, Derek P. (2004). Moving cities: rethinking the materialities of urban geographies, *Progress in Human Geography*, 28(6), pp. 701–724
- López-García, Daniel, et al. (2024). Los sistemas alimentarios urbanos, cada vez más insostenibles, dependientes y desvinculados del territorio. CSIC - Instituto de Economía, Geografía y Demografía (IEGD). Retrieved at: <https://doi.org/10.20350/digitalCSIC/17011>
- Mahmoud, Israa, et al., (2025). Understanding collaborative governance of biodiversity-inclusive urban planning: Methodological approach and benchmarking results for urban nature plans in 10 European cities. *Urban Ecosystems* 28, 2: 1-17.
- Manganelli, Alessandra, (2025). Urban food governance in times of crises: insights from Toronto, *ReCibo, Rivista della Rete Italiana Politiche Locali del Cibo*, 3(1): 53-66
- Manganelli, Alessandra, and Moulaert, Frank, (2018). Hybrid governance tensions fuelling self-reflexivity in Alternative Food Networks: the case of the Brussels GASAP (solidarity purchasing groups for peasant agriculture), *Local Environment*, DOI:10.1080/13549839.2018.1477745
- Marsden, Terry, Hebinck, Paul and Mathijs, Erik, (2018). Re-building food systems: embedding assemblages, infrastructures and reflexive governance for food systems transformations in Europe. *Food Security*, 10(6), 1301-1309.
- McFarlane, Colin, and Rutherford, Jonathan, (2008). Political infrastructures: governing and experiencing the fabric of the city, *International Journal of Urban and Regional Research*, 32(2), pp. 363–374.

- Mendes, Wendy (2008). Implementing social and environmental policies in cities: The case of food policy in Vancouver, Canada. *International Journal of Urban and Regional Research*, 32(4): 942-967.
- Monstadt, Jochen, (2009). Conceptualizing the political ecology of urban infrastructures: insights from technology and urban studies, *Environment and Planning A*, 41(8): 1924-1942.
- Monstadt, Jochen, et al. (2022). Rethinking the governance of urban infrastructural transformations: a synthesis of emerging approaches. *Current Opinion in Environmental Sustainability*, 55:101157, <https://doi.org/10.1016/j.cosust.2022.101157>
- Moragues-Faus, Ana, (2021). The emergence of city food networks: Rescaling the impact of urban food policies. *Food Policy*, 103, 102107.
- Moragues-Faus, Ana, and Marsden, Terry, (2017). The political ecology of food: Carving 'spaces of possibility' in a new research agenda. *Journal of Rural Studies*, 55, 275-288. <https://doi.org/10.1016/j.jrurstud.2017.08.016>
- Moragues-Faus, Ana, and Battersby, Jane, (2021). Urban food policies for a sustainable and just future: Concepts and tools for a renewed agenda. *Food Policy* 103, 102124. <https://doi.org/10.1016/J.FOODPOL.2021.102124>
- Moragues-Faus, Ana, et al. (2023). (edits.) *Routledge Handbook of Urban Food Governance*, 1st Edition. ed. Routledge.
- Moragues-Faus, Ana, and Zerbian, Tanya (2025). A socio-ecological approach to understanding urban food systems (in progress)
- Rutherford, Jonathan, (2013). The Vicissitudes of Energy and Climate Policy in Stockholm: Politics, Materiality and Transition. *Urban Studies*, 51(7), pp. 1449-1470
- Schneider, Kate R., et al. (2025). Governance and resilience as entry points for transforming food systems in the countdown to 2030. *Nature Food* (2025): 1-12.
- Sonnino, Roberta, (2023). Food system transformation: Urban perspectives. *Cities*, 134, 104164.
- Sonnino, Roberta, Lozano Torres, Camilo, and Schneider, Sergio, (2014). Reflexive governance for food security: The example of school feeding in Brazil. *Journal of Rural Studies*, 36, 1-12.
- Swyngedouw, Erik, and Kaika, Maria, (2014). Urban political ecology. Great promises, deadlock ... and new beginnings? *Documents d'Anàlisi Geogràfica* 60.3, 459-81
- Tefft, James, et al., (2021). *Urban Food Systems Governance*, World Bank Publications - Books, The World Bank Group, number 35936, August 2021.
- Tozer, Laura, (2019). The urban material politics of decarbonization in Stockholm, London and San Francisco. *Geoforum* 102: 106-115.
- Zerbian, Tanya, et al. (2024). Territorialising knowledge-policy interfaces: Lessons from urban food governance spaces. *Environmental Science & Policy* 161: 103883.